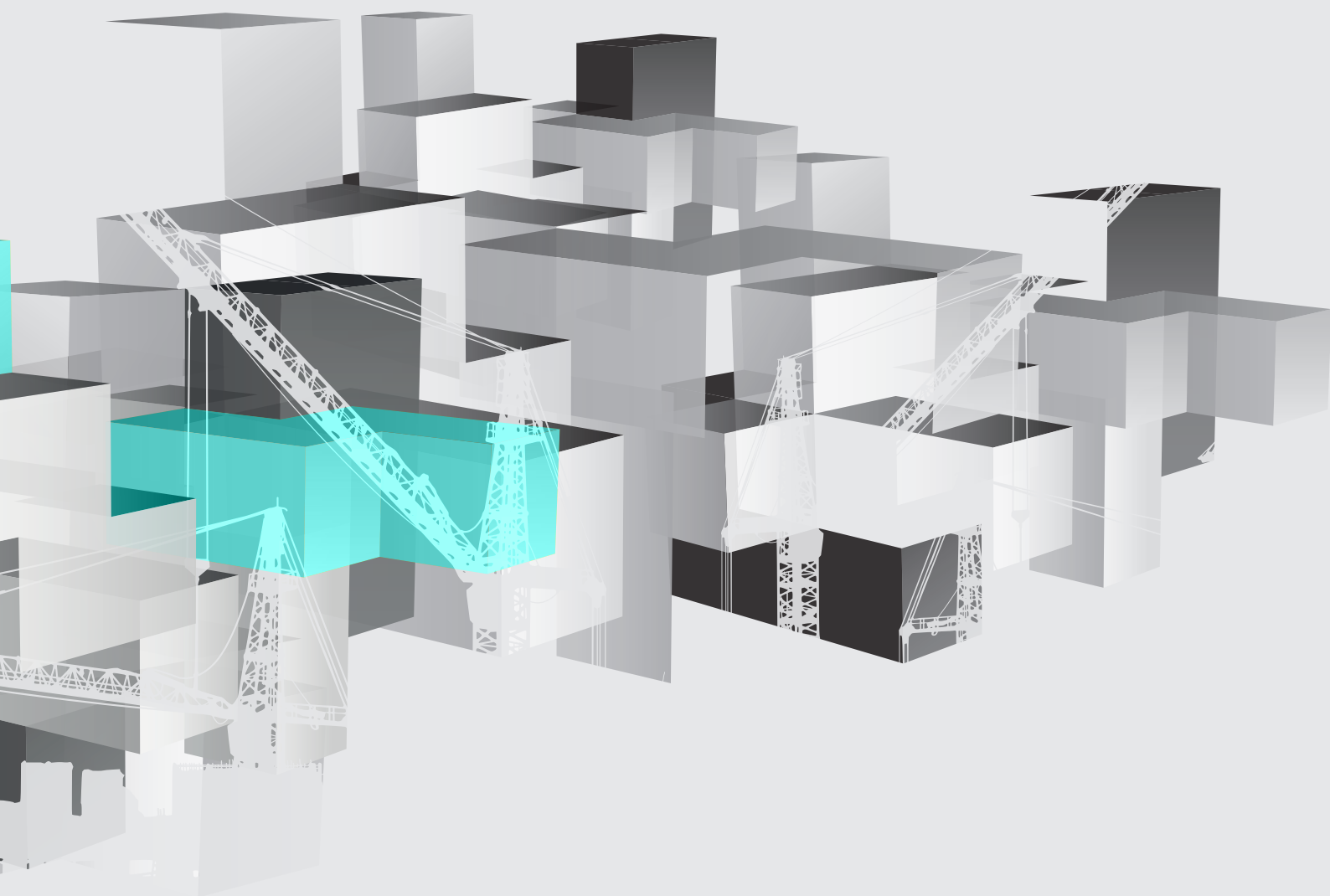


# GUIDELINE

## Suitability Study For IBS Productivity Incentive In Construction Industry

CIDB TECHNICAL PUBLICATION NO: 193



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# GUIDELINE

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## **Suitability Study For IBS Productivity Incentive In Construction Industry**

**CIDB TECHNICAL PUBLICATION NO: 193**





# Preface

The construction industry in Malaysia has been actively working towards achieving the high-income status by 2020. Rahim et al., (2013) explained two major parts of the construction method that are usually implemented in the industry, which are: conventional method cast in-situ method (formwork system) and composite construction method. Based on the Construction Industry Transformation Programme (CITP) 2020-2016, five strategic thrusts have been listed; quality, safety & professionalism, environmental sustainability, productivity, and internalisation. Productivity refers to the primary engine of growth towards Malaysia's high-income target. As a vital sector to the nation's advancement, the construction industry seems to lead with high productivity levels through efficient adoption of new technologies and modern practices, coupled with high-skilled and highly-paid workforce.

This study "SUITABILITY STUDY FOR IBS PRODUCTIVITY INCENTIVE IN CONSTRUCTION INDUSTRY" produced by the Construction Industry Development Board (CIDB) will be used as the primary reference, to provide information for developers, engineers, manufacturers, contractors, consultants and relevant authorities to understand IBS productivity incentive in construction industry. The study aims to review, propose, and develop a report regarding the suitability of productivity incentive for IBS construction among developers, consultants, contractors, and suppliers and also to recommend the suitable productivity incentive from the analysis from the benchmark.

The CIDB wish to express their gratitude and appreciation to the Ministry of Works, IBS manufacturers, contractors, consultants, developers and all industry players involved in this study. This study will be a useful reference towards increasing productivity especially to improve using IBS in construction, high-quality construction, minimize environmental impacts in construction and achieve economies scale in IBS industry.

**IBS Centre,  
Technology Development Sector,  
Construction Industry Development Board Malaysia (CIDB)**

# Editorial

This project was funded by the Construction Industry Development Board Malaysia (CIDB) and executed by the Construction Research Institute of Malaysia (CREAM). We would like to thank the following members for their contribution and support.

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# About this Research

This study is one of the initiatives commissioned by the Construction Industry Development Board (CIDB) to assist construction industry players and stakeholders in moving forward concerning IBS productivity incentive in construction industry. This research was produced by the Construction Research Institute of Malaysia (CREAM) and various industry players and stakeholders expert through a workshop and questionnaire.

As a reference study, the guideline will be a valuable resource used by developers, contractors, consultants and manufacturers, aiming to review, propose, and develop a report regarding the suitability of productivity incentive for IBS construction among developers, consultants, contractors, and suppliers and also to recommend the suitable productivity incentive from the analysis from the benchmark.

The study consists five (5) Parts. The first part introduces the construction industry in general, the Malaysian construction industry, incentive in construction industry, overview incentive in Malaysia and productivity incentive in construction. Part two is about the benchmarking and result of focus group workshop. Part 3 presents the assessment criteria of productivity incentive in construction industry including Singapore, Australia, South Africa, Hong Kong, United States of America and Japan. Chapter four describes results of distribution questionnaire to developers, contractors, consultants and manufacturers. The survey including level of importance of productivity-enhancing factors and measures which are often suggested, ranking importance of productivity incentive criteria, numerical linear importance and usefulness scale and construction productivity incentive framework in Malaysia.

Finally, part 5 provide the recommendations and conclusion for suitability incentive for the construction industry in Malaysia. This also to give recommendations to improve incentive in the construction industry.



# Executive Summary

## Incentive of productivity within the construction arena has escalated in popularity as a key indicator for construction development.

With that implemented, providing incentive productivity for developers, contractors, consultants, and manufactures of multiple projects within the construction field has become a necessity. It appears to encourage firms to further enhance their productivity in the construction industry on IBS. Vast resources are available to award incentive productivity across nations that can be comparable. Each country has various types of incentives on IBS, depending on their aims and objectives. As for Malaysia, incentive productivity is provided to contractors and manufacturers only. Hence, the incentive given to other parties ascertains enhancement in productivity within the construction industry in Malaysia. In fact, six (6) countries are comparable for the practice of awarding incentives of productivity within the construction arena, including Singapore, Australia, Hong Kong, South Africa, Japan, and United States of America (US). Incentives in Singapore happen to display the most comprehensive coverage of productivity and sustainability in the construction industry, in comparison to other countries. Compilation and introduction for the available incentives given by a nation to the stakeholders are indeed necessary to enable one to overview, as well as to comprehend these incentives in the attempt of minimising employment of foreign labours in the construction arena.

The evaluation and pairing exercise of these incentives is conducted to assess their comprehensiveness and effectiveness in terms of productivity and sustainability, which can further facilitate the industry to identify the extent of adequacy for a given incentive in light of their preferences. The mentioned exercise also offers insights on both positive and negative attributes of these incentives, so that the stakeholders can always cross-check the comprehensiveness and the effectiveness of the Malaysian incentives with those internationally well-established ones. Last but not least, this study enlightens stakeholders to keep pace with the evolving and developing incentive productivity available. Throughout the analysis of similarities and differences of each tool, an assessment benchmarking for comprehensiveness of incentive is developed, which draws conclusion that Singapore's incentive attribute is used as a basis for developing incentives productivity on IBS within the Malaysian context.

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## LIST OF SYMBOLS AND ABBREVIATIONS

<i>CITP</i>	Construction Industry Transformation Programme
<i>GDP</i>	Growth Domestic Product
<i>MITI</i>	Ministry of International Trade and Industry
<i>ASEAN</i>	Association of Southeast Asian Nations
<i>MBAM</i>	The Master Builders Association Malaysia
<i>IBS</i>	Industrialised Building System
<i>BIM</i>	Building Information Modelling
<i>CDM</i>	Construction Design and Management
<i>REHDA</i>	The Real Estate and Housing Developers Association Malaysia
<i>MIDA</i>	Malaysian Investment Development Authority Unit
<i>PIP</i>	Productivity Innovation Project
<i>BCA</i>	Building and Construction Authority
<i>CPCF</i>	Construction Productivity and Capability Fund
<i>ACS</i>	Actual Construction Sum
<i>GCS</i>	Guaranteed Construction Sum
<i>HKGBC</i>	Hong Kong Green Building Council
<i>EMSD</i>	Electrical and Mechanical Services Department
<i>BEEO</i>	Buildings Energy Efficiency Ordinance
<i>EPD</i>	Environmental Protection Department





# Introduction

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- 1.1 Construction Industry in General
- 1.2 The Malaysian Construction Industry
- 1.3 Incentive in Construction Industry
  - 1.3.1 Overview Incentive in Malaysia
- 1.4 Productivity
  - 1.4.1 Productivity in Construction
  - 1.4.2 Productivity Incentive in Construction Industry
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## 1.1 Construction Industry in Malaysia

Both developing and developed nations reckon the significance of the construction sector in socio-economic and sustainable development of any country. Construction activities are closely linked with various phases of economic development of a country. This particular aspect has been discussed for several years at the macroeconomic level. In the past, construction activities were linked with the process of industrial and urban development, particularly since the dawn of Industrial Revolution (Rostow, 1963). The key role of construction sector in aggregate economy is widely highlighted in the literature. In fact, a direct correlation has been highlighted between construction output and national output. The construction output grows more rapidly than national output upon progression of economy and vice versa (Hua, 1995; Wells, 1986; Turin, 1969). Moreover, many studies have verified that approximately half of the investment in gross fixed capital formation is arranged by the construction sector amongst many developing nations. It plays a significant role in creating employment opportunities and in generating new income sources for those skilled and unskilled in the society. Therefore, the variation detected within the construction sector, along with its activities, seems to project a great impact on all aspects of human life (Jorge, 2008; Khan, 2008; Rameezdeen, 2008; Chen, 1998; Ofori, 1988; Hillebrandt, 1985; Wells, 1985; World Bank, 1984; Turin, 1978). This implies that the construction sector is highly integrated with other sectors of the economy through both backward and forward linkages, apart from being strongly linked with many other economic activities (Bon, 1990, 1988; Geadah, 2003; Lean, 2001; Rameezdeen, 2006).

These linkages stem for the sector through which it generates higher multiplier effect on the economy (Park, 1989). Therefore, any change in the construction sector is deemed to affect other sectors of the economy and eventually has an impact upon national income (Ofori, 1988). The construction industry is often considered as an engine of economic growth, especially amidst developing economies. The industry can activate and successfully consume locally-produced materials and manpower within the construction arena, as well as maintenance of buildings and infrastructures to motivate local employment and boost economic efficiency (Anaman, 2007). The construction sector, hence, has a great impact on socio-economic development of a country. The construction industry is an economic investment and its relationship with economic progression has been well-positied. Many studies have highlighted the significant contribution of the construction industry towards national economic development (Myers 2013)..

Some have asserted that it is economic growth that drives the construction industry, instead of otherwise, i.e. the construction industry is not a driver of economic prosperity, but rather it adheres to the “path” defined by the total economic growth rate. Nonetheless, it is emphasised that irrespective of the position one takes pertaining to the relationship between construction industry and economic growth, it does not in any way invalidate the significance of the construction industry, particularly the provision of crucial infrastructures that stimulate economic development. As such, the industry is required for national progression for a nation to have meaningful and sustained development. Thus, if the construction industry is inefficient, it would be a difficult feat for a nation to attain meaningful development.

## 1.2 The Malaysian Construction Industry

The construction industry in Malaysia has been actively working towards achieving the high-income status by 2020. Rahim et al., (2013) explained two major parts of the construction method that are usually implemented in the industry, which are: conventional method cast in-situ method (formwork system) and composite construction method. Based on the Construction Industry Transformation Programme (CITP) -2016 2020, five strategic thrusts have been listed; quality, safety & professionalism, environmental sustainability, productivity, and internalisation. Productivity refers to the primary engine of growth towards Malaysia’s high-income target. As a vital sector to the nation’s advancement, the construction industry seems to lead with high productivity levels through efficient adoption of new technologies and modern practices, coupled with high-skilled and highly-paid workforce. The government has outlined an economic road map to transform the nation so as to be pinned on the globe as a developed nation. Since independence, the Malaysian economy has observed plans with five-year strategic thrusts. These strategic trusts are in line with the goal of attaining a high-income nation status by year 2020. Looking towards the 2020 target, the challenge is primarily to sustain the impetus of robust growth. In particular, this demands an average growth of 6.0 % in gross domestic product (GDP) per annum during the Tenth Malaysia Plan period. In order to hit this target, the economic sectors have significant functions. The construction sector is active and features prominently in terms of policy formulation and implementations. The construction industry in Malaysia has been growing at a rapid pace, especially within the housing subsector industry with increment in GDP by %11.6 for year 2014, when compared to %10.9 recorded in year 2013 (Ministry of International Trade and Industry (MITI), 2014). Nevertheless, this particular

industry is plagued with many glitches, quality issues, and abandoned projects. The impact of the presence of foreign labour has exerted further negative impact on the flow of Ringgit Malaysia currency and various social issues within the nation (Azman, 2014).

Based on the data generated by the Central Bank of Malaysia (2018), the highest National GDP was 6.0, which had been recorded in year 2014, while the GDP for construction was 18.1 in year 2012. The construction industry in Malaysia seems to be growing in a consistent manner from 2011 until Q2018 1, inclusive of the rapid growth noted in year 2012.

Table 1.0 National and Construction GDP Values in Malaysia

	2011	2012	2013	2014	2015	2016	2017	1Q 2018
National GDP (%)	5.3	5.5	4.7	6.0	5.0	4.2	5.9	5.4
Construction GDP (%)	4.6	18.1	10.6	11.7	8.2	7.4	6.7	5.5

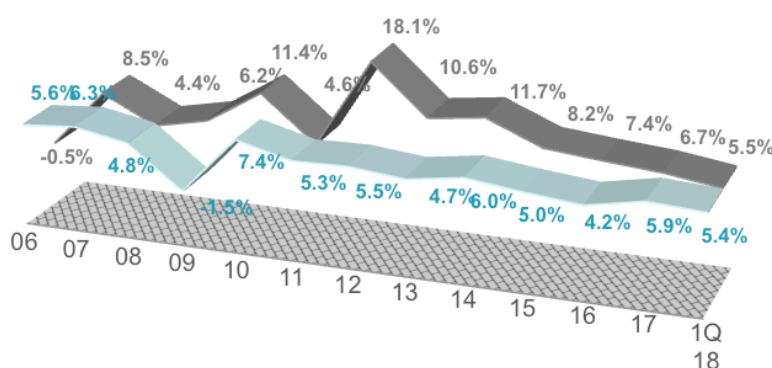


Figure 1.0 National and Construction GDP values in Malaysia

Source: Central Bank of Malaysia (2018)

A comparison of the construction industry in terms of size with selected Association of Southeast Asian Nations (ASEAN) countries suggests that its contribution has been consistent and stable (see Table 2.0). Among the nations cited, the contribution of the Malaysian construction industry, although not the highest performer, its contribution remains modest.

Table 2.0: Percentage share of GDP for selected ASEAN countries (production approach) for the construction sector

Country	2009	2010	2011	2012	2013
South Korea	5.1	4.6	4.2	4.1	4.1
Hong Kong	2.7	2.9	3.3	3.5	3.5
Singapore	4.2	3.8	3.8	4.0	4.1
Thailand	2.2	2.2	2.1	2.1	2.1
Philippines	5.4	5.7	5.0	5.6	5.6
Indonesia	6.4	6.5	6.5	6.6	6.6
Malaysia	3.1	3.2	3.2	3.5	3.8

Source: Malaysian Department of Statistics (2014a)

Although Malaysia has encountered headwinds from the global economic slump, its economic performance during the 11th Malaysia Plan (2020-2016) has been extremely well with its GDP growth among the fastest in the region. The quality of life amidst its people has also improved, as reflected by the escalating per capita income and average household income. This is made possible through the implementation of numerous reforms that have been carried out by the government towards enhancing the quality of life amongst its people. The primary keys among the strategic programme implementations refer to the Government Transformation Programme and the Economic Transformation Programme, underpinned by the Tenth Malaysia Plan. As for the 11th Malaysia Plan, a total of 2.7 million B40 households earned an average monthly household income of RM2,537.

The value of construction work performed in 2017 for private projects recorded a moderate growth of %74 instead RM121 billion (%60 ;2016, RM151 billion). On the other hand, the public projects recorded a decrease of %26 instead RM42 billion (%40 ;2016, RM101 billion). The correlation between national GDP growth and GDP growth of the construction sector from years 2010 until 2017 is portrayed in Figure 2.0.

Table 3.0: Construction in Private and Public Projects

	2010	2011	2012	2013	2014	2015	2016	2017
<b>Private Projects</b>	5,424	5,771	5,997	6,228	6,276	5,711	5,846	5,449
<b>Public Projects</b>	1,878	1,954	2,001	1,971	1,800	1,939	2,098	2,099
<b>Total</b>	<b>7,302</b>	<b>7,725</b>	<b>7,998</b>	<b>8,199</b>	<b>8,076</b>	<b>7,650</b>	<b>7,944</b>	<b>7,548</b>

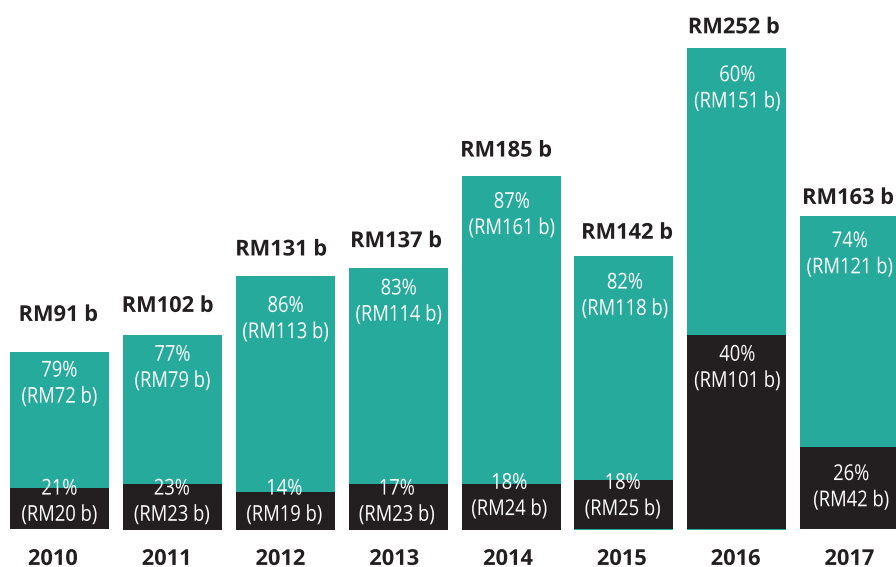


Figure 2.0 Construction in Private and Public Projects

In terms of contribution, the civil engineering subsector dominated the value performance of construction work at %39.6, followed by non-residential buildings (%28.8), residential buildings (%26.6), and special trades activities (%5.0), as illustrated in Figure 3.0.

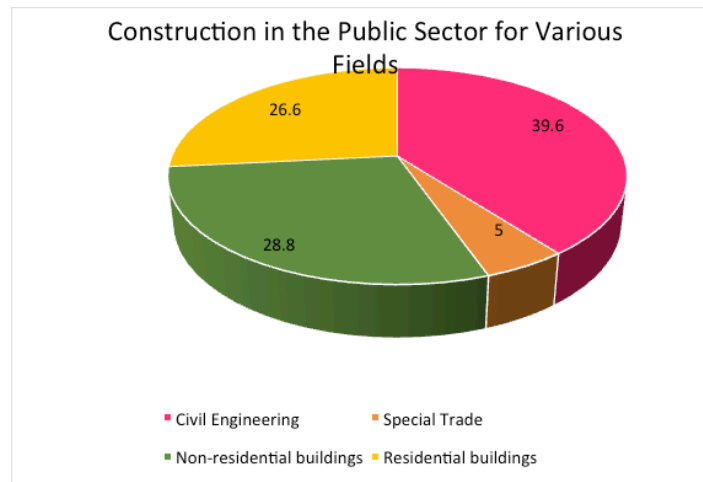


Figure 3.0: Construction in the Public Sector for Various Fields

Source: Statistics (2018)

### 1.3 Incentive in Construction Industry

Incentives refer to a common contractual tool that influences the behaviour of contracting parties. The type of incentive differs by the objectives outlined. A contract may involve several general objectives, for example, enhancement of client-contractor relationship, establishment of long-term relationships, or use of certain business models. As for the latter types of incentives, a broad range of incentives may be used, such as monetary incentives (fixed-price contracts, cost-plus incentive fees, cost-plus-award fees, share in saving incentive), and non-monetary incentives (automatic extension of contract term, frequent payments, letters of appreciation). Incentives have long been used in attempts to improve performance. Reiners and Broughton (1953) asserted that the labour cost spent by main contractors who operate incentive schemes for their employees was considerably lower than that of contractors not involved in such schemes. Fleming (1967) concluded in a study about productivity in housebuilding that improvements could flow either from technological developments and increasing efficiency of individual firms, or from changing the nature of demand by altering the sizes of contracts or adopting contract procedures designed to encourage more efficient working methods.

By placing focus at firm level, Scherer (1964) revealed that contractors who were financially incentivised to improve their performance for US Defence projects behaved in rather unexpected ways. Their contracts included clauses that enabled them to renegotiate the price and/or duration of the project with a huge impact on the effect of the incentives. The contractors did not even try to maximise the expected value of their profits. This offers some background and context for understanding why simple financial incentives have little impact on construction contractors. This is in line with the findings reported by Bresnen and Marshall (2000) that varying incentive schemes may have little impact on performance, when compared with other sources of motivation. Similarly, Rosenfeld and Geltner (1991) identified several significant counter-productive effects of “adverse selection” that must occur in an incentive-contract environment.

The Master Builders Association Malaysia (MBAM) announced its hope for lower import duties for heavy construction machinery and more incentives in Budget 2018 to be disbursed to those industry players that employed Industrialised Building System (IBS) and Building Information Modelling (BIM), such as equipment tax reduction and tax incentives, during a post-budget statement in October 2017, 27. “We hope that the government will support us in our efforts as the government is firm on mandating the adoption of IBS in the construction industry with a three-year grace period for full implementation by year 2020,” claimed the MBAM president, Mr Foo Chek Lee (The Edge Markets, 2017). He added that the association hopes the government would offer tax investment allowance for new technology

and machinery investment so as to promote the production and installation of IBS components. “Not only can IBS products reduce the application or usage of building materials that can cause environmental damage, they also reduce the dependency upon foreign workers,” he said. Additionally, he pointed out that an obstacle to adopting BIM is the high cost of software. “We hope that the government can provide subsidy for companies to adopt BIM. This can help in IBS planning and implementation. Furthermore, BIM can help in complementing the government’s initiative to implement construction design and management (CDM) regulations, whereby hazard and risk can be controlled from the planning and design stage”. Nevertheless, MBAM applauded the government for a budget that “continues to undertake a delicate balancing act between maintaining fiscal prudence, managing growth, and considering people’s well-being”. “A total of RM280.25 billion has been allocated for Budget 2018, an increase of RM19.45 billion or %7.45, when compared to the 2017 budget allocation of RM260.8 billion... MBAM hopes that the policy with regard to the employment of workers can be looked at in a holistic manner so that the aspiration of both the public and the private sectors can be satisfied.” He further concluded, “However, MBAM appreciates the increase of budget on technical and vocational education and training of RM4.9 billion, which will increase the number of local skilled workers and productivity, apart from decreasing dependency on foreign workers”.

Although IBS has been implemented and required for government projects, a number of problems have yet to be resolved, among those listed in the following:

- i) Less understanding regarding the implementation of IBS projects, and lack of information concerning training and development of specialised skills in the field of IBS;
- ii) No request information for IBS used by the client, regardless of government or private;
- iii) No information on construction industry risk associated with IBS;
- iv) Issues related to contracts and payments between IBS contractors and suppliers that affect the smooth running of the project; and
- v) Lack of incentives provided to developers, consultants, contractors, and suppliers.

The Real Estate and Housing Developers Association Malaysia (REHDA) highlighted the issue pertaining to lack of incentives to encourage developers to embark on green building development, particularly financial incentives that do not mitigate the high upfront cost of green buildings. There is also lack of enforcement, including the lack of legislative framework for green technology, as well as the lack of building codes and regulations. In Singapore, when multinational tenants decide to rent a green building, they would need to pay %30-20 higher premium from the normal office rental. As for Malaysia, the rental stands the same regardless of building genre (SunBiz, August ,17 2018).

### **1.3.1 Overview Incentive in Malaysia**

In the case of Malaysia, incentives are only awarded to contractors and IBS manufacturers. As for IBS contractors, the construction industry development board (CIDB) has generated a special levy exemption incentive to contractors undertaking private housing projects using IBS. The condition imposed on contractors is to achieve a minimum of 50 IBS scores. CIDB conducts assessments via site visits and until a project is completed, the contractor may reclaim the levy payments made to CIDB. This incentive has been established since 2006 and it is still in implementation within the construction arena in order to encourage more private projects to use IBS.

As for IBS manufacturer, the Malaysian Investment Development Authority (MIDA), along with CIDB, has created an incentive in 2016 called the ‘tax holiday’ taxation to new and existing IBS manufacturers opening a new plant. Producers need to register their company with both MIDA and CIDB so that these incentives can be provided by MIDA. This particular corporate tax exemption is available only for 5 years, from 2016 until 2020, to eligible and selected companies.

Therefore, further investigations are demanded to increase the application of IBS for future construction projects, regardless of government or private projects. Table 4.0 presents the outcomes retrieved from workshops organised by the IBS Centre at CIDB in January 2018. The involvement of four (4) parties was noted at the workshop in proposing several incentives from the government, which are developers, contractors, consultants, and manufacturers, as depicted in the following, along with the list of proposal:

## Developers

Table 4.0: Incentives for Developers

Type	No.	Incentive / Suggestions	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
TAX	1.	To reduce corporate tax (25%) based on IBS score – Income tax allowance	LHDN, MOF & MIDA Supported by CIDB	Reduction up to 15%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Less income tax up to 15%	Amend Tax Schedule	More Affordable Housing units	No penalty
	2.	Sales tax exemption for all accredited IBS materials	LHDN, MOF & MIDA Supported by CIDB	TBD	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Less income tax	Amend Tax Schedule	More Affordable Housing units	No penalty
	3.	GST exemption for IBS construction material	LHDN, MOF & MIDA Supported by CIDB	6%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Less income tax	Amend Tax Schedule	More IBS construction development	No penalty
	4.	Reduction on custom duties to encourage adoption of mechanisation and automation	LHDN, MOF & MIDA Supported by CIDB	TBD	Effective on 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Less income tax	Amend Tax Schedule	More IBS construction development	No penalty
APPROVAL	5.	Priority for planning approval for Affordable Housing project (<RM250k) using IBS	KPKT		Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50			More Affordable Housing units / projects	No penalty

Type	No.	Incentive / Suggestions	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
FFC	6.	Reduce bank loan interest (lowest 4% - SME IBS Fund) and increase limit from RM10m to RM30m	KPKT & Financial Institution	2%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50			More Affordable Housing units / projects	No penalty
	7.	Reduce development fees – based on IBS score	Local Authority	75%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Less income to the government	Amend Development Fee Schedule	More Affordable Housing units / projects	No penalty
	8.	Exemption of 1% of Infrastructure Fees (ISF) - by phase	KPKT	1%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	1% of overall project value	Amend Infrastructure Fee Schedule	More Affordable Housing units / projects	No penalty
	9.	Reduce fees from Land Surveyors Boards ( <i>Lembaga Jurukur Tanah (LJT)</i> )	Land Surveyors Boards	50%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	RM320 per plot	Amend fee from LJT	More Affordable Housing units / projects	No penalty
	10.	Exemption of stamp duty (developer & purchaser)	LHDN	FOC	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Refer to Professional Development Consultant		More Affordable Housing units / projects	No penalty
	11.	Reduce fee for service provider application and testing (TNB, SAJ etc.)	Service Provider	50%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	50% loss	Amend service provider fee	More Affordable Housing units / projects	No penalty
	12.	Reduce fee for transfer ownership	<i>Pejabat Tanah &amp; Galian</i> (PTG)	50%	Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	RM1,000 per lot	Amend transfer ownership fee	More Affordable Housing units / projects	No penalty

Type	No.	Incentive / Suggestions	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
DEVELOPMENT	13.	Higher plot ratio / density	Local Authority		Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	TBD	TBD	TBD	No penalty
	14.	Education to improve market perception of IBS - roadshow etc.	CIDB		Effective in 2018 (minimum 3 years)				Generate more skilled workers and knowledgeable in IBS	No penalty
INFRASTRUCTURE	15.	Improving Transportation infrastructure	TBD		Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50			Easy to transport IBS Component	No penalty
	16.	Increasing economies of scale for IBS products - Government to adopt IBS as mandatory requirement for government projects - Increase in the number of product suppliers	CIDB		Effective in 2018 (minimum 3 years)	IBS Score: Gov > 70 Private > 50	Positive impact in terms of productivity and economy		- Increasing number of suppliers - Economy growth	No penalty

## Consultants

Table 5: Incentives for Consultants

Incentives	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
1. Tax relief on income from IBS projects for consultants (architects, engineers, quantity & building surveyors)	LHDN, Treasury, Customs	100% tax relief on fee earned from IBS project	15 years starting from 2019	For projects with IBS score exceeding 50 points	Estimate – RM 200mil. loss to the government	LHDN to issue circular	Estimate - RM 2.75bil. can be saved only from remittance by foreign labour	Not Applicable
2. Pioneer status, investment tax allowance, and duty free for IBS status companies/ consultants (Ref. MSC status, MIDA green tech. incentive)	LHDN, Treasury, Customs, CIDB	100%	10 years starting from 2019	To be further discussed (ref. MSC status)	Capped at RM 400mil.	LHDN to issue circular	Based on the number of IBS companies/ consultants	Loss of status
3. Extra fee for consultants involved in the IBS projects	Professional boards (BAM, BEM, BQSM)	Extra 1%	15 years starting from 2019	Qualified persons	0% to government	Schedule of fee to be amended	Increase productivity services	Not Applicable
4. Grant for hardware, software and training for IBS companies/ consultants	CIDB	RM 50K per company/ consultant (one-off payment)	15 years starting from 2019	First time IBS project with a score of 70 (first time consultant) Gross development value RM 20mil.	Capped at RM 20mil. per year for 5 years Overall impact RM 100mil.	Not Applicable	RM 10bil. projects will use IBS exceeding 70 score	Not Applicable

Incentives	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
5. Grant for IBS research development	CIDB	Capped RM 100k per product	Starting from the 2 <sup>nd</sup> quarter in 2018	Industry research for IBS solution Post-prototype (software and other construction products)	Capped at RM 10mil. per year	Not Applicable	To-market	Not Applicable
6. Green lane approval for development plan - Current practice takes about 60 working days	KPKT, state & local governments, technical agencies	Not Applicable	Starting in early 2019	IBS project	Not Applicable	KPKT/ MNKT	Increase productivity services	Not Applicable
7. Amend current UBBL to ensure IBS elements adoption	KPKT, JKT, CIDB, AGC	Not Applicable	Starting from the 1 <sup>st</sup> quarter in 2018	Not Applicable	Not Applicable	To amend UBBL	Suitability of UBBL to IBS elements	Not Applicable

## Contractors

Table 6: Incentives for Contractors

Incentives	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
1. Tender price advantage over tender price using conventional system of building works.	JKR REHDA All potential client	5 - 10% delta diff.	Upon award of contract disbursement shall be based on work done	All classes of contractors	Subsidy from the government	-	More IBS contractors	-
2. Reduction of income tax	MOF, LHDN	10-25%	Yearly	All IBS contractors >50 IBS score	National income	MOF	To attain at least 50 IBS score	-
3. Cost reduction / fee waiver for skilled labour accreditation programmes under <i>Jadual Ketiga</i> <i>Akta CIDB</i>	CIDB	50 - 100%	Yearly	IBS contractor accredited by CIDB	CIDB	To amend Akta 520 CIDB ( <i>Jadual Ketiga</i> )	Increase of IBS skilled work-force	-

## Manufacturers

Table 7: Incentives for Manufacturers

Incentives	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
1. New technology/equipment and machinery (automation – new & upgraded) <ul style="list-style-type: none"> <li>• Grant</li> <li>• Zero interest loan</li> <li>• Capital allowance</li> <li>• Tax exemption</li> <li>• Duty import</li> </ul>	SIRIM/CIDB/MOF/SME Bank	80%-100%	5-10 Years (Effective from 2018)	IBS Manufacturer	Government	Custom Act	Increase productivity	Yes
2. R&D-Testing, new products <ul style="list-style-type: none"> <li>• Grant for products development</li> <li>• Government subsidies for testing cost with various institutions, including SIRIM, CREAM, BOMBA, etc.</li> <li>• Government to expand more testing facilities for IBS product development</li> <li>• Pioneer status for new IBS products for existing companies</li> </ul>	SIRIM/ CREAM/ BOMBA/ CIDB/MOF/ MIDA	80%-100%	5-10 Years (Effective from 2018)	IBS Manufacturer/Researcher	Government	Nil	Increase in quality & reliability of the products. New range of products.	Yes
3. Factory expansion and upgrading <ul style="list-style-type: none"> <li>• Grant</li> <li>• Zero interest loan</li> <li>• Duty exemption</li> <li>• Capital allowance</li> </ul>	MARA/ MOF/ IRB/ Custom	80%-100%	5-10 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in productivity	Yes
4. Utilities- Water, electricity usage <ul style="list-style-type: none"> <li>• Special tariff for IBS manufacturers</li> </ul>	TNB/AIR/ GAS Malaysia	50%	5 Years (Effective from 2018)	IBS Manufacturer	TNB/AIR	Nil	Increase in competitiveness	Yes

Incentives	Responsible Agency	Incentive Rate	Execution Period	Eligibility Criteria	Financial Impact	Laws Impact	Outcome Measurement	Non-Compliance Penalty
5. Fee waiver for any testing of building material	SIRIM/CREAM/CIDB	80%-100%	5 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in competitiveness	Yes
6. Fee waiver for product certification	SIRIM/CREAM/CIDB	80%-100%	5 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in competitiveness	Yes
7. Raw material • Duty exemption	Custom/MIDA	100%	Indefinite (Effective from 2018)	IBS Manufacturer	Government	Custom Act	Increase in productivity and competitiveness	Yes
8. Training • Training cost sharing with the Government by subsidising the training provider • Subsidy to establish training centre • Subsidy for training materials & fees	Ministry of Human Resource	50%	5 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in productivity & efficiency Skill workforce	Yes
9. Software-design & operating system • In-house design team (software free) • Tax exemption	SIRIM/CIDB/Custom	80%-100%	2 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in productivity & efficiency	Yes
10. Shortage of local workforce (3D-Difficult, Dirty & Dangerous) • Local skill workers-professional level tax incentive	Ministry of Human Resource	50%-80%	5 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in productivity & efficiency Skill workforce	Yes
11. Patent registration • Grant • Subsidy from government	SIRIM/CIDB/MyIPO	50%-100%	One off (Effective from 2018)	IBS Manufacturer	Government	Nil	Successful patent registration	Yes
12. Transportation • Subsidy of transportation cost for delivery	MOF	10%-50%	2 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in productivity	Yes
13. BIM library • Grant for engaging external consultants	CIDB/CREAM	50%-80%	2 Years (Effective from 2018)	IBS Manufacturer	Government	Nil	Increase in productivity	Yes



## 1.4 Productivity

According to Asian Productivity Organisation Malaysia Productivity Corporation, productivity refers to the belief in human progress. It is a state of mind that aims at perpetual improvement. It is a ceaseless effort to apply new technology and new methods for the welfare and happiness of mankind. It is also the training of the minds and the development of attitudes amongst people as a whole, which determines if a nation can realise high productivity and an affluent life or otherwise, low productivity and poverty. The increase in market value results from alteration in the form, location or availability of a product or services, excluding brought-in materials or services. The wealth of a company is generated by its own and the efforts of its employees. Financial value can be created by the internal activities of an enterprise in the process of production, which are added to the original raw materials purchased from outside.

In fact, productivity is gaining recognition as a major factor in many problems of the public concern, such as economic growth, inflation, distribution of income wage reform, and international competitiveness.

### 1.4.1 Productivity in Construction

Productivity is commonly defined as a ratio between the output and input volumes. In precise, it measures how efficiently production inputs, such as labour and capital, are used in an economy to produce a pre-determined output level. Productivity has been considered as a key source of economic growth and competitiveness, and as such, is basic statistical information for numerous international comparisons and country performance assessments. For instance, productivity data have been applied to investigate the impacts of product and labour market regulations on economic performance. Productivity growth constitutes an important element for modelling the productive capacity of economies. It allows analysts to determine capacity utilisation, which in turn, allows one to gauge the position of economies in the business cycle, apart from forecasting economic growth. In addition, production capacity is used to assess demand and inflationary pressures.

**“Productivity is not everything, but in the long run, it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.”**

(Paul Krugman, 1994)

### 1.4.2 Productivity Incentive in Construction Industry

The productivity factor involves many elements. Thus, the first step is to analyse a variety of construction projects and to determine the factors that can affect labour productivity (Portas & AbouRizk, 1997). Some factors that have been identified to affect productivity are listed as follows:

**i. Material Delivery Practices**

Thomas et al., (1999) listed some factors that affected productivity, including weather, temperature, fabrication errors, material deliveries, and relocation of crane. Delivery of materials may influence labour productivity adversely. Delay in material deliveries and time needed to unload materials can decrease labour productivity.

**ii. Weather**

Construction work may be affected by weather events, i.e., rain, high wind, snow, and cold temperature (Thomas et al., 1999; AbouRizk et al., 2001). Poor weather may affect daily productivity adversely. Heavy rainfall often leads to complete suspension of highway construction due to saturated and unworkable soil conditions (El-Rayes & Moselhi, 2001). As Malaysia is a tropical country, rainfall can lead to unworkable soil conditions that may delay construction activities. Besides, the time needed for the saturated soil to dry after rainfall may lead to daily losses.

**iii. Temperature and Humidity**

Sonmez and Rowings (1998) categorised temperature and humidity as the two factors that influence the labour productivity. Thomas et al., (1999) concluded that temperature affects labour productivity negatively. Besides, labour productivity of workers who work under a very cold temperature also under direct sunlight in hot environment is low.

**iv. Repetitive Activity**

Labour productivity can be increased by repetitive activity (Portas et al., 1997). The components that define repetitive activity are the degree of repetition and the number of reuse. Continuous repetition of a task may improve productivity as the crew becomes more familiar with the task.

**v. Crew Size**

Portas et al., (1997) asserted that crew size is an essential factor when evaluating labour productivity. A crew with a huge number of workers may affect the productivity inversely and adversely. For instance, the same amount of work can be done within a shorter time with more workers, which reflects a positive effect. Concurrently, a large crew size may also affect labour productivity adversely, mainly due to poor coordination among the workers and overcrowded working space.

**vi. Skills of Labour**

Skills of workers may also affect labour productivity. For instance, a skilled worker may generate higher productivity, when compared those unskilled.

**vii. Scheduled Overtime**

Thomas et al., (2006) mentioned that scheduled overtime may have an impact on construction labour efficiency. The term “schedule overtime” refers to a planned decision by the project management to accelerate work progress by scheduling more than 40 work hours per week for an extended period of time for much of the craft work force. Productivity losses due to fatigue and poor mental attitude may occur due to scheduled overtime. The negative effect of scheduled overtime on productivity should be measured when comparing with labour productivity. AbouRizk et al., (2001) grouped the factors of extra work under the difficulty characteristics. Extra work involves duties performed on a project that are beyond the original scope of the project. Extra work may indicate worse productivity achievements due to time spent on other activities and lower worker morale.

**viii. Frequency of Change Orders**

Hanna et al., (1999) found that change orders can affect labour efficiency for mechanical construction. For instance, change orders increase project cost, create scheduling conflicts, additional work, disrupt project momentum, etc. These are the minor factors that may contribute to loss in labour productivity indirectly. Thomas and Napolitan (1995) indicated 30% loss of labour efficiency when changes are performed. Hence, low labour performance is strongly linked with change orders, disruptions, and rework.

**ix. Location of Work**

Location of work is categorised into two groups: site characteristics and general activity characteristics (AbouRizk & Hermann, 2001). Basically, they refer to work performed at a higher location and limited working space that may result in poor labour productivity. As discussed by Haas & Fagerlund, (2002) among the challenges in managing IBS construction are transportation issue, which, revolve with the issues of size and weight limitations, route restrictions, permitting and the availability of lifting equipment. When the components reach the construction site, it requires additional lift planning. The complexity of lift normally increases with the increase in level of IBS usage. Transportation consideration will give impact on construction schedules, site design, crane cost and availability of designing the plan itself.

## 1.5 Research Objective

The main objective of this study is to review, propose, and develop a report regarding the suitability of productivity incentive for IBS construction among developers, consultants, contractors, and suppliers.

- To study from the six (6) country that give the productivity/incentive to the construction industry as benchmark to the country.
- To recommend the suitable productivity incentive from the analysis from the benchmark.



# Methodology

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- 2.1 Literature Review (Benchmarking)
- 2.2 Focus Group Workshop

This study adopted the qualitative method, mainly due to its own strengths and weaknesses. Typically, the qualitative approach allows each method to complement the other's weaknesses, thereby strengthening the results garnered from the study (Creswell, 2003). Qualitative research methods are used in situations where a researcher intends to explore and comprehend the meanings ascribed by individuals or groups to a social or human problem. The researcher builds from a central question or the broadest question that can be enquired, which is used in order to avoid limiting the research, up to several sub-questions geared towards finding more definitive and varied explanations (Creswell, 2003). In this study, the Literature Review was adopted to analysis the criteria of productivity incentives. The benchmarking technique was applied to compare the criteria of productivity incentives in selected nations: Hong Kong, Australia, US, South Africa, and Singapore. Next, the data were gathered from a desktop study of each country, while secondary data were gathered from various reliable sources, such as journals, conference papers, international magazines, online databases, government/business association publications, and the internet. To note, the information compiled in this study was collected from March 2018 until Jun 2018.

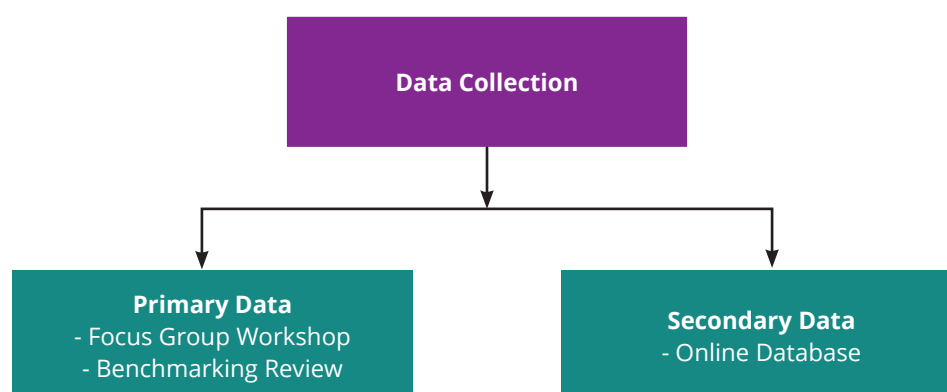


Figure 4.0. Process of data collection

## 2.1 Literature Review (Benchmarking)

Literature review plays an important role in this study as it does not only provide detailed information regarding past studies, but it also sets the stage for the remainder of the study. Literature review facilitates the identification of sustainable rating tools, both developed for Malaysia and for other parts of the world. Through literature review, the characteristics of each incentive were analysed and understood because comparative studies on incentives, including their similarities and differences, have been conducted and are well-documented by prior researchers and other publication local and international. The information for each productivity incentive was gathered through publicly-available and relatively easy-to-locate information using the internet, conference proceedings, and published journal articles. This is not meant to be exhaustive; essentially everything notable about each productivity incentive had to be documented. Tables and charts are used to categorise, summarise, and compare the information gleaned from the literature review. Literature review also assisted in constructing the assessment criteria to ascertain the aspects of comprehensiveness and effectiveness of the tool, which is indeed the core objective of this present study. As such, screening process was carried out to list out all relevant studies to shortlist the most appropriate criteria.

## 2.2 Open Ended Interview

The qualitative research interview seeks to describe and the meanings of central themes in the life world of the subjects. The main task in interviewing is to understand the meaning of what the interviewees say. (Kvale,1996). A qualitative research interview seeks to cover both a factual and a meaning level, though it is usually more difficult to interview on a meaning level. (Kvale,1996). Interviews are particularly useful for getting the story behind a participant's experiences. The interviewer can pursue in-depth information around the topic. Interviews may be useful as follow-up to certain respondents to questionnaires., to further investigate their responses. (McNamara,1999). Standardized, open-ended interview - the same open-ended questions are asked to all interviewees; this approach facilitates faster interviews that can be more easily analysed and compared. In this report, the method used is interview open ended to developer, contractor, manufacturers and consultants.



# The Scope of Research And Assessment Criteria

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- 3.1 Introduction
- 3.2 Assessment Criteria of Productivity Incentive in Construction Industry
  - 3.2.1 Singapore
  - 3.2.2 Australia
  - 3.2.3 South Africa
  - 3.2.4 Hong Kong
  - 3.2.5 United States of America (US)
  - 3.2.6 Japan

### 3.1 Introduction

Across the globe, various incentives seem to focus on different areas within the construction industry, including productivity and innovation on construction incentives, BIM fund, scholarship and sponsorship programmes, training programmes, environmental incentives, developing and improving construction equipment, designing mechanical and electrical systems, safety performance, non-financial incentive schemes, performance incentive, and mixed incentives. This study narrows its focus on productivity and construction incentives. Many countries differ considerably with respect to their incentive features predominantly from design and/or performance basis, although a wide range of incentive criteria is readily available across the globe. The objective of providing incentives in the construction arena is to enhance motivation and commitment among stakeholders to voluntarily set higher-order project goals. Despite the increased use of financial incentives, there is addressing means of optimising outcomes. If the incentive system is perceived to be fair and is applied to reward exceptional performance, which is far from being manipulative, then contractors are more likely to be positively motivated. As such, it is imperative to setup the scope and boundary of the study prior to further analysis. Three imminent elements must be clarified in producing meaningful outcomes from the analysis: (i) sustainability, (ii) comprehensiveness, and (iii) effectiveness. Each of these elements is discussed in detail in this chapter.

### 3.2 Assessment Criteria of Productivity Incentive in the Construction Industry

This study combed through 5 types of productivity incentives implemented in 5 countries; Singapore, Australia, South Africa, Hong Kong, Japan and US. Each country has different elements of incentives depending on their government policies and the types of incentives provided in their construction industry.

#### 3.2.1 Singapore

The Productivity Innovation Project (PIP) scheme primarily aims at encouraging contractors and prefabricators to embark on development projects that build up their capability and improve their site processes to attain higher site productivity. These projects could be worked on individually or in groups. The incentives are for all stakeholders involved in the construction project value chain, registered and operate in Singapore, as well as eligible, including developers, consultants, contractors, and prefabricators (if proposal helps to reduce site workers). The incentive scheme helps contractors to re-engineer site processes or adopt labour-efficient construction technologies to reduce site workers or to enhance site productivity. The following costs are supported by co-funding and reimbursement bases, including manpower, equipment, materials, professional services / subcontracting, and acquisition of intellectual property rights.

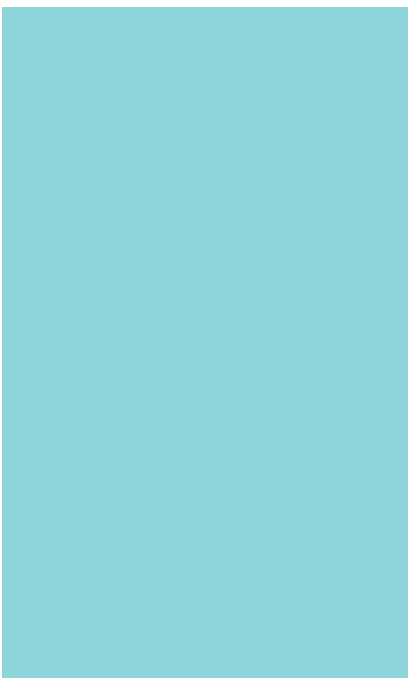


Table 8: Participating firms in Singapore incentive

Participating firms	Standard PIP Scheme	Enhanced PIP Scheme	
		Funding Level	Funding Cap
Firm	Co-funded up to %50 Capped at 100,000\$ per application	Co-funded up to %70*	Capped up 300,000\$ per application (for selected technologies)
Prefabricators	Co-funding up to %50 Capped at 500,000\$ per application	Co-funded up to %70*	Capped up 500,000\$ per application  Capped up to 1,000,000\$ per application for highly automated technology
Group (At least two unrelated companies)	Co-funding up to %50 Capped at 500,000\$ per application	Co-funded up to %70*	Capped up to 500,000\$ per application
Industry (Actively led by Public Agency with at least 2 unrelated companies)	Co-funding up to %70 Capped at 1,000,000\$ per application	Co-funded up to %70**	Capped up 10,000,000\$ per application

\* Firms must achieve at least %30 productivity improvement and demonstrate development in any 2 of the 3 areas in financial standing, human resource development or certifications/awards.

\*\* Firms must achieve at least %40 productivity improvement and the technology used must demonstrate the potential to greatly transform the current state of the industry.

#### i. Eligibility

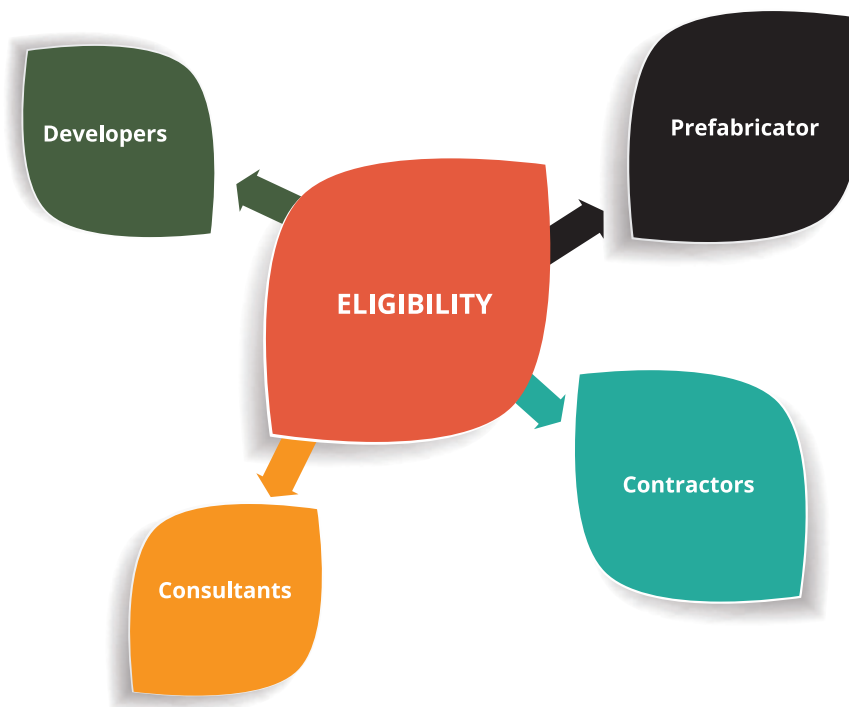


Figure 5: Eligibility

## ii. Qualifying Period

Qualifying Period	Project duration needs preferably to be kept for 2 years and the project must not commence during application period
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## iii. Application Process

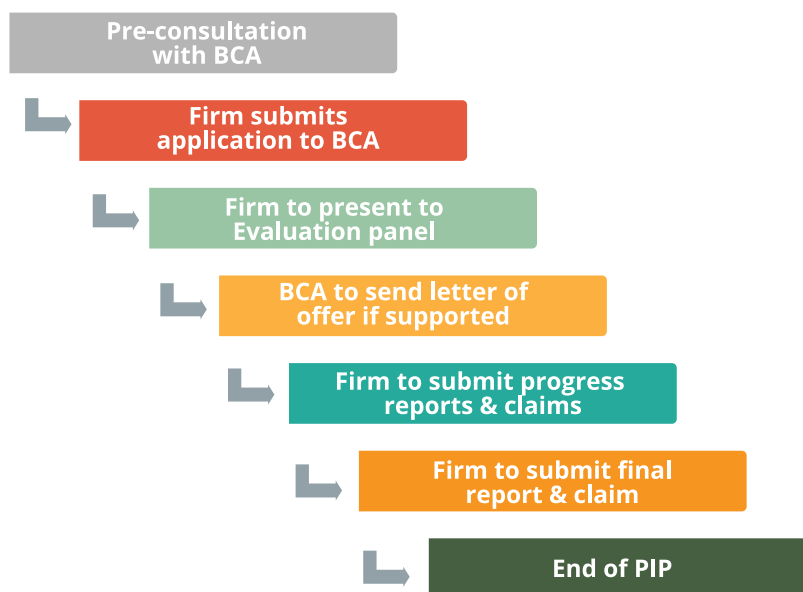


Figure 6: Application Process

## iv. Claims and Disbursements

- (a) Disbursement of funds is always made on a reimbursement basis, i.e. the company can only be reimbursed for expenses that have actually been incurred. Direct payment to the company's creditors are prohibited.
- (b) Claims and reimbursements will be made on a half yearly basis, up to a cumulative total of 70% of the approved grant amount. The remaining 30% will be held back until if the project fails to achieve at least 20% productivity improvement. If the applicant is not a builder, the first 30% of the approved grant may be disbursed within the development period. The remaining 70% will only be disbursed after the implementation of the proposed PIP solution on an actual construction project, and with at least 20% site productivity improvement achieved.
- (c) The final claim should be submitted within 6 months of project completion.
- (d) Claims should be made using prescribed forms and must be accompanied by:
  - i) a progress report, and
  - ii) an external auditor's certification for each claim.

## v. Tracking of Projects

Progress Reports are to be submitted by the company on a quarterly basis. A final report is needed.

## vi. Project Completion

The company should submit the following within 6 months from the completion/ termination of the project:

- (a) Final report;
- (b) Video featuring the use of proposed technologies/method;
- (c) Auditor statement of expenditure; and
- (d) Statement on the final claim.

## vii. Others

- (a) Applicant is to declare the other Government incentives that the company is currently enjoying so as to prevent overlapping or double funding to the company on the same work.
- (b) For test bedding and piloting test of products or systems, the company should be able to justify that the products/systems they propose to develop will generate significant benefits, either directly or indirectly.
- (c) The project team within the firm, group or industry should demonstrate strong commitment to adopt technology and improved work processes as part of their business strategy. The grant will support the team to upgrade the technology or improve work processes in the construction project.

## viii. Productivity method

The applications will be evaluated based on the potential of productivity improvement on site. The project should generate savings in man-days or improvement in productivity of the specific site process by at least %20. At least %90 of application cases are processed within 8 weeks upon the submission of complete documentation. The guidelines on PIP Scheme Part of the Construction Productivity and Capability Fund (CPCF) are as follows:

### (a) Objective

The PIP refers to a scheme that encourages and facilitates Singapore-registered businesses to build their capability, identify productivity gaps, and improve site processes so as to achieve higher site productivity.

### (b) Eligibility Criteria

To be eligible, a business (e.g. developer, consultant, contractor, prefabricator) must satisfy the following conditions:

- Be a Singapore-registered construction-related business enterprise.
- Project should involve significant improvement in building design, products, processes and applications, and lead to significant site productivity improvement.
- Project should develop new capabilities within the company and/or industry.
- The deliverable of the project must aim to achieve improvement in site productivity (reduced cycle time, reduced manpower, higher yield, etc.) by at least 20%.

### (c) Form of Assistance

The PIP fund offers financial assistance to cover a percentage of the qualifying cost of a developmental project. The intent of the scheme is to encourage technology adoption, site process re-engineering, and innovation in construction projects. Expenses in manpower, equipment, materials, professional services, and intellectual property acquisition for conducting the development projects are supported on a cofunding basis. As government grants are not meant to offset the tax liability of companies, GST is not a supportable cost.

## ix. How to claim?

Claim can only be made after the PIP application has been approved and on reimbursement basis. Applicants must submit the completed PIP claim form with the following supporting documents, where applicable:

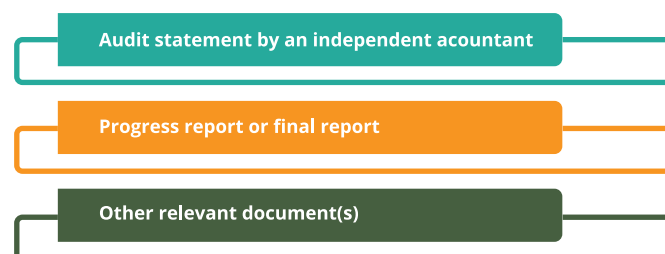


Figure 7: Claim Process

Note: A Progress claim may be made every six months. The final claim must be made within six months from the scheduled completion date of the project. Otherwise, the offer of the grant shall lapse automatically. The funds will be disbursed through interbank GIRO.

### 3.2.2 Australia

Construction is an important industry in Australia, with sales accounting to a whopping 327\$ billion or some %21 of GDP and its contribution to value-added being %7.6 of GDP. The Australian Bureau of Statistics (ABS) data allowed the researcher to examine and to estimate the productivity magnitudes involved in this industry, along with their components, including building construction, heavy and civil engineering construction, as well as construction services, which account for %23, %35, and %43, respectively. The word 'productivity' is often used loosely in ordinary language – but it is used strictly in the construction arena as quantitative correlations between industry output, labour, and capital inputs. As a measure of output, the term 'value-added' is used, as created by the industry. In the case of labour input, the best measure is hours worked – however, for some purposes, simple head counts were applied instead. Productivity of the Australian labour is critically important, being one of the drivers of living standards in the long run. Generally, the construction is a productive industry with a value-added per worker above the average of all industries and well above the average with extremely productive industries, such as mining, is excluded.

Some parts of construction, such as heavy and civil engineering, are very productive as they generate productivity %53 higher than the Australian average. While current productivity is important, so is productivity growth over time. Within the period of 95-1994, the first year for some relevant data series, construction had kept pace over time with the rest of the market sector in Australia. However, upon using the multifactor productivity measure, the productivity growth in construction seemed to outpace the market average by a factor of %35.6 to %10.7. Part of the reason for this is the slump of capital productivity by %27 in the rest of the economy, while the evidence presented here shows that it increased by %11 in construction (The Australian Institute, 2014).

Financial Incentive Mechanism (FIM) was introduced into the project contract aim to promote motivation and to reward contracting parties for achieving improved performance above "business as usual" (Washington, 1997). The types of FIMs applied in large building projects in Australia include:

a) Profit Sharing Incentive

Operates around a target construction sum (TCS), where cost savings from the actual construction sum (ACS) are distributed between the client and the contracted parties in pre-determined portions.

b) Performance Incentive

This incentive is offered based on achievement of set performance targets related to specific project goals. This financial incentive type can be applied to a number of performance goals, such as technical goals (e.g. safety, training operation, non-disturbance quality of work, schedule goals, as well as practical and actual competition prior to a target completion date).

c) Mixed Incentive

This type of incentive is characterised by the combination of profit sharing (cost outcome) and performance financial incentive. Multiple incentive mixes can include the multi-objective system, where the total incentive amount awarded to participants refers to the sum of the partial incentive and the partial loss of one of the incentives does not affect the opportunity of attaining the other bonus amounts.

Procurement approach and FIM design in the Australian Government

As a case study, the project referred to an Australian Government 14-storey non-residential building with a construction cost of \$130+ million. It was a landmark project with a complex and novel design. Under this procurement approach, the managing contractor was appointed by the government client at the end of schematic design stage, through a competitive tendering process. The contractor appointed managed the design documentation and the construction of the project based on selection process, which typically emphasised non-price criteria (70% weighting) over price criteria (30% weighting). The tender was based on conceptual brief and schematic design developed by the client and consultants prior to the engagement of the managing contractor. Once the managing contractor was appointed, they took on the responsibility to manage the design documentation through the design consultants who were novated across to the managing contractor. At this stage, the government client maintains control over the design process. It was a requirement under the contract that client representatives must approve all design changes nominated by the managing contractor, considering the original project brief, schematic design, programme, and cost plan. Once the design was complete, the managing contractor managed the construction trade packages and

provided ongoing management to the consultant's production of construction documentation. The managing contractor held the majority of risks for design and construction cost overruns as they were entitled to price adjustments under their design and documentation management fee, their construction fee or the nominated guaranteed construction sum (GCS), which in combination, comprised the TCS agreed during the tender stage.

Therefore, if the actual costs exceeded the TCS amount, it was the managing contractor's responsibility to absorb these cost overruns. This procurement approach requires the managing contractor to have efficient cost management skills, as in most cases, the contractors bid partially completed documents to proposed to the client construction sum that will not be exceeded (Hampson et al., 2001). FIMs are suitable for this procurement approach if there is potential to bring the actual construction costs below the target construction cost (for shared savings). The FIM in the project reflects a performance-based FIM. It involved an incremental allocation from an incentive pool of \$1.6 million built into the original project budget. The incentive offer was based on the completion specific "stretched scope" construction items outside the mandatory scope of the contract. Overall, the FIM is intended to motivate the managing contractor, consultants, and subcontractors to achieve saving below the TCS and complete the stretched scope work items. Thus, if money is saved below the TCS and redistributed into the completion of the stretched scope, they are bound to receive a share of the incentive pool. The incentive pool allocation is based on an exponential measurement equation. Therefore, the more stretched scope items completed, the larger allocation percentage, up to a cap of \$1.6 million for all items. It was intended the FIM to be distributed to the managing director, consultants, and major subcontractors based on how much each contributed to achieve the stretched scope. Table 9 presents the positive motivation drivers for this case study.

Table 9: Motivation drivers

Motivation drivers	Details
<i>Relationship workshop</i>	Initial relationship workshops assisted the formation of strong project relationships and established a "best for project team" culture, driven by the relationship management requirements of the project agreements.
<i>Client Flexibility</i>	Client representatives were willing to approve cost saving design changes to alleviate the financial pressures on the managing contractor, in part driven by the "act in good faith" contractual obligation.
<i>Future Work</i>	The desire by stakeholders to improve their reputation, through successful delivery of an iconic project increased the attractiveness of achieving greater than business as usual performance.
<i>FIM Reward Distribution</i>	Under a team agreement, the financial incentive reward was on offer to all major project team members who had input to achieve stretched scope work items, including subcontractors.

(Hampson et al., 2001)

### 3.2.3 South Africa

The Tax Incentive is designed to support Greenfield investments (i.e. new industrial projects that utilise only new and unused manufacturing assets), as well as Brownfield investments (i.e. expansions or upgrades of existing industrial projects). The incentive offers support based on capital investment and training. The minimum investment in Qualifying Assets required is R50 million for a Greenfield project and an additional investment of R30 million for a Brownfield project. The objectives of the incentive programme are to support the following:

- Investment in manufacturing assets is to improve the productivity of the South African manufacturing sector; and
- Training of personnel is to improve labour productivity and the skills profile of the labour force.

South Africa offers the following:

#### (a) Investment Allowance

- » 55% of Qualifying Assets or a maximum of R900 million investment allowance in the case of any Greenfield project with a preferred status (PS) (100% if located in a Special Economic Zone or SEZ)
  - » 35% of Qualifying Assets or a maximum R550 million investment allowance in the case of any other Greenfield project (75% if located in a SEZ);
  - » 55% of Qualifying Assets or a maximum of R550 million investment allowance in the case of any Brownfield project with a PS; and
  - » 35% of Qualifying Assets or a maximum of R350 million investment allowance in the case of any other Brownfield project.
- Qualifying Assets are defined as new and unused buildings, plant, and machinery contracted for and acquired after date of approval and brought into use within 4 years from the date of approval.

#### (b) Training Allowance

- » A training allowance of R36 000 per full time employee may be deducted from taxable income during the first 6 years.
- » According to the points system, an industrial policy project will achieve 'qualifying status (QS)' if it achieves at least 4 (four) of the total 8 points, and 'PS' if it achieves at least 7 (seven) of the total 8 points.

The project could score points for:

- Upgrading an industry within South Africa by utilising innovative processes (max. 1 point);
- Utilising new technology that results in improved energy efficiency and cleaner production technology (max 2 points);
- Providing general business linkages within South Africa (max 1 point);
- Acquiring goods and services from SMMEs (max 1 point for Greenfield & 2 points for Brownfield);
- Providing skills development in South Africa (max 2 points); and
- In the case of a Greenfield project, is located within a SEZ (max 1 point) Targeted Enterprises
- The investment must be:
  - » A Greenfield project (new project);
  - » A Brownfield project (expansion or upgrade); or
  - » Classified under 'Major Division 3: Manufacturing in the Standard Industrial Classification of All Economic Activities (SIC) 5th Edition or SIC 7th Edition,

Table 8 Presents a Glimpse of The Industrial Policy Projects.

Additional and Training Allowance	Greenfield Projects (New Project)	Brownfield Projects (Expansions and Upgrades)
<b>A. MANDATORY REQUIREMENTS FOR INDUSTRIAL POLICY PROJECTS</b>		
Manufacturing assets to be acquired and contracted for on or after date of approval. Sec 121 par.1 of the ITA.	<ul style="list-style-type: none"> <li>• New and unused buildings</li> <li>• New and unused Plant &amp; Machinery</li> </ul>	<ul style="list-style-type: none"> <li>• Additions to existing buildings</li> <li>• New and unused additions to existing Plant &amp; Machinery</li> </ul>
Minimum qualifying assets (QA) required sec.121. par. 7 (a)	R50m (R50m from 1 Jan 2015. Previously R200m)	R30m or the lesser of R50m or 25% of expenditure on existing assets
Improve energy efficiency	Utilise modern, viable energy-efficient equipment & processes in the sector	At least 10% energy saving
Skills development	At least 2% of wage bill	At least 2% of wage bill
Limitations: Concurrent benefits	<ul style="list-style-type: none"> <li>• Industrial Participation Projects</li> <li>• Other Incentives – refer to Regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Participation Projects</li> <li>• Other Incentives – refer to Regulations</li> </ul>
<b>B. INVESTMENT ALLOWANCE AS % OF QUALIFYING MANUFACTURING ASSETS</b>		
PS. Sec 121. Par. 2(a) (7 or 8 out of a points)	55% (100% if located in an SEZ) Example: 55% x R100m (QA) = R55m Tax reduction: R55m x 28% = R15.4m	55% (100% if located in an SEZ) Example: 55% x R100m (QA) = R55m Tax reduction: R55m x 28% = R15.4m
Maximum allowance (PS)	R900m (also applicable to SEZs)	R550m (also applicable to SEZs)
QS Sec 121. Par. 2(b) (4,5 or 6 out of 8 points)	35% (75% if located in an SEZ) Example: 35% x R100m (QA) = R35m Tax saving: R35m x 28% = R9.8m	35% (75% if located in an SEZ) Example: 35% x R100m (QA) = R35m Tax saving: R35m x 28% = R9.8m
Maximum allowance (QS)	R550m (also applicable to SEZs)	R350m (also applicable to SEZs)

<b>C. TRAINING ALLOWANCE</b>			
Applicable to both PS & QS Projects Sec. 121 par.4 & 5 (a) & (b)	The lesser of actual total own training costs OR R36 000 per full time employee to be claimed within 6 years from date of approval.	The lesser of actual total own training costs OR R36 000 per full time employee to be claimed within 6 years from date of approval.	
<b>D. IMPLEMENTATION PERIOD</b>			
Investment allowance for PS and QS. More than 50% of manufacturing assets in use. Sec. 121 par 7 (a)	Manufacturing assets to be taken into use within 4 years from date of approval (Investment Allowance Benefit Period)	Manufacturing assets to be taken into use within 4 years from date of approval (Investment Allowance Benefit Period)	
Training allowance for PS and QS Deductible during year in which training cost is incurred Sec. 121 par 5(a)	Deductible during year in which training cost is incurred, not exceeding 6 years (Training Allowance Benefit Period)	Deductible during year in which training cost is incurred, not exceeding 6 years (Training Allowance Benefit Period)	
<b>E. NON-QUALIFYING PROJECTS</b>			
Specific exclusions in terms of the Standard Industrial Classification of all Economic Activities in South Africa (SIC) Version 5, replaced by SIC Version 7, Section C. Manufacturing from 1 January 2015. Sec 121 par 1	<ul style="list-style-type: none"> <li>· SIC 3051 or 1101/2. Spirits and ethyl alcohol from fermented products and wins</li> <li>· SIC 3052 or 103. Beer and other malt liquors and malt</li> <li>· SIC 3060 or 12. Tobacco products</li> <li>· SIC 3577 or 252. Arms and communication</li> <li>· Bio-fuels at the manufacture negatively impacts on food security in SA</li> </ul>		

Source: Department of Trade and Industry Republic of South Africa (2015)

Table 8: Information Industrial Policy Projects

POINT SYSTEM TO QUALIFY AS AN INDUSTRIAL POLICY PROJECT		
Qualifying Criteria	Greenfield Projects (New Project)	Brownfield Projects (Expansions and Upgrades)
<b>Points allocated on the following criteria will determine the status of a project</b>		
1. Innovation	<ul style="list-style-type: none"> <li>The project will utilise processes of innovation, thereby changing pre-existing techniques and the use of plant, machinery and equipment within the same industrial sector as the project.</li> </ul> <p><b>AND</b></p> <ul style="list-style-type: none"> <li>These processes will materially reduce production costs, but improve production time, product quality/longevity within the same industrial sector as the project</li> </ul> <p><b>(Maximum of 1 point)</b></p>	<ul style="list-style-type: none"> <li>The project will utilise processes of innovation, thereby changing pre-existing techniques and the use of plant, machinery or equipment,</li> </ul> <p><b>AND</b></p> <ul style="list-style-type: none"> <li>These processes will materially improve production time, reduce production costs, improve product quality or improve product longevity</li> </ul> <p><b>(Maximum of 1 point)</b></p>
2. Improved Energy Efficiency: Cleaner Production Technology	<p>The project will utilise viable energy-efficient equipment and processes throughout the additional investment allowance benefit period, innovative for the industrial sector, as certified by the South African National Energy Development Institute – SANED (not taking into account any period before the month in which the industrial policy project reaches 50% of its production capacity)</p> <p><b>(Maximum of 2 points)</b></p>	<ul style="list-style-type: none"> <li>Energy efficiency improvement of at least 12.5% relative to a baseline as determined for the 12-month period prior to the application as certified by the SANED by the end of the additional investment allowance benefit period</li> </ul> <p><b>(Maximum of 1 point)</b></p> <p>OR</p> <ul style="list-style-type: none"> <li>Energy efficiency improvement of at least 15% relative to a baseline as determined for the 12-month period prior to the application as certified by the SANED by the end of the additional investment allowance benefit period</li> </ul>

3. Business Linkage	<ul style="list-style-type: none"> <li>The project will be engaged in the production of goods, where less than 40% of the local demand for such goods were not previously produced in the Republic;</li> </ul> OR <ul style="list-style-type: none"> <li>The project will contribute to the global competitiveness of an industrial sector by the production of goods where identical or similar goods would not be produced in the Republic without substantial capital investment</li> </ul> <b>(Maximum of 1 point)</b>	<ul style="list-style-type: none"> <li>The project will be engaged in the production of goods, where less than 40% of the local demand for such goods were not previously produced in the Republic;</li> </ul> OR <ul style="list-style-type: none"> <li>The project will contribute to the global competitiveness of an industrial sector by the production of goods where identical or similar goods would not be produced in the Republic without substantial capital investment</li> </ul> <b>(Maximum of 1 point)</b>
4. SMME Procurement	Acquire at least 10% of its raw materials, intermediate products and services from small, medium and micro enterprises.	<ul style="list-style-type: none"> <li>Acquire at least 10% of its raw materials, intermediate products and services from small, medium and micro enterprises.</li> </ul> <b>(Maximum of 1 point)</b>
2. Skills development (Training of Employees)	<p>The cost of training will be:</p> <ul style="list-style-type: none"> <li>More than 2% of the annual average wage bill, but less than 2.5% (Maximum of 1 point)</li> </ul> OR <ul style="list-style-type: none"> <li>More than 2.5% of the annual average wage bill (Maximum of 2 points)</li> </ul>	<p>The cost of training will be:</p> <ul style="list-style-type: none"> <li>More than 2% of the annual average wage bill, but less than 2.5% (Maximum of 1 point)</li> </ul> OR <ul style="list-style-type: none"> <li>More than 2.5% of the annual average wage bill (Maximum of 2 points)</li> </ul>
6. Located in a SEZ	Located in SEZ (Maximum of 1 point)	Not Applicable
Points for QS	4, 5 or 6 out of 8 points	4, 5 or 6 out of 8 points
Points for PS	7 or 8 out of 8 points	7 or 8 out of 8 points

### 3.2.4 Hong Kong

The Hong Kong Green Building Council (HKGBC) has coordinated with different parties to provide tax incentives and funding assistance for BEAM Plus project applicants. Electrical and Mechanical Services Department (EMSD), China Light and Power (CLP), HK Electric and Water Supplies Department also offer various kinds of incentives to applicants for differing BEAM Plus Assessment Tools. Accelerated Deduction under Profits Tax : HK Energy Efficiency Registration Scheme for Buildings (HKEERSB). This application is for NB (Normal Beam), EB (Exiting buildings), and BI (Beam Plus Interiors) projects.

With effect from 1st January 2018, new or existing buildings/premises that have achieved Final Bronze rating (or Satisfactory grade in the case of EB Selective Scheme – Energy Use (EU)) or above under BEAM Plus NB, EB or BI are eligible to register under the EERSB of EMSB. The capital expenditure incurred in the installation/construction of energy efficient building installations registered under HKEERSB is eligible for accelerated deduction under profits tax.

#### i) Energy Efficiency Registration Scheme for Buildings (EERSB)

Registration under this voluntary scheme is not regarded as having complied with the Buildings Energy Efficiency Ordinance (BEEO). The BEEO includes installation of lighting, lift and escalator, electric, and air-conditioning systems. Since enactment of BEEO, all prescribed buildings governed by the BEEO have already fulfilled the minimum energy efficiency requirements under the Building Energy Codes (BEC). In order to encourage building owners achieve better energy performance beyond the statutory requirements, the voluntary EERSB serves to recognise buildings that outperform the statutory requirements under the BEEO.

With effective from 1st January 2018, all types of new and existing buildings/premises (not limited to prescribed buildings) achieving energy performance that outperforms the minimum statutory requirements under the BEEO, with certificates of good building energy performance through the BEAM Plus Assessment System managed by the HKGBC or other internationally recognised building environmental assessment systems, can apply to join the EERSB.

The capital expenditure incurred on the construction of energy efficient building installations (including lighting, air conditioning, electrical, as well as lift and escalator) registered under EERSB may be eligible for accelerated tax deduction. The eligible facilities were divided into two categories: environmental protection machinery and environmental protection installations. Environmental protection machinery includes low noise construction machinery or plant registered under the Quality Powered Mechanical Equipment system administered by the Environmental Protection Department (EPD), as well as waste and wastewater treatment, and air pollution control machinery or plant in compliance with the requirements under the various ordinances administered by the EPD. A %100 deduction under profits tax is awarded in the year of purchase for the capital expenditure incurred on the provision of eligible machinery. Environmental protection installations will mainly be renewable energy installations, including solar photovoltaic, wind turbine, and thermal waste treatment installations. Other eligible installations refer to energy efficient building installations registered under the HKEERSB administered by the EMSD. A deduction under profits tax for %20 of the capital expenditure incurred on the construction of eligible installations will be provided in each five consecutive years starting from the year of acquisition. Some taxpayers may have owned and have been using environmental protection machinery or installations before the proposal implementation, in which they may elect to have the reducing value of the machinery under the depreciation allowance regime fully deducted in 09-2008 or, in the case of installations, to have %20 of the residual value of the installations deducted in each five consecutive years from 09-2008.

As mentioned in the 19-2018 Budget, the government will further enhance tax concessions for capital expenditure incurred by enterprises in procuring eligible energy efficient building installations and renewable energy devices by allowing tax deduction to be claimed in full in one year, instead of the current time frame of five years.

## **ii) Requirements for application**

The following depicts some highlights of the basic requirements for obtaining the certificate of EERSB. The details of EERSB are as follows:

- a) Overall final assessment rating at the “Bronze” level or above under the BEAM Plus Assessment System (“BEAM Plus”) for buildings or interiors as promulgated by the HKGBC, or
- b) Individual aspect scoring (final assessment stage) at the “Bronze/Satisfactory” level or above under EU category in any BEAM Plus Assessment System for buildings or interiors as promulgated by the HKGBC, or
- c) The minimum award grading (or above) in other internationally recognised building environmental assessment system for buildings or interiors. Applicant shall provide necessary supporting documents to justify compliance with the energy efficiency performance under this scheme.

According to the nature of the BEAS certificate, the HKEERSB certificate will be specified with one of the following categories, where appropriate new building, existing buildings, and retrofitting works are included. The application form of EERSB (2018 Edition) can be obtained from the website.

## **iii) Funding assistance for Energy Efficiency Improvement Works (For EB V2.0 Projects only)**

CLP Power has set up the CLP Eco Building Fund to subsidise residential buildings and their nearby ancillary facilities to carry out energy efficiency enhancement works, while the HK Electric has setup the HK Electric Smart Power Fund to subsidise residential buildings or composite buildings with substantial portion of residential use to carry out such work. BEAM Plus EB applicants who fulfil the criteria of the funds are encouraged to apply for the scheme. The following measures facilitate the applicants of BEAM Plus EB V2.0 projects to apply for the subsidies:

- a) In the case of CLP Eco Building Fund, registration with Comprehensive Scheme or EU Aspect of Selective Scheme under BEAM Plus EB V2.0 is included as one of the criteria, where priority will be given by CLP when assessing the fund application. In this case, an applicant has to submit to CLP the Acknowledgement Letter of BEAM Plus EB registration issued by the HKGBC as evidence.

Promoting energy efficiency and conservation is an effective way to combat climate change and pursue sustainability. By improving the energy efficiency of the buildings, one does not only reduce energy costs, but also helps to create a more sustainable city. CLP is fully committed to the promotion of energy efficiency and CLP Eco Building Fund has been established since 2014 to provide financial assistance to eligible residential buildings and their nearby ancillary facilities (e.g. clubhouse, podium, property management office) to implement energy efficiency improvement works. From 1st October 2018 onwards, the scope of the fund will be extended to cover eligible commercial, industrial, and composite buildings, as well as their nearby ancillary facilities.

## **iv) Benefits: Scope of Funding**

The fund is aimed at subsidising residential, commercial, industrial, and composite buildings, as well as their nearby ancillary facilities, by carrying out retrofitting projects to improve energy efficiency in communal areas. The installations may include any of the following:

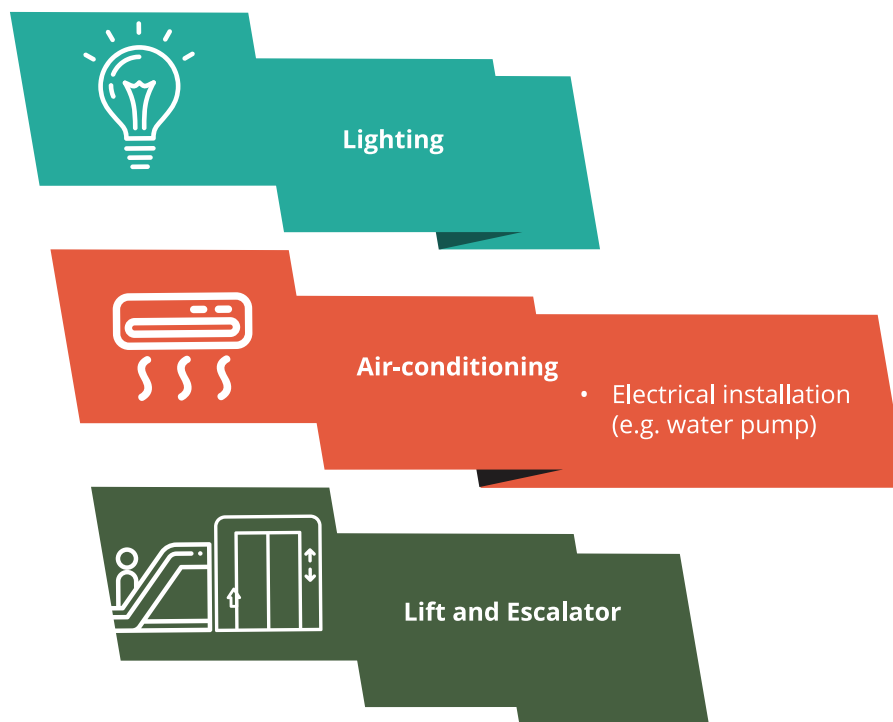


Figure 9: Scope of building incentives

Apart from the retrofitting projects, the following projects will also be supported by the fund:

t



Figure 10: Fund supported

#### v) Funding Mechanism

The amount of funding for retrofitting projects will be approximately %10 to %50 of the actual project expenditure, depending on the type of building, the type of installation, and project duration. Project expenditure shall restrict to the cost of energy efficiency installations, as well as the costs of Qualified Service Provider appointment and accounting audit, where necessary. The amount of funding for retro-commissioning and implementation of smart technologies in building depends on the amount of energy saving and project duration. The more energy the project will save and the sooner the project will be completed, the more funding will be granted. The funding is disbursed to applicants in the form of reimbursement, i.e. the applicant has to settle the payment prior to seeking reimbursement from the fund.

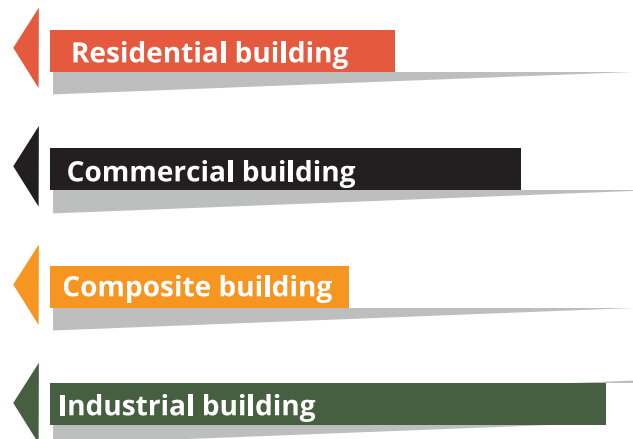
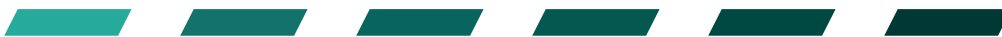


Figure 11: Eligibility entities of incentive

#### vi) Eligibility

The following entities are eligible to apply for the fund:

**Owners' Corporations registered under the Building Management Ordinance (Cap. 344)**



**Owners' organisations (e.g. Owners' Committee)**



**Residents' organisations (e.g. Mutual Aid Committee)**



**Commercial buildings, industrial buildings and composite buildings with single ownership may also apply for the Fund.**



The following are not eligible to apply:

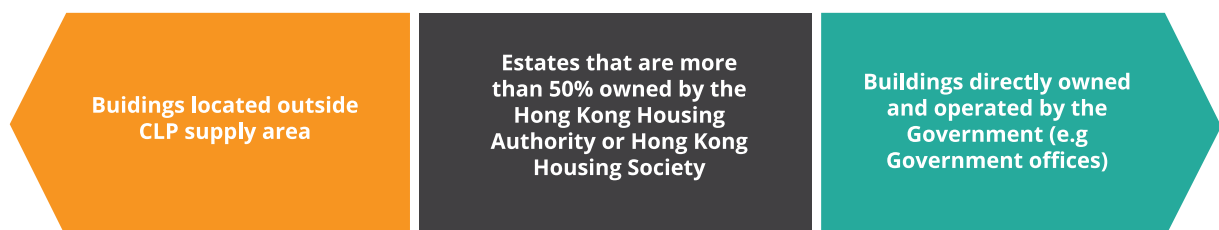


Figure 12: Non-eligibility applied

**vii) Application Procedures**



Figure 13: Application Procedures

**viii) Application Processing**

All applications are handled by CLP, while the final approval comes from CLP and a vetting committee that is comprised of various stakeholders from across the community with keen interest in promoting energy efficiency. The project must be completed no later than 24 months after approval.

**3.2.5 United State of America (US)**

For incentive in the US, architects and engineers have to score a big win in the tax reform bill upon inclusion in Section 199A—%20 deduction on income. To date, in the just-passed budget bill—architects and engineers win again (as well as some contractors) with an extension of an important tax benefit—Section 179D—which rewards the design and building of energy efficient buildings (including modifications to existing buildings). For architects, engineers, and contractors, this suggests a deduction of up to 1.80\$ per square foot for energy efficient design for government buildings—widely-defined to include state, local, and federal—think jails, parking garages, airports, as well as state colleges and universities. The Congress recently required that to qualify for 179D, the building must surpass 2007 ASHRAE standards. This provision exclaims win, win, win - a win for taxpayers enjoying lower energy costs at the state, local, and federal government level; a win for designers being awarded for their work; and a win for the country—benefitting from greater energy independence, efficiency, and conservation.

Section 179D had—along with a host of other energy provisions—been extended in the Path Act until the end of 2016. The outlook was very mixed about another extension—so it was extremely good news for designers that as part of the bigger budget that this provision along with other energy provisions was included and extended until 2017/31/12. This benefit is especially for architects, engineers, and contractors working on federal, state or local government contracts-- on a little-known big tax break that is available now and that can put sometimes hundreds of thousands of dollars of cash into the pocket of one's business. The 179D commercial buildings energy efficiency tax deduction is the section of the tax code that offers benefits for businesses, architects, engineers, and contractors when they build or renovate a building (or design a government building in the case of an architect, engineering or contracting firm), which is energy efficient. In precise, the maximum deduction is 1.80\$ per square ft.

#### **i) 179D Commercial Buildings Energy Efficiency Tax Deduction**

The first thing that one needs to know is that for an energy efficient building to qualify, or partially qualify, it does not need to have grass growing on the roof or a windmill powering its electrical systems. In brief, if one wants to surpass the 2001 ASHRAE standards – the most current state codes have already required this. The reality is that in working with hundreds of clients, the firm should find the vast majority of new constructions (and many energy efficient redos) qualify or partially qualify for 179D just by meeting the current stringent building code requirements.

Second, there are a number of ways that a building or improvement can qualify or partially qualify. The three subsystems that are potentially eligible for this lucrative incentive are building envelope, HVAC/hot water systems, and interior lighting systems. It is common that a building or improvement can qualify for one subsystem and not qualify for the other two. Hence, one needs to look at all the ways the building can potentially qualify or partially qualify.

Third, the definition of a building is very broad. This, basically, includes all commercial buildings, warehouses, factories, parking garages, and family housing with four storeys or more. As for local, state, and federal government, this is inclusive of new schools, university buildings, dormitories, airport terminals, and jails, to name a few. However, one must note that buildings constructed for Indian tribes and tax-exempt entities (think charities) do not qualify for the 179D benefit.

Finally, an architect/engineer/contractor can go back three years and reap this benefit. This means; the architect/engineer/contractor can look at government buildings that have helped design and were placed in service in the past three years -- get an allocation letter from the government, amend their returns, and gain the 179D benefits.

#### **ii) Who Can Qualify**

##### **a) Owner**

The first group that can qualify is the owner of the building or improvement, including a tenant if the tenant has paid for and owns the improvement. The building owner can go back to buildings put in service or improvement made in the last six years and they may qualify for 179D. The building owner takes the current year deduction and reduces his basis in the building or improvement. As for building owners, 179D offers a potentially significant timing benefit to pay taxes.

##### **b) Architects/Engineers/Contractors**

The law provides that a government agency (federal, state or local) can allocate the 179D tax benefits to architect/engineer/contractor engaged in the design work of the building. The architect or engineering firm is assigned the tax benefit from the government agency --the IRS requires a letter signed by the government with very specific statements. In practice, the alliant group has found that it is vital that a designer quickly contacts the government to get a signed allocation letter -- because the government may be able to assign the tax benefit to whoever helped design the building. Therefore, it is crucial that the architect or engineering firm, without delay, requests an official letter from the responsible government employee assigning the tax benefit to their firm (recall – good for buildings in service last three years) – or where appropriate, incorporate the tax benefit in the contract negotiations. Nevertheless, at the end of the day, most government entities recognise that by signing these allocation letters they are helping encourage green building and more importantly, bringing much-needed dollars to their local economy.

### iii) Trust but Verify

179D stipulates that the architect/engineer/contractor designer must not only get a letter allocating the tax benefit from the government agency -- but must also have the energy savings independently certified. The independent certification requires not only modelling, but also a site visit by a licensed engineer. In practice, conducting these independent studies is critical to get the right software to maximise the tax benefits, but also the on-site visits by engineers can yield even greater tax savings -that the plans vs. reality often work in the favour of increasing tax savings. The administration supports increasing the benefit to 3.00\$ per square foot. The reality is that approximately %70 of electricity in this country is consumed by commercial buildings and 179D is technologically a neutral way of promoting energy efficiency. Besides, the Congress recognises that the building industry is vital for any economic recovery -- and reckons that 179D has proven to be an effective means of delivering hundreds of thousands of dollars in tax savings for architects and engineers upon application.

### 3.2.6 Japan

Japan has established its New Energy Policy Package in December 2017 and under this policy, the Regulatory Sandbox Scheme Japan has been introduced on 6th June 2018 to boost the productivity of its construction industry. The Regulatory Sandbox Scheme in Japan enables speedy verification and data collection that can lead to regulatory reforms through establishment of an environment where new technologies and business models can be demonstrated under certain conditions, such as limited participants or duration, without adhering to the existing regulations. The competent authorities in this scheme refer to the Regulatory Sandbox team in liaison with the Cabinet Office within the Japan's Economic Revitalisation Bureau of the Cabinet Secretariat.

As a summary, table 10 displays the benchmarking analysis of the five (5) countries, including Singapore, Japan, Australia, USA, Hong Kong, and South Africa. Based on the critical literature review, the types of productivity incentives can be classified into fifteen (15) types, which are: eligibility, qualifying period, funding/incentive mechanism, application process, more than RM1 million cost project, tracking of projects, project completion, form of assistance, productivity method, claim method, supportable cost, claim period less than 6 month, specific zones, skill development of employees, and energy efficiency. The maximum total benchmarking of productivity incentives is fifteen (15), which is led by Singapore, followed by Australia and South Africa with fourteen (14) elements, as well as Hong Kong and USA with eleven (11) components.

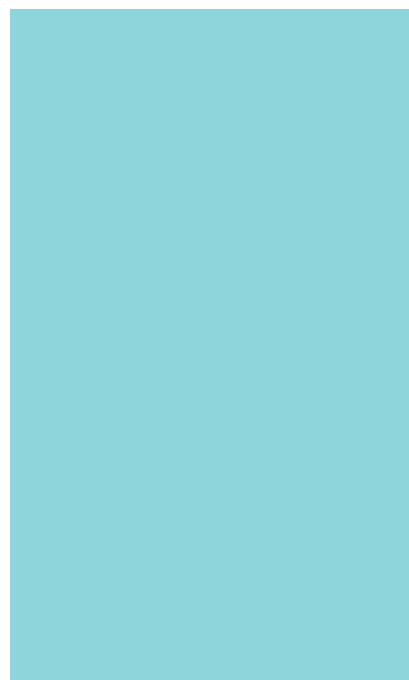


Table 10: The Benchmarking Criteria of Productivity Incentives Between Countries in Construction Industry

Types	Singapore	Australia	South Africa	Hong Kong	USA
Eligibility	✓	✓	✓	✓	✓
Qualifying Period	✓	✓	✓	✓	✓
Funding/incentive Mechanism	✓	✓	✓	✓	✓
Application Process	✓	✓	✓	✓	✓
More than RM1million cost project	✓	✓	✓	✓	
Tracking of Projects	✓	✓		✓	
Project Completion	✓	✓	✓		✓
Form of Assistance	✓		✓	✓	✓
Productivity method	✓	✓	✓		✓
Claim method	✓	✓	✓	✓	✓
Supportable cost	✓	✓	✓	✓	✓
Claim Period less than 6 month	✓	✓	✓		
Specific zones	✓	✓	✓	✓	✓
Skill developments of employee	✓	✓	✓		
Energy efficiency	✓		✓	✓	✓
<b>Total</b>	<b>15</b>	<b>13</b>	<b>14</b>	<b>11</b>	<b>11</b>

Table 11 portrays the details of productivity comparison for the productivity incentives awarded in Singapore, Australia, Hong Kong, South Africa, and US. This study selected the criteria employed by Singapore as the guideline because this country exhibited the maximum total benchmarking with fifteen (15) components. As for the eligibility criteria, in Singapore, the incentive is provided to developers, consultants, contractors, and prefabricator. While in Australia, the incentive is given to developers, consultants, contractors, and subcontractors. As for the US, the incentive is awarded to architects, engineers, contractors, and owner. Two types of incentives are provided in South Africa, which are Greenfield investments (i.e. new industrial projects that utilise only new and unused manufacturing assets) and Brownfield investments (i.e. expansions or upgrades of the existing industrial projects).

The incentive in Hong Kong for eligible facilities is meant for environmental protection machinery and environmental protection installations. Hong Kong and US award incentives to cater for energy efficiency, which are towards sustainability and green building. The Qualifying Period criteria describe the Singapore's period project duration, which should preferably be kept within 2 years. As for Australia, the FIM is built into the project contract to motivate and to reward the contracting parties for achieving improved performance above "business as usual". The managing contractor would be appointed by the government client at the end of the schematic design stage through a competitive tendering process.

The three types of incentive offering are profit sharing incentive, performance incentive, and mixed incentive. The details of an Australian case study can be referred at Section 3.2.2. Meanwhile, the incentives in South Africa appear to be under 121 tax allowance incentives, including the two types of incentives: investment allowance benefit and training allowance benefit, with the duration of 4 and 6 years. Under this tax incentive, particularly for industrial projects, there are 6 criteria to verify the points, which are: innovation, improved energy efficiency, business linkages, SMME procurement, skill development (training of employee), and located in SEZ. Each criterion has various points based on the project genre (Greenfield/Brownfield). Next, the HKGBC coordinates with different parties to provide tax incentives and funding assistance for BEAM Plus project applicants. The requirement for application includes overall final assessment rating at the “Bronze” level or above under the BEAM Plus Assessment System (“BEAM Plus”) for buildings or interiors, as promulgated by the HKGBC, or individual aspect scoring (final assessment stage) at the “Bronze/Satisfactory” level or above under EU category in any BEAM Plus.

The Assessment System is implemented for buildings or interiors, as promulgated by the HKGBC, or minimum award grading (or above) in other internationally recognised building environmental assessment system for buildings or interiors. The applicant shall provide the necessary supporting documents to justify the compliance with energy efficiency performance under this scheme. The amount of funding for retrofitting projects would be approximately %10 to %50 of the actual project expenditure, depending on the type of building, the type of installation, and the project duration. The more energy the project will save and the sooner the project will be completed, the more funding will be granted. The funding is disbursed to applicants in the form of reimbursement, i.e. the applicant has to settle the payment prior to seeking reimbursement from the fund.

As for the application process criteria, in Singapore, the process is as dictated by the BCA, which includes submission of progress report, final report, and claim, which are presented to the evaluation panel and later submitted to BCA. Meanwhile in Australia, the application is based on agreement between the contracted parties, such as developers, consultants, and contractors. As for South Africa, the application process is through points of project, and in Hong Kong, the certificate of approval is awarded by the CLP. In the US, an applicant needs to get a letter allocating the tax benefit from the government agency and also have the energy savings independently certified. All projects amounting to more than RM1million, except for USA, should gain certificate for energy efficiency. For the project completion in Singapore, they need to compile several documents, such as the final report, a video featuring the use of the proposed technologies/method, auditor statement of expenditure, and statement on the final claim in 6 months from the completion/termination of the project. The applicant is to declare other government incentives that the company is currently enjoying so as to prevent overlapping or double funding to the company on the same work. For test bedding and piloting test of products or systems, the company should be able to justify that the products/systems they propose to develop will generate significant benefits, either directly or indirectly.

The project team within the firm, group or industry should demonstrate strong commitment to adopt technology and to improve their work processes as part of their business strategy. The grant will support the team to upgrade the technology or to improve work processes in the construction project. As in Australia, project completion is based on agreement between the contracted parties, whereas in South Africa, the investment allowance benefit period is 4 years up to 6 years. In the US, the incentive for design can help in service in the past 3 years.

All the studied countries have forms to complete to apply the incentives, except Australia, because the mechanism is based on agreement amongst the contracted parties. All the countries seem to emphasise productivity method, except for Hong Kong and the US, because their focus is narrowed towards green building and sustainability. The claim method in Singapore is based on reimbursement basis with supported documents, while Hong Kong can claim in full within a year instead of the current time frame of five years. The supported cost for Singapore is more detailed as one has to present the complete cost, including manpower, equipment, materials, professional services/subcontracting, and acquisition of intellectual property rights. The submission form submitted by the applicants is processed within 6 months in Singapore and South Africa. South Africa has SEZ for application of incentives, since the rate of incentives differ by zones. All the studied nations offer skill development of employee, except in Hong Kong and the US. Energy efficiency also appears to be vital for construction environment. Based on the case study comparison, only Australia does not focus on energy efficiency because their incentive is more focused on profit sharing and performance tool between the contracted parties.

Table 11: The Benchmarking Criteria of Productivity Incentives Details of Each County in Construction Industry

Types	Singapore	Australia	South Africa	Hong Kong	USA
<b>Eligibility</b>	Developer, consultant, contractor, prefabricator	Developer, consultant, contractor, subcontractors	Greenfield investments (new industrial projects that utilise only new and unused manufacturing assets), Brownfield investments (expansions or upgrades of existing industrial projects).	New and existing buildings/premises (not limited to prescribed buildings)  Eligible facilities: Environmental protection machinery and environmental protection installations	Architects, engineers and contractors and owner.
<b>Qualifying Period</b>	Project duration should preferably be kept within 2 years.	The managing contractor is appointed by the government client at the end of schematic design stage, through a competitive tendering process.	Investment allowance benefit period: 4 years  Training allowance benefit period: 6 years	The funding is disbursed to applicants in the form of reimbursement, i.e. the applicant has to settle the payment first before seeking reimbursement from the fund.	Architect/engineer/contractor can look at government buildings that helped design and were placed in service in the last three years.

Types	Singapore	Australia	South Africa	Hong Kong	USA
<b>Funding/ incentive Mechanism</b>	<p>Standard PIP Scheme</p> <p>Firm Co-funded up to 50% Capped at \$100,000 per application</p> <p>Prefabricators Co-funding up to 50% Capped at \$500,000 per application</p> <p>Group (At least two unrelated companies) Co-funding up to 50% Capped at \$500,000 per application</p> <p>Industry (To be actively led by Public Agency with at least two unrelated companies) Co-funding up to 70% Capped at \$1,000,000 per application</p>	<p>Profit sharing incentive</p> <p>Performance incentive</p> <p>Profit sharing and performance</p>	<p>(a)Investment Allowance » 55% of Qualifying Assets or a maximum of R900 million in any Greenfield project(100% located in a SEZ) » 35% of Qualifying Assets or a maximum of R550 million in the case of any other Greenfield project (75% located in a SEZ) » 55% of Qualifying Assets or a maximum of R550 million in any Brownfield project with a PS; » 35% of Qualifying Assets or a maximum of R350 million in any other Brownfield project.</p> <p>(b)Training Allowance: » A training allowance of R36 000 per full time employee may be deducted from taxable income during the first 6 years » Based on the points system, an industrial policy project will achieve 'QS' if it achieves at least 4 of the total 8 points, and PS if it achieves at least 7 (seven) of the total 8 points.</p>	<p>A 100% deduction under profits tax is given in the year of purchase for the capital expenditure incurred on the provision of eligible machinery. Environmental protection installations are mainly renewable energy installations: solar photovoltaic, wind turbine, and thermal waste treatment installations. Other eligible installations are energy efficient building installations registered under the HKEERSB administered by the EMSD. A deduction under profits tax for 20% of the capital expenditure incurred on the construction of eligible installations is given in each five consecutive years starting from the year of acquisition</p> <p>Funding assistance for Energy Efficiency Improvement Works</p> <p>The amount of funding for retrofitting projects is 10% to 50% of the actual project expenditure, depending on the types of building and installation, and project duration.</p>	<p>Section 179D Owner The first group that can qualify is the owner of the building or improvement and this also includes a tenant if the tenant paid for and owns the improvement. The building owner can go back to buildings put in service or improvements made in the last six years and they will qualify for 179D</p> <p>Architects/ Engineers/ Contractors.</p> <p>Deduction of up to \$1.80 per square foot for energy efficient design for government buildings— widely defined to include state, local and federal— jails, parking garages, airports, as well as state colleges and universities</p>

Types	Singapore	Australia	South Africa	Hong Kong	USA
<b>Application Process</b>	The process prepared by BCA	Agreement between contracted parties	Based on points of project	Needs approval from CLP	Must get a letter allocating the tax benefit from the government agency and energy savings independently certified
<b>More than RM1million cost project</b>	\$100,000-\$10,000,000	More than \$1,600,000	The minimum investment in Qualifying Assets is R50 million for Greenfield project and R30 million for Brownfield project.	Based on energy efficiency project	-
<b>Tracking of Projects</b>	Progress Reports are submitted by the company on a quarterly basis.	Based on project	-	The project must be completed no later than 24 months after approval.	-
<b>Project Completion</b>	6 months from the project completion/ termination with documents: (a) Final report; (b) Video featuring the use of proposed technologies/ method (c) Auditor statement of expenditure; (d) Statement on the final claim	Based on agreement between contracted parties	Investment allowance benefit period: 4 years  Training allowance benefit period: 6 years	-	Helped design and were placed in service in the last three years.
<b>Form of Assistance</b>	Yes	-	Yes	Application form of EERSB (2018 Edition)	Yes

Types	Singapore	Australia	South Africa	Hong Kong	USA
<b>Productivity method</b>	The project should generate savings in man-days or improvement in productivity of the specific site process by at least 20%. At least 90% of application cases are processed within 8 weeks upon submission of complete documentation	FIM is built into the project contract to promote motivation and to reward contracting parties for achieving improved performance above "business as usual".	The lesser actual of actual total own training costs or R36000 per full time employee to be claimed within 6 years from the date of approval.	-	Encourage green building and more importantly, bringing much-needed dollars to local economy.
<b>Claim method</b>	Reimbursement basis for claim. Documents needed: (a) Audit statement by an independent accountant (b) Progress report or final report (c) Any other document(s) that may be needed	The tender is based on conceptual brief and schematic design developed by the client and consultants prior to the engagement of the managing contractor	Applicable to both PS and QS projects. Investment allowance for PS and QS more than 50% manufacturing asset in use.	Claimed in full in one year instead of the current time frame of five years.	Allocation letter from the government, amendment in their returns, and reap the 179D benefits.
<b>Supportable cost</b>	Manpower, equipment, materials, professional services / subcontracting, and acquisition of intellectual property rights.	Price adjustments under their design and documentation management fee, their construction fee or the nominated GCS, which in combination comprised the TCS agreed during the tender stage.	New and unused buildings, plants, and machinery contracted for and acquired after date of approval and brought into use within 4 years from date of approval.	Capital expenditure incurred on the construction of energy efficient building installations (include lighting, air conditioning, electrical, as well as lift and escalator) registered under EERSB.	The design and building of energy efficient buildings (as well as modifications to the existing buildings).

<b>Claim Period less than 6 month</b>	Yes	Achieve saving below the TCS and complete the stretched scope work items.	Yes	-	-
<b>Specific zones</b>	All zones	All zones	SEZ	All zones	All zones
<b>Skill developments of employee</b>	Reduced cycle time, reduced manpower, higher yield, etc.) by at least 20%.	The FIM in the project is based on performance	The cost training exceeds 2% of the annual average wage bill, but less than 2.5% (max 1 point) Or More than 2.5% of the annual average wage bill (max 2 points)	-	-
<b>Energy efficiency</b>	Re-engineer site processes or adopt labour-efficient construction technologies	-	At least 10% energy saving in utilising modern, viable energy efficient equipment, and process in the sector	Eligible facilities are divided into two categories - environmental protection machinery and environmental protection installations	The administration supports increasing the benefit to \$3.00 per square foot. The reality is that approximately 70% of electricity is consumed by commercial buildings and 179D is technologically a neutral way of encouraging energy efficiency.



# Results and Discussion

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## 4.1 Introduction

This chapter presents the results retrieved from the study. The profile of the respondents in the study is presented so as to support the data gathered from the open-ended questionnaire employed during the interview with the panel of experts comprised of various stakeholders, including developers, manufacturers, consultants, and contractors. All the respondents have more than a decade experience in the construction arena.

## 4.2 Open-Ended Questionnaire Survey

### 4.2.1 Response Rate

The interview session was held by using open-ended questionnaire survey to gather data. The duration to complete the interview sessions was 2 weeks. The sample size was 30 persons, as shown in Table 12. The respondents held senior positions in their organisations, in which nearly half of them were General Managers and Managing Directors (including Executive Directors and Directors). The managers included Design Manager, Construction Manager, Technical Manager, and Project Manager.

Table 12: List of Panel of Experts in the Construction Field

Respondents	Rate (%)
Developer	20
Manufacturer	30
Consultant	20
Contractor	30
<b>Total</b>	<b>100</b>

Table 13: Cronbach alpha

Cronbach's Alpha	N of Items
.802	50

Table 13 displays that the alpha coefficient for the four items was .802, suggesting that the items have relatively high internal consistency. Besides, reliability coefficient of .70 or greater is considered as “acceptable” in most social science research studies. The Cronbach’s alpha determines the reliability of multiple-question Likert-scale survey. A “high” value for alpha does not imply that the measure is unidimensional. Next, the exploratory factor analysis was employed to ascertain the aspect of dimensionality. Technically speaking, Cronbach’s alpha is not a statistical test, but merely a coefficient of reliability (or consistency).

#### 4.2.2 View of Respondents on The Definition of Productivity

Figure 14 illustrates that %70 of the respondents agreed that the term 'productivity' means The output per person employed, while some respondents (50) considered the proportion of work done with machines. The amount of money received by the company for its output, the unit cost of the amount of work done and the proportion of time saved compared to the project's plan (programmed) was at a similar level (%43.3).

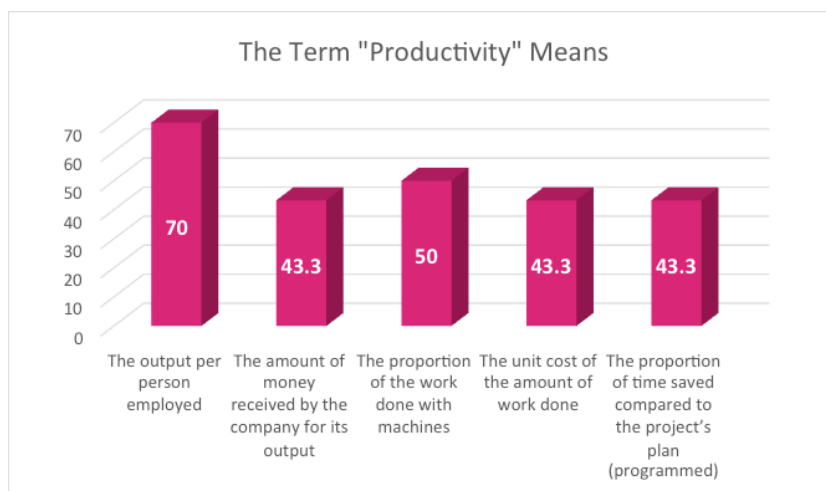


Figure 14: The term "Productivity" Means

#### 4.2.3 View of Respondents on Usefulness of Current Measures of Productivity

The percentage scores for most of the measures had been near. The ranking, based on the percentage scores, is as follows: (1) m2 square metre per day, (2) value-added per worker, (3) gross output per worker, (4) gross output per month, and lastly, the constructability score. Although the constructability score ranked lower, it is evident that they remained as highly-regarded measures with mean score close to 1.30. It is important to note that the top-ranked measures of productivity retrieved from the survey are operationally useful to the companies. Hence, they would be worth tracking by the firms.

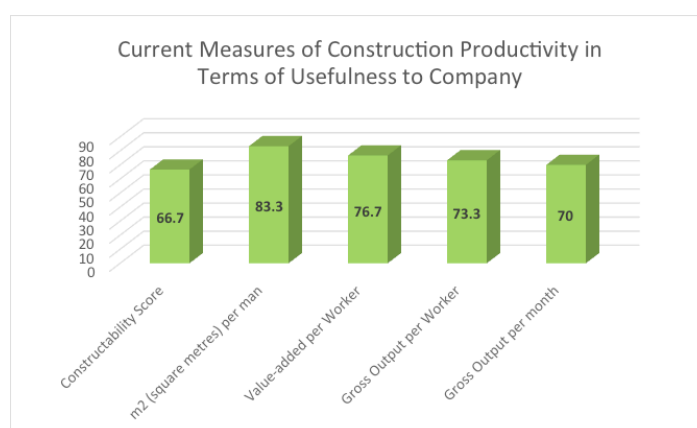


Figure 15: Current Measures of Construction Productivity in Terms of Usefulness to Company

#### 4.2.4 Views of Respondents on The Extent of Growth in Productivity in Various Segments of the Construction Industry

The respondents shared their views on the extent of growth in productivity in various segments of the construction industry within the Malaysian context. The data, as illustrated in Figure 16, show that public/private housing, residential (landed) and non-landed topped the list, followed by commercial, industrial, and institutional buildings.

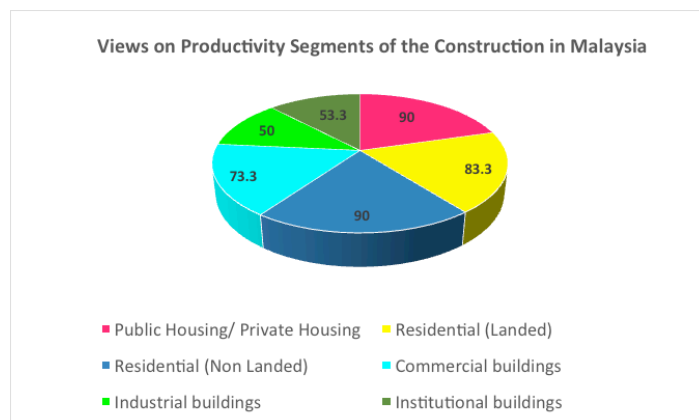


Figure 16: Views on Productivity Segments of the Construction in Malaysia

#### 4.2.5 Views of Respondents if Stakeholders Pay Attention to Productivity

As shown in Figure 17, the manufacturer, followed by clients and government were considered as the highest number of respondents to be paying adequate attention to productivity. The respondents acknowledged the government's leadership role in the productivity improvement programme established in Malaysia. They also indicated that clients took the issue seriously. Given the respondents' indication of the important role that consultants played in determining productivity performance on construction projects in Malaysia, measures should be devised to ensure their closer involvement in the productivity drive. The client can set the tone for attention to productivity on the construction project by stressing its importance, using contractors' prior productivity performance as an important criterion in procurement, provision of incentives, and submission of progress reports requirement pertaining to productivity. Clients should be persuaded with a solid business case for project-level productivity and could be given incentives to do so. Consultants have a major say in productivity on the construction project about the selection of materials and often, methods of construction. There should also be efforts to involve them in the improvement measures. Other players indicated by the respondents as not paying adequate attention to productivity included sub-contractor, manufacturing industry, architectural and interior design consultants, workers, and construction related to civil service government agencies.

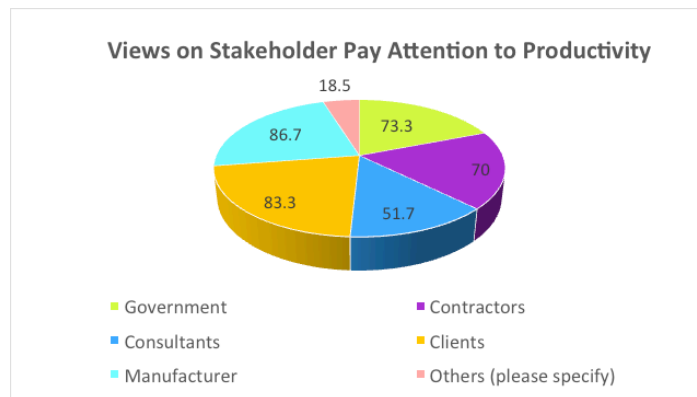


Figure 17: Views on Stakeholders Paying Attention to Productivity

#### 4.2.6 View of Respondents on the Importance of Productivity Incentives Given to Stakeholders

Figure 18 displays the importance of productivity incentive to the stakeholders. The respondents agreed (%90) that incentives should be given to the stakeholders, including developers, manufacturers, consultants, and contractors and %10 respondents not agreed the incentives given to the stakeholders. The two major components of compensation open to management are financial (material) and non-financial (non-material) components. According to Milkovich and Newman (2008), incentive schemes (short- and long-term) constitute part of the financial components of employee compensation. Incentive schemes boost performance and have been applied by numerous organisations across the globe with remarkable success. Productivity is an attitude of the mind. It reflects the mentality of progress and constant improvement of that which exists. It is also the certainty of being able to change that which exists. Productivity is the will to improve on the present situation, no matter how good it may look.

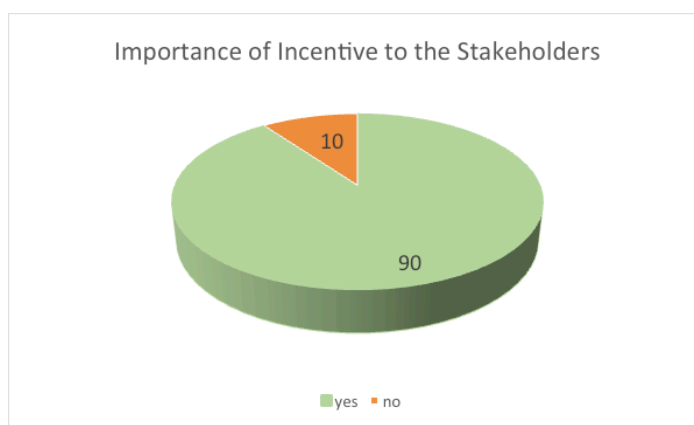


Figure 18: Importance of Incentive to the Stakeholders

#### 4.2.7 A Policy for Improvement of Productivity based on the Project

The respondents were requested to indicate if their companies had written policies on the improvement of productivity on their projects. More than half of the respondents (%60) reported that their companies did have such policies; while %40 indicated that their companies did not employ productivity policies. The stakeholders stated they adhered to the policies mainly to hit the target and Key Performance Indicator (KPI), but they do not have any tool to measure the target.

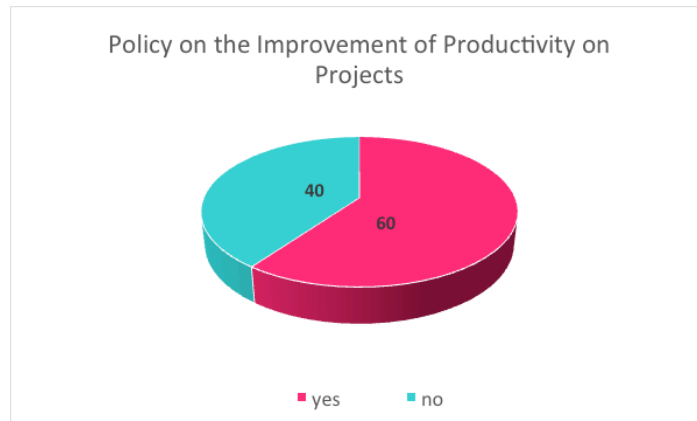


Figure 19: Policy on the Improvement of Productivity on Projects

#### 4.2.8 Setting targets of Productivity to Achieve on its Project

Figure 20 displays that %70 of the respondents reported that their companies did set targets of productivity on their projects, whereas %30 not set any target of productivity on projects. Typically, contractors and manufacturers are more concerned about setting targets to complete the projects. They normally set how many c meters cube that could be set up in a day. As such, the salary of labourers and the incurred costs could be calculated.

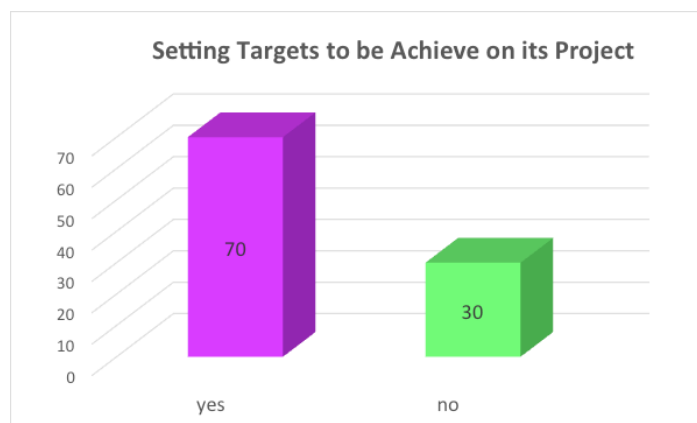


Figure 20: Setting Targets to be Achieved on its Project

#### 4.2.9 Measuring the Productivity (at any level) on the Projects

As shown in Figure %66.7, 21 of the respondents claimed that their companies measured productivity at any level of the project based on project requirements and objectives and %26.7 is not measure the productivity at any level on their projects.

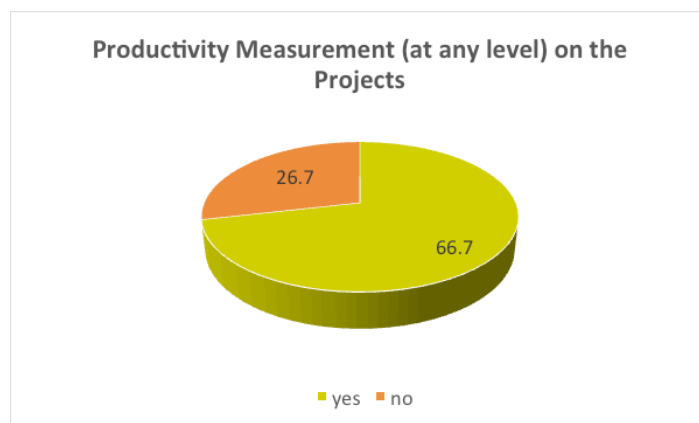


Figure 21: Productivity Measurement (at any level) on the Projects

### 4.3 Relevance and Level of Importance of Productivity-Enhancing Factors And Measures Are Often Suggested

Answer Option	Not Important	Of Least Important	Neutral	Important	Very Important	Mean
clients' insistence on productivity				63.3	36.7	<b>4.37</b>
training of workers			3.3	40	56.7	<b>4.53</b>
review of relevant government regulations			3.3	43.3	53.3	<b>4.50</b>
more extensive use of prefabrication			6.7	43.3	50	<b>4.43</b>
better service from suppliers			3.3	6.7	46.7	<b>4.30</b>
standardisation of components			10	23.3	66.7	<b>4.57</b>
mandatory requirement for contractors to pay attention to productivity			6.7	43.3	50	<b>4.43</b>
longer construction period	10	6.7	13.3	30	40	<b>3.77</b>
applying techniques to reduce amount of work	3.3			40	56.7	<b>4.5</b>

In terms of importance, the highest percentages were 63.3 which had been recorded for standardisation of components. On the other hand, only %3.3 of the respondents gave neutral answers for training of workers, review of relevant government regulations, better service from suppliers and applying techniques to reduce amount of work. Another %10 and %3.3 opined that longer construction period and applying techniques to reduce amount of work as unimportant. Further elaboration regarding the mean scores are given in the following section, Section 4.5, Table 14: Relevance and Level of Importance of Productivity

## 4.4 Section B

### 4.4.1 Criteria Validation of Productivity Incentives in Construction Industry in Malaysia

Generally, all-term scale had been applied for the criteria of productivity incentive in the construction industry, which are: very useful, useful, and neutral, of least use and not useful. All the criteria appeared to be useful in awarding the incentive for developers, consultants, contractors, and manufacturers. The highest percentages were %66.7 and %53.3 for eligibility criteria and qualifying period, respectively. Meanwhile, %3.3 reflected application process, more than rm1million cost project, and qualifying period criteria. In fact, all the criteria were viewed as useful and important for productivity incentive in Malaysia. The lowest mean is specific zones (3.69). Further details about the mean scores are presented in Section 4.5.

Table 15: Criteria of productivity incentive in Malaysia

Criteria	Details	Likert Scale					
		Very Useful	Useful	Neutral	Of Least Use	Not Useful	Mean
Eligibility	Developer, consultant, contractor, prefabricator	66.7	30				<b>4.69</b>
Qualifying Period	Project duration should preferably be kept within 2 years.	40	53.3	3.3			<b>4.38</b>
Funding/incentive Mechanism	<p>Firm Co-funded up to 50% Capped at \$100,000 per application</p> <p>Prefabricators Co-funding up to 50% Capped at \$500,000 per application</p> <p>Group (At least two unrelated companies) Co-funding up to 50% Capped at \$500,000 per application</p> <p>Industry (To be actively led by Public Agency with at least two unrelated companies) Co-funding up to 70% Capped at \$1,000,000 per application</p>	43.3	43.3	10			<b>4.34</b>
Application Process	The process prepared by CIDB	50	40	3.3	3.3		<b>4.38</b>

More than RM1million cost project	\$100,000-\$10,000,000	36.7	40	3.3	13.3	3.3	<b>3.86</b>
Tracking of Projects	Progress Reports are to be submitted by the company on a quarterly basis.	58.6	34.5	6.9			<b>4.52</b>
Project Completion	6 months from the completion/ termination of the project with documents: (a) Final report; (b) Video featuring the use of proposed technologies/ method (c) Auditor statement of expenditure; (d) Statement on the final claim	55.2	41.4	3.4			<b>4.52</b>
Form of Assistance	Form prepared by CIDB						<b>4.21</b>
Productivity method	The project should generate savings in man-days or improvement in productivity of the specific site process by at least 20%. At least 90% of application cases are processed within 8 weeks upon the submission of complete documentation	41.4	51.7	13.8			<b>4.34</b>
Claim method	Reimbursement basis for claim Documents needed:  (a) Audit statement by an independent accountant (b) Progress report or final report (c) Any other documents that may be needed	44.8	48.3	3.4	3.4		<b>4.31</b>
Supportable cost	Manpower, equipment, materials, professional services / subcontracting and acquisition of intellectual property rights.	41.4	51.7	6.9			<b>4.34</b>
Claim Period less than 6 month	Payment	34.5	44.8	3.4	13.8	3.4	<b>3.83</b>

Specific zones	Not including all zones	24.1	41.4	24.1	<b>10.3</b>		<b>3.69</b>
Skill developments of employee	Reduced cycle time, reduced manpower, higher yield, etc.) by at least 20%.	51.7	44.8	3.4			<b>4.48</b>
Energy efficiency	Re-engineer site processes or adopt labour-efficient construction technologies	55.2	41.4	3.4			<b>4.45</b>

## 4.5 Ranking Importance of Productivity Incentive Criteria

### 4.5.1 Numerical Linear Importance and Usefulness Scale

The numerical linear scale had been employed to determine the importance and the usefulness of the criteria in productivity incentive in the construction industry within the Malaysian context.

#### a) Importance

Table 16: Importance of Numerical Linear Scale

Numerical Linear Scale	Level of Assessment
$1 < \bar{X} \leq 1.8$	Very not Important
$1.8 < \bar{X} \leq 2.6$	Not Important
$2.6 < \bar{X} \leq 3.4$	Moderate
$3.4 < \bar{X} \leq 4.2$	Important
$\bar{X} \leq 4.2$	Very Important

Source: Simamora (2004)

Table 17: Mean Score of Relevance and Level of Importance of Productivity

Rank	Answer Option	Mean Score
1	standardisation of components	4.57
2	training of workers	4.53
3	review of relevant government regulations	4.50
4	applying techniques to reduce amount of work	4.50
5	more extensive use of prefabrication	4.43
6	mandatory requirement for contractors to pay attention to productivity	4.43
7	better service from suppliers	4.30

8	clients' insistence on productivity	4.37
9	longer construction period	3.77

The respondents were prodded on the importance of productivity enhancing factors and measures that were often suggested by consultants, manufacturers, developers, and contractors in Malaysia. The mean scores and the ranking results are presented in Table 17. The top nine factors (with mean scores of 4.57) were: standardisation of components, training of workers, review of relevant government regulations, applying techniques to reduce amount of work, more extensive use of prefabrication, mandatory requirement for contractors to pay attention to productivity, better service from suppliers, clients' insistence on productivity and longer construction period. Meanwhile, factors and measures that were given the least scores by the respondents (mean score of 3.77) referred to longer construction period. All the criteria was very important and will used for incentive framework. This is because; longer construction period would affect the productivity of any project. Thus, a rapid construction guarantees a smooth sailing project.

b) Usefulness

Table 18: Useful Numerical Linear Scale

Numerical Linear Scale	Level of Assessment
$1 < \bar{X} \leq 1.8$	Of Least Use
$1.8 < \bar{X} \leq 2.6$	Not Useful
$2.6 < \bar{X} \leq 3.4$	Moderate
$3.4 < \bar{X} \leq 4.2$	Useful
$\bar{X} \leq 4.2$	Very Useful

Table 19: Mean Scores of Productivity Incentive in Malaysia

Rank	Criteria	Details	Mean
1	Eligibility	Developer, consultant, contractor, prefabricator	<b>4.69</b>
2	Tracking of Projects	Progress Reports are to be submitted by the company on a quarterly basis.	<b>4.52</b>
3	Project Completion	6 months from the completion/termination of the project with documents: (a) Final report; (b) Video featuring the use of proposed technologies/method (c) Auditor statement of expenditure; (d) Statement on the final claim	<b>4.52</b>
4	Skill developments of employee	Reduced cycle time and manpower, but higher yield by at least 20%	<b>4.48</b>
5	Energy efficiency	Re-engineer site processes or adopt labour-efficient construction technologies	<b>4.45</b>
6	Application Process	The process prepared by CIDB	<b>4.38</b>
7	Qualifying Period	Project duration should preferably be kept within 2 years.	<b>4.38</b>

8	Productivity method	The project should generate savings in man-days or improvement in productivity of the specific site process by at least 20%. At least 90% of application cases are processed within 8 weeks upon the submission of complete documentation	<b>4.34</b>
9	Supportable cost	Manpower, equipment, materials, professional services/subcontracting and acquisition of intellectual property rights.	<b>4.34</b>
10	Funding/incentive Mechanism	Firm Co-funded up to 50% Capped at \$100,000 per application  Prefabricators Co-funding up to 50% Capped at \$500,000 per application Group (At least two unrelated companies) Co-funding up to 50% Capped at \$500,000 per application  Industry (To be actively led by Public Agency with at least two unrelated companies) Co-funding up to 70% Capped at \$1,000,000 per application	<b>4.34</b>
11	Claim method	Reimbursement basis for claim Documents needed:  (a) Audit statement by an independent accountant (b) Progress report or final report (c) Any other document that may be needed	<b>4.31</b>
12	Form of Assistance	Form prepared by CIDB	<b>4.21</b>
13	More than RM1 million cost project	\$100,000-\$10,000,000	<b>3.86</b>
14	Claim Period less than 6 month	Payment	<b>3.83</b>
15	Specific zones	Not including all zones	<b>3.69</b>

Table 19 presents the mean score results of criteria in productivity incentive for the construction industry in Malaysia. The criteria were validated by interviewing a panel of experts from various fields, including developers, consultants, contractors, and manufacturers with experiences more than a decade in the construction arena. The top fourteen criteria (with mean scores of 4.0) were: eligibility, energy efficiency, application process, skill developments of employee, more than RM1million cost project, project completion, productivity method, supportable cost, funding/incentive mechanism, form of assistance, claim method, qualifying period and tracking of projects. Another set of suggestions offered by the respondents was: Claim Period less than 6 month (mean score of 3.83). The stakeholders suggested minimising the claim period from 6 months to 3 months because the -6month period is considered as too long to receive payment. The lowest mean is specific zones criteria (3.69). They suggested to include all the zones and not limited specific zones for incentive applied for the stakeholders.

The stakeholders also suggested qualifying period need to up from 2 years until 5 years. For the application they also suggested to using e-submission for more effective and faster. For the criteria of more than RM-100 RM10 million cost project should be change and upgrade until more than RM100million should get incentive. The respondents agreed to give the incentive based on IBS scoring of project. Thus, all the criteria listed in this study could be applied in the implementation of productivity incentive for the construction industry in Malaysia. The form assistance criteria should look at collaborative work with other authority and lead by CIDB. The additional criteria for the productivity incentive for IBS project in Malaysia that suggested from respondents including to focus an SME as a start, sustainable construction methods, and green building. For conclusion, all the criteria was used as an incentive criteria in construction incentive framework in Malaysia.

## 4.6 Construction Productivity Incentive Framework in Malaysia

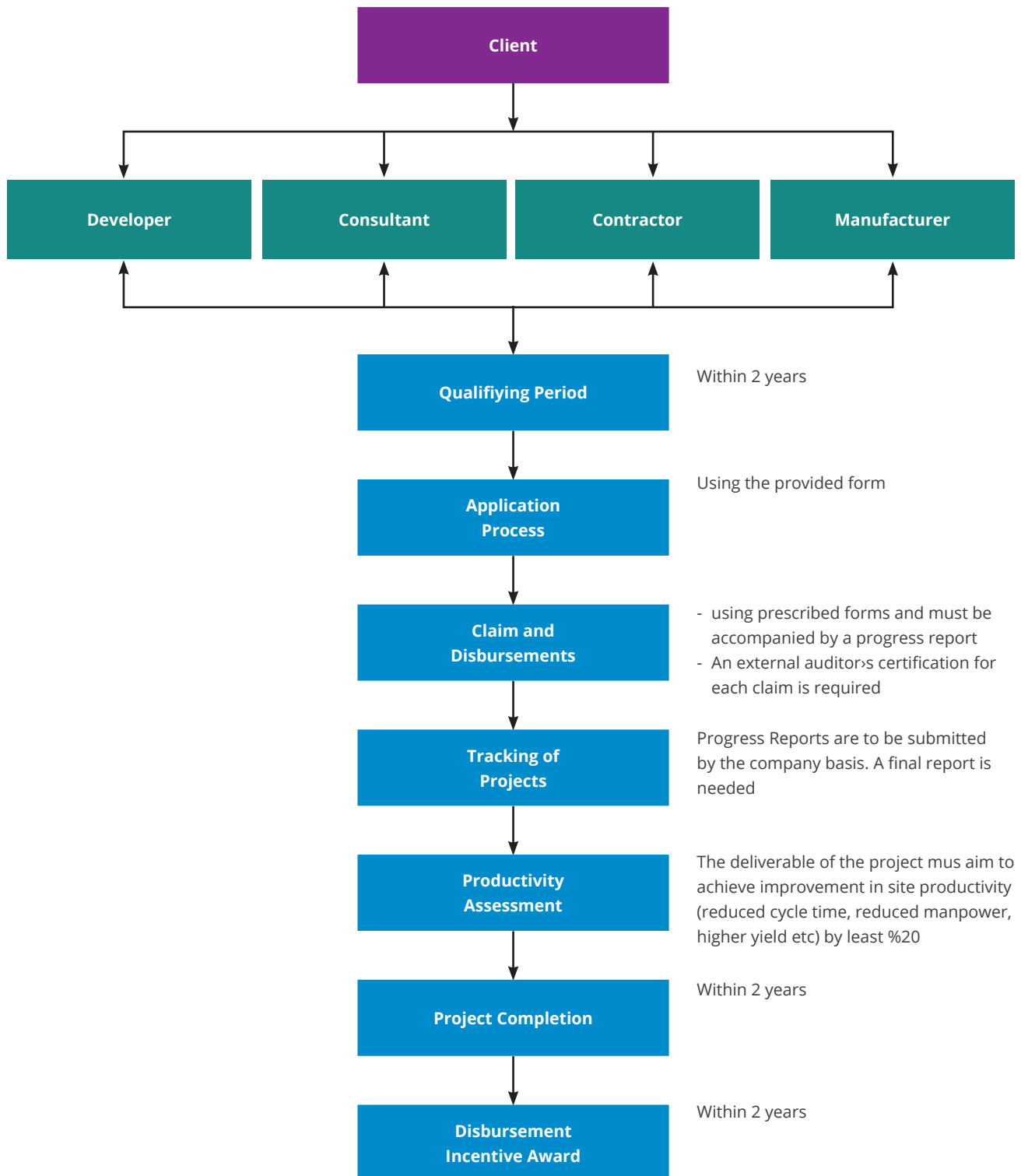


Figure 21: Construction Productivity Incentive Framework





# Recommendations And Conclusion

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- 5.1 Introduction
- 5.2 Suitable Incentive for the Construction Industry in Malaysia
- 5.3 Recommendations to Improve Incentive in the Construction Industry

## 5.1 Introduction

This study has listed the important criteria for productivity incentive by comparing five countries - Singapore, Australia, South Africa, Hong Kong, and USA, as well as gaining opinions from the stakeholders in Malaysia. The most appropriate incentive criteria that can be applied in Malaysia reflect that of Singapore's incentive mechanism. The incentives provided by Singapore cover all the significant aspects, especially pertaining to productivity, which happens to be the main objective in this research. The other criteria are inclusive of eligibility, qualifying period, funding/incentive mechanism, application process, more than RM1million cost project, tracking of projects, project completion, form of assistance, productivity method, claim method, supportable cost, claim period less than -6month, specific zones, skill developments of employee, and energy efficiency. The benchmarking ratio for Singapore, in comparison to other countries, is 15, followed by Australia with 13, South Africa with 14, and Hong Kong and US with 11 each. In this chapter, recommendations are provided for productivity incentive based on the strategy objectives.

## 5.2 Suitable Incentive for the Construction Industry in Malaysia

The suggestion for the productivity incentive can be divided based on four stakeholders, including developers, consultants, contractors, and manufacturers, as depicted in the following:

### i) Consultants

The consultants require incentives in terms of IBS and BIM software to facilitate in the construction industry. They face difficulties in using the software due to lack of expertise in the construction arena. Thus, the consultants need training incentives to teach how to use the software programme. The consultant companies also seem to face constriction in time and cost to provide professional training for interested staff to learn the new software. Since the cost of purchasing the software is expensive, the consultants also propose to be given incentives so as to reduce purchasing cost at least by %50. Using the software eases processes and dismisses the hassles of manual ways.

### i) Developers

The developers tend to propose two types of incentives, which are mandatory and non-mandatory. The non-mandatory (non-cost incentives) are provided by progress documentation to obtain building approvals before a project starts. The developers proposed that the authorities expedite the building approval process from 3 months to 1 month if the construction of the building adopts the IBS method. They also suggested updating the UBBL act by including the use of IBS elements within the act. This also offers advantages to buyers via rapid construction through the use of IBS method. Among the mandatory (cost involved) instance is reduction in development charges by at least %25. They also suggested providing financial loan to developers to carry out their projects smoothly.

### ii) Manufacturers

The manufacturers proposed an incentive in terms of funds for IBS factory. The capital to build IBS factory requires massive funds. Training should also be given to those who are beginning to build an IBS factory. Mostly, they have no experience in this construction field. Commonly, contractors take their own initiative to build the plant. In addition, training should also be given to staff who lack expertise in designing using the Tekla and Ravit software packages.

### iii) Contractors

The enhancement of productivity is a key factor in a nation's economic growth. It is also essential in the healthy growth and competitiveness amidst companies. The contractors proposed an incentive for a %50 capital loan from the government. Project payments should also be accelerated as some departments are in the process of payment. This may hinder contractors from conducting capital rounds. Financial agencies have to re-establish contract-based Letter Offer. The government also has to distribute task jobs to small contractors in accordance to the project's worth so as to avoid being monopolised by some parties. Reduction of levy payments for low-value projects should be fixed at least %50 of the original.

### 5.3 Recommendations to Improve Incentive in the Construction Industry

Improvisation of productivity in the construction arena has been driven by medium-term strategies, regulations, and incentives. Additionally, the course related to IBS method and BIM tool should be embedded in public and private universities. This subject is important so as to ensure that the students know how to use the tool upon joining the employment line. They also suggested enforcement using BIM tool in construction industry for contractor and consultant to less the mistake. The respondents recommended incentives based on specific zones as not all places have easy access to IBS. For example, certain areas in Sabah and Sarawak do not have many IBS factories. Therefore, logistics should be weighed in in regard to IBS implementation. As for energy efficiency, the respondents proposed the use of IBS material as a block work to reduce heat. With that, electricity consumption is substantially saved. The payment methods should also be reviewed to facilitate and expedite the payment process to the contractors. Besides, the government needs to set up financial assistance as provided by MARA to provide sufficient capital loan. As such, manufacturers may make arrangements with MARA by receiving MARA students as industrial trainees in the company. Hence, the loans are compensated with provision of training to the students.

The developer also faces demand risk, wherein developers construct and supply products in accordance to demands and preferences of the buyers. However, this does not benefit directly in terms of energy efficient investment. Instead, developers need to bear the extra cost of the new technologies involved. This is later passed on to the house buyers in the form of higher selling price. If a country is serious about moving forward, incentives must be provided so as to allow the contractors to design sustainable and green buildings (SunBiz, August ,17 2018).

Construction companies have also taken several effective measures to enhance their productivity. While views differ on whether productivity has grown over the years, it is acknowledged by all the stakeholders that there is ample room for improvement. Measuring productivity at relevant levels can help to determine where action is required, and what can be done. Productivity improvement in the construction arena is a complex undertaking that requires action by all the parties involved in projects. The contractor bears the responsibility of delivering the physically built item, in which the contributions of the stakeholders culminate, and where productivity performance of the project is determined. Besides that, the respondents also suggested to using the The Fourth Industrial Revolution (IR 4.0) to speed up the production. Industry 4.0 was a term coined in Germany to reflect the massive changes in machine intelligence and automation driven by software, computing power and sensor hardware. As World Economic Forum executive chairman Klaus Schwab points out in his book on the subject, the First Industrial Revolution used water and steam to mechanise production. The second used electronic power to create mass production while the third used electronics and information technology to automate production. The possibilities of billions of people connected by mobile devices with unprecedented processing power, storage capacity and access to knowledge are unlimited. And these possibilities will be multiplied by emerging technology breakthroughs in fields such as artificial intelligence, robotics, the internet of things, autonomous vehicles, -3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing. The machines will be able to do a lot of the work that people used to do, including non-manual and repetitive tasks.



In addition, these future machines are highly networked and work without boundaries across the globe. The impact on human activity industrial or otherwise will be very significant. They can take over a lot of jobs, both in the blue and white-collar segments. Also, the operating structures in the industries will change as machines start coordinating themselves to deliver work. Furthermore, the support system also crucial in construction industry. Government need to introduce support system such as direct payment to the precaster to avoid non-payment being made by main contractor. Incentive also consider to the stakeholders that use latest technology with baseline. This is way hoe to encourage the stakeholders to using the new technology that can adopt in construction industry. The incentive given should be carefully considered district framework must be stated and closely monitored.

Construction companies, inclusive of developers, manufacturers, contractors, and consultants, may opt for a more systematic approach to ensure development of their productivity-enhancing capabilities and capacities at the trade, project, and company levels. They should measure productivity at these levels and use the outcomes to develop and to set appropriate targets within the company, as well as at the relevant stages of their projects by monitoring their work and assessing their level of performance.

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