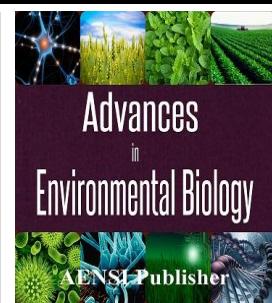




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The Study of Load Bearing Masonry (LBM) System in a Developing Country

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ABSTRACT

Load-bearing masonry is an alternative method for the construction industry especially in the housing project. The adoption of the LBM brings an enormous beneficial effect to the construction industry and organization productivity. However, research in the field of the LBM system adoption is still in its limitation. The comprehensive reviews of the literature demonstrate that the majority of the research is discussed the development and potential of the system compared to study the factors influence the adoption of the system. Therefore, this paper aims to discuss the previous studies and as a part to fulfill the gap in the management construction research especially for the LBM system.

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INTRODUCTION

The main challenge facing housing in Malaysia is the rising cost of building construction that is a factor of the over-reliance on the importation of building materials. Building materials constitute the largest input in the construction and according to [6] about 75 percent of the materials cost contribute to the total cost of the construction. As reported by [6], cost of building materials increase from 0.2 percent to 2.2 percent for the year 2012 and the optional construction methods need to be suggested such as load bearing masonry (LBM) system in the housing construction industry.

Masonry structure is a simple technique for the construction, and it made from collective units of bricks or blocks in making a wall. Load bearing masonry is a concept where the floors and walls work together as a system and each giving support to others [22]. In another word, the system was designed to support the building loads by the roof, upper floor slabs, dead load and lateral loads, such as wind and soil pressure and there are five types of structural masonry namely: plain masonry or unreinforced masonry, reinforced masonry, pre stressed masonry, confined masonry and interlocking block system in construction projects.

The adoption of LBM system widely used in developed countries, for example, Europe [11]. In Malaysia, the use of masonry was found more than 500 years ago during the settlement of the Portuguese in Melaka. Then, brick masonry is widely implemented in Tanah Melayu and continued by British. Today, this system was namely as brick/block work masonry system, interlocking block system and commonly used for the housing and building construction.

Previous Study of LBM System:

The adoption of new method or technologies in construction is influenced by a few factors. Research in the field of the LBM system adoption is still in its limitation. An investigation of the literature demonstrates that the majority of the research is in the technical issues for examples studies about design structure, material testing of structure elements [10;12]. There is a limited study on the management issues such as potential factors in the adoption of the masonry structure [16]. Thus, this paper aims to discuss the previous studies as a part to fulfill the gap in the construction industry study. The information presented is based on available literature in the construction industry and summarizes in Table 1.

Table 1: The studies of masonry system

No	Studies	Authors
1.	Historical and development of masonry	[5;19]
2.	Masonry productivity	[17]
3.	Sustainability of masonry	[8;4;18]
4.	Interlocking masonry in housing construction	[2;13]
5.	The advantages of masonry system	[15;9]
6.	The adoption of masonry system in construction	[1]

i. Historical and development of masonry:

Masonry structures have been used in the earlier part of the century for the smallest to huge buildings, infrastructures and monuments. The world's most beautiful homes are made from masonry. Masonry buildings especially those of bricks acquire a beautiful, natural and look classic as well as strong, durable and low maintenance. Masonry is still the most important material for the housing construction, while the developed country has an interest in transforming masonry into variety of structure application [14] and innovates the design in improvements of performance and serviceability of needed [5]. A review by [19], his study demonstrated the historical of development of the modern masonry and also exploitation for some innovation large-scale structures such as retaining the wall, water tower and shopping center.

Early, the application of this method was based on the 'rule of thumb' and then the builders passed on through the generation. The structures look massy and bulky, then present not economical. Now day, through research and development the material more innovative, the standard codes of practices and design guide allow stronger, safer and economical. Then, masonry becomes the one of the alternative method and competitive market demands with less labor intensive building systems [7].

ii. Masonry productivity:

Masonry system majorly enhances the productivity of the construction. A study by [17] stated the project-related factors such as work type, building element, construction methods and design requirement influence the productivity by using the masonry system. Additionally, by understanding the factors would help the designers and the builders to design and build masonry structure for more efficiently and manageable of the projects.

iii. Sustainability of Masonry:

Mentioned by [9] sustainable housing as affordable housing that incorporates environmentally friendly, use natural of resources, better quality of life and economic growth. Sustainable housing requires proper definition of housing needs and the use of sustainable building material is one of the environmental responsible [3] because it offers low maintenance, energy conservation, improve productivity, greater flexibility, improve occupant's health and use of natural resources [21]. Masonry performs simultaneous functions of carrying load and enclosing space while possessing strong properties for fire resistance, thermal and sound insulation and protection against environmental exposure [18]. As a result, masonry presented a cost-effective and low-energy alternative when designed appropriately.

iv. Masonry for housing construction:

The use of masonry, namely interlocking bricks is growing in popularity around the world. This system replaced the traditional masonry with seem as LEGO concept. Through the research and development, this system was acceptable for housing demands [20]. This method more adopted in the housing construction due to its simplicity in block laying, less mortar and independent of workmanship variations [3].

v. Advantages of Masonry:

The LBM masonry is the optional construction methods because of the system has potential to overcome the problems in construction industry and one of a good alternative because of their advantages such as in design, construction and cost [15]. The system does not require any expensive tools, machine and plan, only skilled workers needed in laying of bricks or blocks [9]. Besides that, the system doesn't have any intensive period for the preparation method in beginning of the construction. Since that, it is can reduce the cost of labors and methods.

vi. The adoption of masonry:

The adoption of a masonry system in construction was widely applied especially in developing countries. In United Kingdom and Australia the use of brickwork is more popular, whereas in the United States and Canada the use of blockwork is mostly used. Studies by [4] found the adoption of the masonry system influence by shorter time and reduce the cost for the construction. Meanwhile, [1] in their study concluded that the adoption of the system among the industry player is in low level, but the awareness of the technology is high.

Due to innovation through the design, this system more performed in Malaysia, for example, the Bungalow in the FELDA LAKA, Kedah [13] and then the builders interested to practice the interlocking block system for the housing and building construction. It noticed that, the masonry structure was recognized in Malaysia's construction industry as an optional method for building system.

Conclusion:

From the discussion above, the studies of the masonry structure particularly about the development of the system, masonry productivity, sustainability and advantages of the masonry system. But, factors influence the adoption of this system among the industry players not intensively study. An understanding of the factors influencing the adoption LBM system in the construction organization would help the practitioners and government in enhancing the usage of the system in construction activities. Additionally, adoption of technology is essential of the construction firms to compete at the international construction demands. Then it encourages the growth of the industry and country economic.

For the future, it is interesting to consider such as the factor influence the adoption of this system in understanding the situation of the industry players in the adoption of this system as an alternative method for construction. Consequently, this is part of our Ph.D. research in the local university.

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