

# **Decision-making in Technology Adoption: The Case for Industrialised Building Systems (IBS) in the Malaysian Construction Industry**

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A thesis submitted in partial fulfilment of the requirements  
for the degree of Doctor of Philosophy

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## DECLARATION

### Statement of Originality:

This thesis contains no material which has been accepted for the award of any degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository\*\*, subject to the provisions of the Copyright Act 1968.

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**11 August 2014**

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Sharifah Akmam Syed Zakaria

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Date

*Specially dedicated to:*

*My husband Dr. Ir. Hardiman, M.Sc*

*for his love, understanding and support*

*and*

*my lovely daughter*

*Wan Rania Azillah*

*for her patience, love and affection.*

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## **ABSTRACT**

Shifting from conventional construction to Industrialised Building Technology (IBS) aims to increase productivity and quality, decrease labour shortages and improve working conditions. Policy approaches have thus concentrated on providing tailored information to encourage IBS technology adoption and to assist IBS decision-making. This research addresses the gap in the understanding of decision-making as a phenomenon in the context of IBS technology adoption, using a qualitative exploratory approach underpinned by an interpretative phenomenological paradigm. It specifically focuses on developing an understanding of how emerging contextual factors (e.g. government policy), structural factors (e.g. project organisation and management factors) and behavioural factors (e.g. human-related matters) influence IBS decision-making.

The role decision makers play in the adoption of IBS technology is increasingly gaining attention, particularly in the context of the pace at which this technology is implemented in the construction industry. In this context, a holistic conceptual framework is constructed and it is analysed through a qualitative multiple- perspective approach encompassing inter-project and intra-project perspectives in the Malaysian construction industry. The inter-project perspective is explored through semi-structured face-to-face interviews with a group of construction-profession stakeholders. The intra-project perspective is explored through three case studies each composing of a group of supply-chain members in IBS building projects with relevant archival data. It was found that structural, contextual and behavioural factors impacted on IBS decision-making in a hierarchical way according to the degree of influence of each factor, with structural factors being the most relevant and dominant.

This research also highlighted the important implications of structural, contextual and behavioural factors for IBS decision-making and discovered that although construction-profession stakeholders and the supply-chain members of IBS projects identified similar factors as influencing IBS decision-making, they perceived the importance of these factors differently. From the findings, this research has generated a major IBS decision-making model with facets or manifestations of the same basic model as it is essential to recognise the complex range of factors associated with IBS decision-making.

This research provides insight into the decision-making of IBS technology in building projects as a means to shift from conventional building methods to a modern building technology which can lead to sustainable construction practice. Hence, by identifying influencing factors on IBS decision-making in construction, supports could be made in terms of better understanding and facilitating, where relevant, the greater use of IBS technology in the construction industry so as to ensure sustainability. Finally, contributions to the literature and research methodology, besides research limitations and areas for further research, were discussed.

Key words: decision-making, industrialised building systems (IBS), building projects, construction industry.



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## **LIST OF ABBREVIATIONS**

A/E/C	Architectural, Engineering or Construction
BIM	Building Information Modelling
C&D	Construction & Demolition
CIDB	The Construction Industry Development Board of Malaysia
CIMP	Construction Industry Master Plan
CREAM	Construction Research Institute of Malaysia
IBS	Industrialised Building System
ICF	Integrated Conceptual Framework
IPA	Interpretative Phenomenological Analysis
IT	Information Technology
MMC	Modern Method of Construction
MS	Malaysian Standard
NEM	National Economic Model
NVivo	NUD*IST (Non-numerical Unstructured Data Indexing Searching and Theorising) Vivo
OSP	Off-Site Production
PWD	Public Works Department
S&P	Standardization and Pre-assembly
STUCONBEH	Structural-Contextual-Behavioural
UK	United Kingdom
USA	United States of America
WTO	World Trade Organization

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## LIST OF PUBLICATIONS

### Book Chapter:

1. Zakaria, S. A. S., Brewer, G., & Gajendran, T. (2013). *Decision-making of Industrialised Building System: A Supply Chain Perspective on the Influence of Behavioural Economic Factors*, In *IAENG Transactions on Engineering Technologies* (pp. 767-779). Springer Netherlands.

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3. Zakaria, S. A. S., Brewer, G. and Gajendran, T. (2013) *The Influence of Competitive Factors on Industrialised Building System (IBS) Decision-making: Construction Stakeholders' Perspective*, 23rd International Business Research Conference 18 - 20 November, 2013, Marriott Hotel, Melbourne, Australia

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6. Zakaria, S. A. S., Brewer, G. and Gajendran, T. (2011) *Psychology in the Decision-making of Industrialised Building Systems (IBS): A Field of Application*, The International Academic Forum of Asian Conference on Psychology & the Behavioral Sciences, March 20-22, 2011, Ramada Osaka Hotel, Osaka, Japan

7. Zakaria, S. A. S., Brewer, G. and Gajendran, T. (2010) *Conceptual Framework of Psychology Decision-making on Industrialised Building Systems (IBS) Technology*, 2010 International Conference on Engineering, Project, and Production Management (EPPM 2010). Proceedings of EPPM 2010: International Conference on Engineering, Project, and Production Management, 14-15 October, 2010, Taiwan, p. 61-70

*I hereby certify that the work embodied in this thesis contains a published paper/s/scholarly work of which I am a joint author.*

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