Towards innovative housebuilding: Introducing mass customisation in Malaysian housing

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Abstract

Increased competition amongst housing developers is a global phenomenon and has spurred creativity and innovation in the housing industry. Within the housing industry, one such innovation lies in the design and process, with the underlying aim of reducing construction waste, enhancing customer satisfaction and thus ensuring the sustainability of the housebuilding industry in the long run. A study is currently on-going to investigate the viability of mass customisation within Malaysian housebuilding. As part of that study, this paper forms a component that evaluates the case for the mass customisation in the context of existing literature. The aims here are to present the concept and to analyse the opportunities and challenges that potentially emanate from the adoption of the concept. The discussion serves as a prelude to an empirical work currently in progress, which will be reported in a separate paper of a larger study into the viability of the mass customisation of the Malaysian housebuilding. The main aim of this paper is to introduce the concept of mass customisation as an innovation in Malaysian housebuilding industry. First, current literature on housing mass customisation is reviewed. Consequently, the advantages and challenges of implementation will be examined in the Malaysian context. This paper serves as a needful prerequisite to an upcoming paper which will inform on the results of a survey on the viability of housing mass customisation in Malaysia.

Keywords: Mass customisation, housing, Malaysia
I. Introduction

Increased competition among housing developers is a global phenomenon and has spurred creativity and innovation in the industry. Housing developers have come up with various innovations to achieve customer satisfaction. Pre-occupation renovation leading to wastage of materials such as extension, re-tiling, change of layout, etc. will increasingly become a thing of the past as local developers now have introduced flexibility in design and layout as implemented following success - of the concept to various degrees of success - in UK, USA, Japan, Taiwan and Netherlands. One such innovation in the design and process within the housing industry is the adoption of Mass Customisation concept which could reduce construction waste, enhance customer satisfaction and thus ensure the sustainability of the housebuilding industry in the long run. This paper forms a component of a larger study into the viability of mass customisation within the housing sector in Malaysia. The main aim of this paper is to introduce the concept of mass customisation as an innovation in Malaysian housebuilding industry. First, current literature on housing mass customisation is reviewed. Consequently, the advantages and challenges of implementation will be examined in the Malaysian context. This paper serves as a needful prerequisite to an upcoming paper which will inform on the results of a survey on the viability of housing mass customisation in Malaysia.

II. The Concept of Mass Customisation As a Concept

Mass customisation operates on the basis that producers or providers of goods and services could capture more market share by delivering customised products on a mass basis. This concept has been defined as ‘...the use of flexible processes and organisational structures to produce varied and often individually customised products and services at the price of standardised, mass produced alternatives’ (Hart and Taylor, 1996). Simply put, this means that, it involves the capability of producers to offer personalised products, with each product tailored to customers’ individual requirements, on a large scale. The argument is that, while seeking some basic standards, customers would often want some individual recognition and custom treatment, whilst seeking some basic standards at the same time also want some individual recognition and custom treatment (Lovelock, 1988). Thus, mass customisation offers a competitive approach to challenge more traditional strategies such as mass production. This customer-centric approach, selling lifestyle and fantasy, has been the marketing strategy for myriad categories such as apparel, construction and home furnishings, computers, sports equipment, publishing and printing and balloons (Zipkin, 2001).

Central to the evolution of the concept of mass customisation in businesses were increased competition and winning customer loyalty via customer satisfaction i.e. customer focus. Its main enablers were elicitation, process flexibility and logistics (Zipkin, 2001). Elicitation has been described as a process whereby customers decide on their preferences and then communicate those choices to the producer. This process has been aided by customer relationship management (CRM) and automation (IT-based) (Zipkin, 2001). Process flexibility, on the other hand, translates the information into physical product in high volume. Pine and Gilmore (1998) went further to argue that flexibility in both processes and organisational structures is pivotal to the successful implementation of mass customisation; it is what distinguishes mass customisation from mass production. Closely related to mass
production, flexibility in production has been enhanced by innovations such as modular design, lean operations and digital-IT. Finally, logistics is the stage whereby products manufactured according to individual customer’s preferences are delivered to the correct customer.

Lampel and Mintzberg (1996) further outline the spectrum of design and logistic strategies between pure standardisation and pure customisation, as below.

<table>
<thead>
<tr>
<th>Design</th>
<th>Fabrication</th>
<th>Assembly</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure standardisation</td>
<td>No choice</td>
<td>Limited choice</td>
<td>Limited choice</td>
</tr>
<tr>
<td>Segmented standardisation</td>
<td>Relatively low-cost &amp; lead-time</td>
<td>Make-to-stock</td>
<td>Distribution of standard finished products to niche market postponed based on aggregate requirements</td>
</tr>
<tr>
<td>Customised standardisation</td>
<td>Compromise between cost, lead-time &amp; choice</td>
<td>Assembly-to-order</td>
<td>Assembly-to-order postponed based on customer choice from options</td>
</tr>
<tr>
<td>Tailored customisation</td>
<td>High choice</td>
<td>Make-to-order</td>
<td>Fabrication based on a set of standard designs</td>
</tr>
<tr>
<td>Pure customisation</td>
<td>Infinite choice</td>
<td>Relatively high cost &amp; lead-time</td>
<td>Buy-to-order</td>
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**Figure 1:** Spectrum of design and logistic strategies between pure standardisation and pure customisation (Source: Lampel and Mintzberg, 1996)

Pine, Victor and Boynton (1993)’s “product-process change matrix” divided into four the stages in which organizations can operate, namely invention, mass production, continuous improvement and mass customisation. Mass customisation could therefore be argued as the natural progression in the housing sector that has continuously experienced technological innovations.

**III. Some international Experiences in Housing Mass Customisation**

The mature UK house building industry has adopted housing customisation since the late 1990’s to fulfil buyers’ requirements not only in design and decorative features but also housing-related services, such as insurance and maintenance in the sales package (Barlow and Ozaki, 2001). Innovations in UK housing have been hampered, however, by institutional
restriction such as rigid local authority planning and design guidelines and mortgage lenders wary of innovative designs that may affect future marketability of the property.

In the USA, mass customised houses are even more popular among the “baby boomer” generation. Born between 1945 and 1965, they are the largest purchasers of new homes in the US and different from their depression-era parents, they are sophisticated consumers who demand more choice and tailored solutions that mass-produced homes could not fulfill (Larson, Intille, McLeish, Beaudin and Williams, 2004). Some mass customisation-enabling design and construction tools are being developed in the country. MIT, for instance, have already embarked on developing automated design tools (ADT) that facilitate agile and customisable architectural systems and strategies through its House_n Research group (Larson et al., 2004). To ensure effective mass customisation process, ADT should be linked to automated manufacturing whereby the home will comprise manufactured components integrating structure, finishes, communication, power, embedded sensors, etc. These components should be able to be rapidly assembled on-site with little skilled labour. In this case, the ADT will be readily supported by the availability of computerised numerically controlled (CNC) machines, currently a common fixture in large millwork and metal plants. CNC machines would produce controlled and precise fabrications of housing components that allows the usage of new materials and embedding of delicate electronics and devices into the fabric of the environment. The technological enablers of mass customisation mentioned above would receive further boost should the open architectural standards, currently under discussion, receive consensus from the professionals. A universally accepted standard outlining protocols, infrastructure and connections would allow for diverse companies to compete head-to-head for the loyalty of customers. Researchers at MIT have established Open Source Building Alliance (OSBA), an organisation that brings together industry and academic researchers for an integrated research which would ultimately result in industry standards in systems architecture (Larson et al., 2004).

Japan has the second largest new housing market in the world (Barlow et al., 2003). With about 13 new units per 1000 population per year, the rate of new build in Japan is over twelve times that of UK. The Japanese homebuyers, familiar with the systematic and individualised way of building traditional houses, would not accept uniformity. Realising this, the pioneering case of mass customisation - Sekisui Heim M1- prioritised buyers’ demand by accommodating the individual user’s needs. Together with considerations of fundamental shift in Japanese social structure and the resultant decline in skilled workers, it accepted user control while also harnessing industrial production. One lesson from Japanese customized homes industry is that there is no single form of ‘mass customisation’ (Barlow et al., 2003). Instead, there are a variety of different solutions for delivering housing products.

Like so many cities in Asia, the conventional housing market offered standardised products and occupants have to spend money on remodelling before moving in even though the house was in good condition. As the market grows more mature, a business strategy called ‘pre-sale’ has dominated the Taiwan housing market especially in metropolitan areas (Lai, Wang and Zhou, 2004). This entails an open dialogue between customers and the builder ensuring that the specific needs of future residents are met if common agreements on the design, cost and quality are reached in time (Juan, Shih and Perng, 2006). Since the houses have not actually been constructed yet, builders accept buyers’ input during the pre-sale stage but within the scope of possibility. Buyers, however, possessing limited information
and professional knowledge often faced decision-making difficulties regarding a building which exists only virtually, compounded by a large number of customisation possibilities regarding the demand, the cost and quality of a building that only virtually exists. IT could provide partial solution to the problem, for instance employing a hybrid approach combining case-based reasoning (CBR) and genetic algorithm (GA) (Juan et al., 2006). With the increasing demand for housing customization, suppliers bear the undeniable responsibility to offer customers customizable housing units, as well as satisfying their needs and expectations within a preferred budget. Lessons learned from Taiwan housing conditions illustrate the urgent requirement for good practices in housing customization, for which assisting customers in making satisfactory decisions becomes a critical and indispensable service (Juan et al., 2006).

The evolution of the construction industry in Netherlands may be attributed to good institutional support, particularly government subsidies for industrial, flexible and demountable building (IFD) pilot projects (Van Gassel, 2002). IFD has been described as a form of sustainable building as industrial production of components facilitates flexible use whilst, by being demountable, components may be replaced separately according to their lifespan. The availability of IFD in the Netherlands has provided an opportunity for mass customisation in housing, which was important in an increasingly buyer-oriented market. Additionally, the Dutch construction industry had Open Building and Lean Construction at their disposal to achieve mass customisation goals in projects such as the Almere municipality in 2001 (Cuperus, 2003).

IV. The Pull Factor: Technological Advancement in Housing Construction

The rules have changed in the housing industry due to two factors, the rise of the IT and ICT and shortage of skilled labour. The days of speculative housing developers are numbered: competition is no longer restricted to local level, being labour intensive is a bane and being slow to adopt innovations could potentially be harmful to business. The internet, information technologies and powerful computations have provided the necessary framework for an alternative to site-based mass-production housing. Furthermore, labour costs have become more expensive and unsustainable in the long run due to shortage of skilled labour. In a volatile global economic climate, necessary adaptations need to be implemented by housebuilders in order to maintain their competitiveness (Noguchi, 2001).

The transition from the cumbersome traditional production builders to mass production i.e. ‘industrialised’ building could be traced in the post WWII Europe, characterised by uniform floor plans and large concrete panels produced in factories. Initially seen as a solution to housing the population en masse cheaply, it was quickly realised that ‘one size did not fit all’ i.e. some markets reject the uniformity that characterised mass production. The Industrialised Building System (IBS) described the construction technology in which all building components such as wall, slab, beam, column and staircase are mass produced either in factory or at site factory under strict quality control and minimal wet site activities (Lim, 2006). This system may be argued as a catalyst for mass production in construction.

The housing market is increasingly encountering more market-savvy house buyers who ask for more variety. Consequently, the design and development process needs to continuously innovate in order to satiate these new breed of sophisticated house buyers without
sacrificing profitability. Changes in customer demands are one possible reason to adopt new construction technology. Other reasons include market pull, technology transfer and technology push (Willems, 2003).

The construction industry has borrowed heavily from the manufacturing sector in the past. For instance, Lean Construction is a construction management concept with origins in the car manufacturing industry (Cuperus, 2003). Its main aim is to reduce waste by adopting a clear set of objectives for the delivery process, concurrent design of product and process and the application of product control during the product lifespan (design to delivery) (Cuperus, 2003).

Open Building is another available concept which promotes sustainability by enabling occupiers of such buildings to determine specifications that most suit their needs, thus creating conditions for responsibility and care. Cuperus (2003) described the concept as ‘a multi-faceted concept, with technical, organisational and financial solutions for a built environment that can adapt to changing needs’. It entails viewing the house as a collection of layers or levels, kept as distinct as possible to optimise their performance and flexibility. Modular components are built off site in an environment where efficiency, cost and climate can be controlled.

The advancements of building technology and IT serve as prerequisites for successful implementation of mass customisation in housing. At the same time there are other pertinent factors such as consumer demand and supporting institutional framework that need to be affirmed for mass customisation to take place successfully.

V. Housing Mass Customisation in Malaysia: The Way Forward

Mass customisation in housing is envisioned to enable increased customer choice, en masse, in matters such as spatial configurations and options for lighting, finishes, appliances and energy producing components. In a mature mass customisation-led market, architects and industrial designers would use an integrated system based on industry-wide standards for both building components and digital technologies.

Innovation in housebuilding came as a result of housing developers’ shift in customer focus as a new business strategy. This fixation on customer focus is seen to reflect an organisation’s ability to deliver high levels of customer satisfaction and basically deals with meeting customer needs (Barlow and Ozaki, 2003). The ‘customer focus’ notion, however, needs to be carefully considered in the context of housing as it includes a wide range of other concepts such as ‘good service’, ‘customer satisfaction’, ‘customer loyalty’ and ‘customer empowerment’ which are unsuitable in the housebuilding sector (Barlow and Ozaki, 2003). In housebuilding, three key aspects in customer focus may be applied namely ‘good service, customised home design on top of quality products and good information flows between customers and the housebuilder and within the company’ (Ozaki, 2003). These three aspects are prerequisites to enable mass customisation in housing.

The Malaysian Government has long envisioned that the Malaysian society would inevitably evolve into ‘(a) more sophisticated society... (that) will resist anything homogeneous or
monotonous lifestyle and tastes... (requiring) more choices in the buildings where they live’ (Ministry of Housing and Local Government, 1999). The concept of mass customisation is actually not exactly new in Malaysia. Information technology services, for instance, are one of the earlier industries to implement the strategy albeit under some form of constraints (Peters and Saidin, 2000). Nevertheless, any move for toward the implementation of housing mass customisation should be examined from both supply and demand side. The current available construction technology and management need to be matched by customer demand for housing mass customisation to be a viable undertaking.

The organisation responsible for the development of the construction industry in Malaysia is the Construction Industry Development Board (CIDB). CIDB is the body responsible for research and development in construction, promoting new technologies in building technology, monitoring the performance of the construction industry and identifying weaknesses in the construction sector (CIDB website, 2008). The Malaysian construction industry has utilised the Industrialised Building Systems (IBS) since the 1960’s (CIDB, 2005). The IBS Roadmap 2003-2010 outlined the government’s long-term strategies in moving towards Open Building system via IBS, which includes implementation of Modular Coordination by local authorities under the legal provisions of the Uniform Building Bylaw, implementation of IBS for affordable housing (low cost housing), implementation of IBS in government projects, implementation of Minimum Buildability Score for private sector projects monitored by the local authorities and levy reduction incentive for Modular Coordination usage (CIDB, 2005).

It is not the intention of this paper to linger dwell on IBS implementation in Malaysia as there has been a robust literature on the discourse. Nonetheless, it is pertinent to note that the acceptance of IBS – IBS technology has not been universally accepted by Malaysian builders despite its early introduction (CIDB, 2005; Abd Hamid, Ghani, Abdul Rahim, and Mohamad Kamar, 2007; Kamar, Alshawi and Hamid, 2009). Amongst factors contributing to the delays of IBS implementation included negative mindset, perception of high cost, poor quality products, insufficient weak push factor and insufficient onsite specialised skills (Abd. Rahman and Omar, 2006; CREAM, 2007). More recently, Kamar et al (2009) provided an analysis of the barriers to IBS implementation in Malaysia in the form of a fishbone analysis as in Figure 2.
Figure 2: Fishbone analysis on IBS implementation barriers: The case of Malaysia (Source: Kamar et al., 2009).

House builders’ resistance in using IBS in development is expected to diminish drastically rapidly in the near future as the Malaysian’s housing market continues its strong growth against the backdrops of the relatively young population (whereby 72.8 per cent of the population fell below the age of 39 in 2005 and a median age of 23.9 was recorded in 2000) and the implementation of ‘Malaysia as my second home program’ since 2002 (Ahmad Shakir and Hamzah, 2008).

In Malaysia, the adoption of IBS has been seen mainly adopted in the government projects (school), commercial development (shopping complex) and non-commercial residential projects (government quarters) (Abd. Rahman and Omar, 2006), affordable housing (Lim, 2006) and infrastructure projects such as bridges and drains (Marsono, Md. Tap, Ng and Makhtar, 2006). A few number of major housing developers also have embarked on an experimentation with some degree of customisation to house buyers as a marketing strategy to attract market savvy house buyers, albeit small in scale and offering limited choices to offer. With the robust housing demand and continued advancement of thebacked by available advancements in construction technology, the natural progression way forward for house builders would appear to be the adoption of mass customisation who, if they wish, to remain competitive and relevant in the housing market seems to be the implementation of mass customisation. With reference to the three essential elements of mass customisation as propagated by Zipkin (2001), the housing industry’s readiness to embrace the concept is made less complicated as logistics is a non-issue in housing. We believe that the Malaysian housing industry, at the current technological level achieved in construction technology, has achieved sufficient elicitation and process flexibility to enable permit at least some degree of mass customisation.
VI. Challenges of Housing Mass Customisation in Malaysia

As with any other product innovations, the state of current technology available and the market demand need to be carefully assessed before producers proceed with embark on mass customisation. A major challenge in successful adopting housing mass customisation lies in bridging the gap between developers and house buyers. Juan et al. (2006) have demonstrated the importance of supporting house buyers in making satisfactory decisions with regard to their future domain, in this case via IT-based tool. Business strategies based on consumer-centricity, a prevalent trend in the housing market, must learn from Taiwan’s experience that good practices in housing customisation are indispensable especially in assisting house buyers in making informed decisions, in what Zipkin (2001) termed as the ‘elicitation’ process. Elicitation entails the extraction and communication of customer choices, a task simplified somewhat by progress in customer-relationship management (CRM) and information technology. Advancement of information technology enables a high degree of user interfaces. Such supports need to be considered before embarking on mass customisation in housing.

Process flexibility is another issue that needs to be considered as some constructions are not sufficiently flexible. Based on the current construction technology currently available in the country, it is apparent that a full-fledged mass customisation implementation would not be realised in the near future, taking note of the UK experience as reported by Barlow and Ozaki (2003). This could indicate that only a certain product attribute may be customised. The government’s initiative in promoting IBS as a means to achieve Open Building System should be supported by various quarters in the housing industry, as it would not only assist in achieving affordable housing targets but also realising housing aspirations of house buyers. This is one barrier to innovation as mentioned by Larson et al. (2004) that must be overcome in order to realise the potential for the new generation of housing.

In the UK, limitations to housing innovations have included the rigid local authority planning and design guidelines (Barlow, 1999; Ozaki, 2003). This is an institutional concern that may hinder mass customisation in housing. In the past, Malaysian local authorities have traditionally been observed to be less than enthusiastic in allowing about incorporating for IBS provisions in the local building bylaws. Flexibility in building laws is thus an area that merits further examination consideration before proceeding with mass customisation. Increasingly, however, nonetheless, the concern has been mitigated through there has been increasingly greater more and more exposure awareness and persuasion understanding that have resulted from campaigns coming from CIDB and other government agencies (particularly the Ministry of Housing and Local Government) in supporting of IBS usage adoption that may render this concern a redundant one.

Finally but perhaps the most important consideration is determining the state of readiness from Malaysian house buyers in accepting the new concept. Any marketing literature will mention concept development and testing as an important process in new product development. The preferences of the final consumers of customised housing – i.e. the house buyers – should be surveyed to confirm the viability of mass customisation in housing. A subsequent paper in the series will report the results of a household survey which examines the above issue.
VII. Conclusion

The housing market has increasingly become more buyer-centric with house buyers becoming more sophisticated; uniform and standardised products will soon be replaced with buildings tailored to the occupants’ needs. The next stage in the maturing Malaysian housing market is to move towards mass customisation. Mass customisation helps to eliminate waste, enhance house buyer satisfaction and increase building sustainability not to mention makes for good business sense among housing developers. More developed countries have embarked on the concept, with different levels of success. There are, however, lessons to be learned from each of those countries. Barriers to innovation must be addressed; Malaysia must achieve significant level of IBS in housing construction for mass customisation to be viable. Institutional support, for one, is an important consideration. The legal framework needs to facilitate this important innovation in housing with similar spirit from the implementing bodies. The elicitation gap between builder and customer has to be closed, with particular reference to Taiwan’s case. Finally, the readiness of the supply side must be met with similar readiness from the demand side. A second paper in the series will report on house buyers’ preferences on the issue of mass customisation in the Malaysian housing market.

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