The Beneficial of BIM Adoption in the Interior Design Services for Design Process

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Abstract. The design process is a preliminary to design the space and development of the process to build a building by the further systematic layout and appropriately. Through the design phases, designers are capable to prepare the drawings and organize the documents using by Building Information Modelling (BIM). This technology and innovation be able to enhance the performance of interior design services by improvement of skill and knowledge. These researches are to classify the element of services in the interior design and to evaluate the effectiveness of BIM usage in design process for the interior design industry. BIM is imperative for industry players to be the best construction by technologies implementation. Through this study, the number of sixty-three interior design firms was chosen and limit to surrounding in Klang Valley registered with Lembaga Arkitek Malaysia (LAM). The survey was conducted through the questionnaire survey and the data collection will be analysed to grant significant information in BIM adoption for interior design services.

1. Introduction

Today, a new technology has continuously changed the approach of people conduct business and their lives which greatly impacted their daily life [1]. As an interior designer, there is no different to others accepted and incorporated with new innovation technology too has impacted the interior designers business, cooperation and communication with clients, and how to adopt new ideas and communicate [2]. As an interior design, the decision making is very important which is known as a design process. There is has several steps included the design idea, improvement of design, contract documents and contract administration.

Although designers have a design process, they are still to think the innovative design solution while fulfilling client's need. This process is defined as design thinking, solution issues-focused, problem-solving methods even as affording innovative approaches to explore and analyze design solutions [3, 4, 5, 6, &7]. There is a need too to beyond approach of the interior design industry and glance toward human interactive or environment interactive conceptual and theoretical element. The design solution is generally significant to accommodate in the design phases to be efficiently processed for the construction and documentation by implement BIM for interior design firms. Interior design can increase the knowledge and develop a skill in the services for the interior design industry with BIM adoption.
2. Literature Review

2.1. Interior Design Services
An interior designer has enclosed on training, space planning, construction, detailing, and finishes materials selection in addition to considerations of furnishings. In the construction and design, it is describes client and user requirements, develops on conceptual approach, and creates documents solutions. In the interior design, project management is a part of services provided to fulfill projects demands, knowledge and skilful [8], even though as a interior designers should be acknowledgeable in term of design criteria and must not be left behind in the technical skills and requirements of projects with interpersonal communication and management strategies flow together with the technology updated [9].

However, interior designer's job scope not limited only design; the capacity of interior designer's work similar to architecture and of course is yet it to limited process to the enclosed space either design tasking and processes of drawing. Not only talking about design, interior design also involved in the construction and completion phases of projects involved. The process can only be successful by conducting through proper planning, executing the design, tremendous monitoring and fair controlling until the project hand over.

2.2. A Theory and Practice of BIM
BIM is a process for design practice and standards of building design, delivery and operation. The intention of BIM does not only spotlight on traditional method like CAD but is more an inventive and indicator of innovation that is enormously smart to tolerate for a proper management in design [10]. Implement BIM can enhance the organization of human capabilities and organization by declining interruptions and imprecision between a clients.

BIM endowment the opportunities to cooperated with each other and to employ the data in the certain areas, values, and commercial aspect in construction industry [11, 12]. Furthermore, technology have a capability to contribution the competitive advantage by improve chances and decrease the costs [13] that is showing as a function of Technology, Process and People [14]. Interior design process is merging with some design decisions, occupied and improved the driven by a miscellany of factor; space consumption, area conditions, visuals, material rate, finishes and material – to ensure for decision-making development. BIM adoption using via technology, the documentation every phases will increase a efficient process to enable the speedy movement of the project.

2.3. Interior Design and BIM
Interior design is a professional practice with imaginative and solution finder to applied the possession of field to attain a superior environment. Solving the problems can increase the quality of life and occupied culturing with aesthetically striking. Based [15] it is mentioned that illustrate of the interior designers are needed a good thoughtful on construction aspects to certify effectiveness using BIM. With the innovation and new technology, interior designers are obliged to comprehend the core and implementation of building details in design effectively in BIM.

Interior designer’s portrays a building's as the inner space with the concrete scale to manipulate the design components for instance wall, ceiling and floor. Interior designer's has to distress about the human ergonomic to certified the working and purposeful space. According to [16], interior design is expertise body to be a creative thinking and technical skills to solve design problems.
Figure 1. The design process work flow. (http://hmhai.com/design-phases

Table 1. Knowledge of BIM for Interior Design

| BIM for Interior Design                                                                 |
|-----------------------------------------------------------------------------------------|
| **Interior Advantages**                                                                 |
| 1. Speed and ease of interior design creation and its ability to visualize the design   |
| 2. Ability to capture and manage the design via multiple options – from space layout    |
| to material selections.                                                                 |
| 3. The richness and reliability of data - early fundamental task.                      |
| **Interior Design Options**                                                            |
| 1. To keep multiple design alternatives until enough information decision making.      |
| 2. Enabling designers to develop and study multiple design alternatives simultaneously |
| within a single model.                                                                 |
| **Interior Design Information**                                                        |
| a. Schematic design                                                                     |
| - Able to create a master schedule for interior spaces.                                |
| - A working database view of a project.                                               |
| - Able to input table-based schedules for many interior design components.             |
| - Produce accurate preliminary estimates.                                              |
| b. Calculating Quantities                                                               |
| - Storage, manage and coordinates design                                               |
| - Calculate area and quantify material and reliably – reducing overall project cost    |
| - Accurate area measurement – carpet, wall coverings, ceiling tile, or finishes.       |
| - Ability to track occupancy, space allocation and assets.                             |
| c. Interior Documentation                                                               |
| - All the construction documents relating to the interior design are direct presentation. |

3. Research Aim and Methodology
This research aims to identify and evaluate the benefits of BIM for interior design industry in Malaysia in the design process. This research is to find the data about the benefits and barriers to adopt BIM in the interior design industry. This research focusing on interior design firms registered with Lembaga Arkitek Malaysia (LAM) and the total of number sixty-three interior design firms was chosen in this study as a case study.
4. Result Analysis

According to the result, this study focusing on the beneficial BIM adoption to interior design firms in the design process and identifying the awareness, readiness, problems and barriers of BIM appropriate usage in the interior design firms.

According to Table 2 shows only 11 respondents firm was established in year 1990 and below while 10 respondents firm was established between 1991 and 2000. Meanwhile, 19 respondents firm was established between 2001 and 2010. However, only 23 respondents firm was established in year 2011 and above.

| Year               | Small firms | Medium firms | Big firms |
|--------------------|-------------|--------------|-----------|
| 1990 and below     | 3           | 5            | 3         |
| 1991 - 2000        | 5           | 3            | 2         |
| 2001 - 2010        | 8           | 5            | 6         |
| 2011 and above     | 11          | 8            | 4         |
| **Total**          | **27**      | **21**       | **15**    |

Table 3 shows the awareness and readiness level of interior design using BIM. The level of awareness and readiness for small firms are higher than the big firms with different percentage 19% compare medium firms was 33%. It is shown; small firms are ready to used BIM comparing two others size of organisation in the interior design firms.
Table 3. Level of Awareness and Readiness BIM for Interior Design

| Size of Interior Design Organization (f) | Level of Awareness | Level of Readiness |
|----------------------------------------|-------------------|-------------------|
| Small firms (f)                        | 43                | 43                |
| Medium firms (f)                       | 33                | 33                |
| Big firms (f)                          | 24                | 24                |

Table 4 shows the BIM knowledge instead of the experience of BIM for interior design firms. From the table, small firms are very advanced for knowledge with 9 respondents comparing medium and big firms. Small firms also lead for knowledge zero which is 18 respondents answering compare medium forms and big firms.

Table 4. BIM Knowledge

| BIM Knowledge | Small firms (f) | Medium firms (f) | Big firms (f) |
|---------------|-----------------|------------------|---------------|
| Yes           | 9               | 5                | 3             |
| No            | 18              | 16               | 12            |

Figure 3 shows the services for interior design in Malaysia and the most popular are software applications with 15 respondents agreed with BIM in the software application. The next is with 13 respondents are interior design documentation and selection of colour most agreed to have in BIM adoption.

Figure 3. Interior Design Services
5. Discussion and Conclusion
Implementation BIM for interior design industry still need to improve the adoption and awareness. BIM technology can help interior designers to find the solution on design and design process while several factors need consideration in BIM implement. Knowledge and financial are the main barriers to ensure BIM implement in the interior design industry. Beneficial of BIM should be considered to ensure interior design not to behind from others construction industry and must have to move ahead in term of technology and innovation in the construction industry. Ensuring BIM will be implemented in interior design industry, government and organisation related to the interior design body must have manage and organise to develop and enhance application BIM in the interior design industry.

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