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STRATEGIC PLANNING FOR SUSTAINABLE WETLAND TOURISM IN SETIU, TERENGGANU USING BUILDING INFORMATION MODELLING (BIM)

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Abstract

The sustainability of tourism industry is critically important especially during the pandemic since early 2020. With the diffusion of information and communication technology in the industry, Building Information Modelling (BIM) is widely adopted in tourism industry. However, thesystematic implementation of BIM in tourism industry experiences challenges. This study aims to develop strategic planning by implementing BIM in Setiu wetland, Terengganu, Malaysia within the tourism industry context. Initially, the strategies are drawn from a comprehensive review of the relevant literature. Through an interview with 8 effective expertise from the BIM modeller, town planner, architecture, engineer, contractor (AEC), project manager, programme manager and Setiu wetland person in charge (expertise). Seven critical strategies were identified which are, clearly defined plans and objectives for BIM implementation, financial support, capabilities and skills in using BIM, collaborative working to BIM execution, managing changes and risks in projects, organizational and delivery measures to ensure BIM implementation, government policy and incentives to promote BIM implementation. The further principal component analysis groups the strategies and finds latent factors of the strategies, including institutional governance, change accommodation, technical environment, cooperation, and resources. This finding reveals that systematic BIM implementation is inevitably associated with the tourism industry context and indicates that the enhancement of current BIM implementation in industry covers the strategies of the technical, institutional, and managerial aspects to accommodate changes. The results provide implications for adopting BIM in tourism industryand may help improve the efficiency of the industry. This study is still ongoing and findings are based on the current data collected. In future validation of data is needed to sustain the wetland tourism by using Building Information Modelling (BIM).

Keywords*: Strategic Planning, Building Information Modelling (BIM), Tourism Industry, Wetland, AEC experts.*

INTRODUCTION

Wetland ecosystems have unique functions and benefits, and they are one of the most diverse ecological perspectives and important living environments for humans. However, as a large population center, the city's ecological environment is unquestionably concerning (Wang et al., 2016a). Severe phenomena and situations, such as the rapidly growing population, the rapidly developing economic situation, and the expanding urban scope, have resulted in a slew of ecological security issues, including shrinking wetland areas and overexploitation of wetland resources. Urban development, among the human activities that cause habitat loss, contributes the most to the extinction rate of local species and frequently results in the extinction of most local species (Wang et al., 2016b). Cities' "kidneys" are urban wetlands, and protecting and constructing wetlands is an important part of urban ecological construction). The construction of an urban wetland park contributes to the healthy development of the urban wetland natural ecological environment as well as the creation of a pleasant urban living environment). The most significant distinction between urban wetlands and other natural wetlands is that they are found in or adjacent to cities and are heavily influenced by the urban environment, economic development, and social and cultural forms (Yan et al., 2018). People's perceptions of urban wetland park are somewhat skewed, which not only fails to fully appreciate the park's positive attributes but also contributes to its low level of landscape construction). The great change in urban landscape is the most visible external manifestation of the urbanization process and social and economic development. At the same time, it results in the loss of wetland landscape characteristics and a large-scale reduction of urban river wetland. In fact, many cities have lost a large portion of their wetlands. China is a large wetland country, with the fourth largest wetland area in the world, but wetland is one of the components of urbanization that disappears the fastest (He, 2022). As a result, protecting and studying urban wetland parks are critical (Qiao et al., 2016).

In recent years, BIM implementation has rapidly expanded worldwide. According to McGraw-Hill Construction (2012), BIM adoption has become compulsory in some projects in Denmark, Finland, Norway, Singapore, Sweden, the UK, and the US. In addition, the Australian government had a 3-year plan to adopt BIM in its public AEC projects and to encourage BIM use throughout the industry of the country (Building SMART Australasia 2012). The National Economic and Social Development Plans of China also specified BIM as a key initiative to promote the adoption of BIM in the tourism industry (Bernstein 2015).

BIM also has a couple of observed values in the industry. The recent survey of Dodge Data and Analytics (2015) showed that 25%, 48%, 37%, and 35% of participants from the US, the UK, France, and Germany reported a 25% greater return on investment in their projects that had adopted BIM. Moreover, one recent case study showed that the use of BIM in a construction project could clarify and address issues equal to 15.92% of the total expense of the project (Kim et al., 2017).

However, the adoption of BIM in tourism field requires strategic planning to accommodate the systematic implementation of BIM and realize its potential values. There is no study have been dedicated to this issue. Yet, few strategic planning has not been dedicated to the enhancement of BIM implementation in tourism practice projects focus on wetland.

Moreover, much of the existing BIM research indicates that the implementation of BIM in practice is a systematic and step-by-step effort. A few studies (Khosrowshahi and Arayici 2013; Porwal and Hewage 2013; Succar 2009) have pointed out that BIM implementation includes three stages, and the final stage is to achieve integrated collaboration. Also, Jin et al. (2017a) clarified the correlations of BIM benefits, value-realized factors, and barriers in BIM practice. The integration of BIM into IPD is necessary to improve project performance (Miettinen and Paavola 2014; Rowlinson 2017). However, systematic BIM implementation in AEC projects falters due to the complexity of the construction work (Mancini et al. 2017).

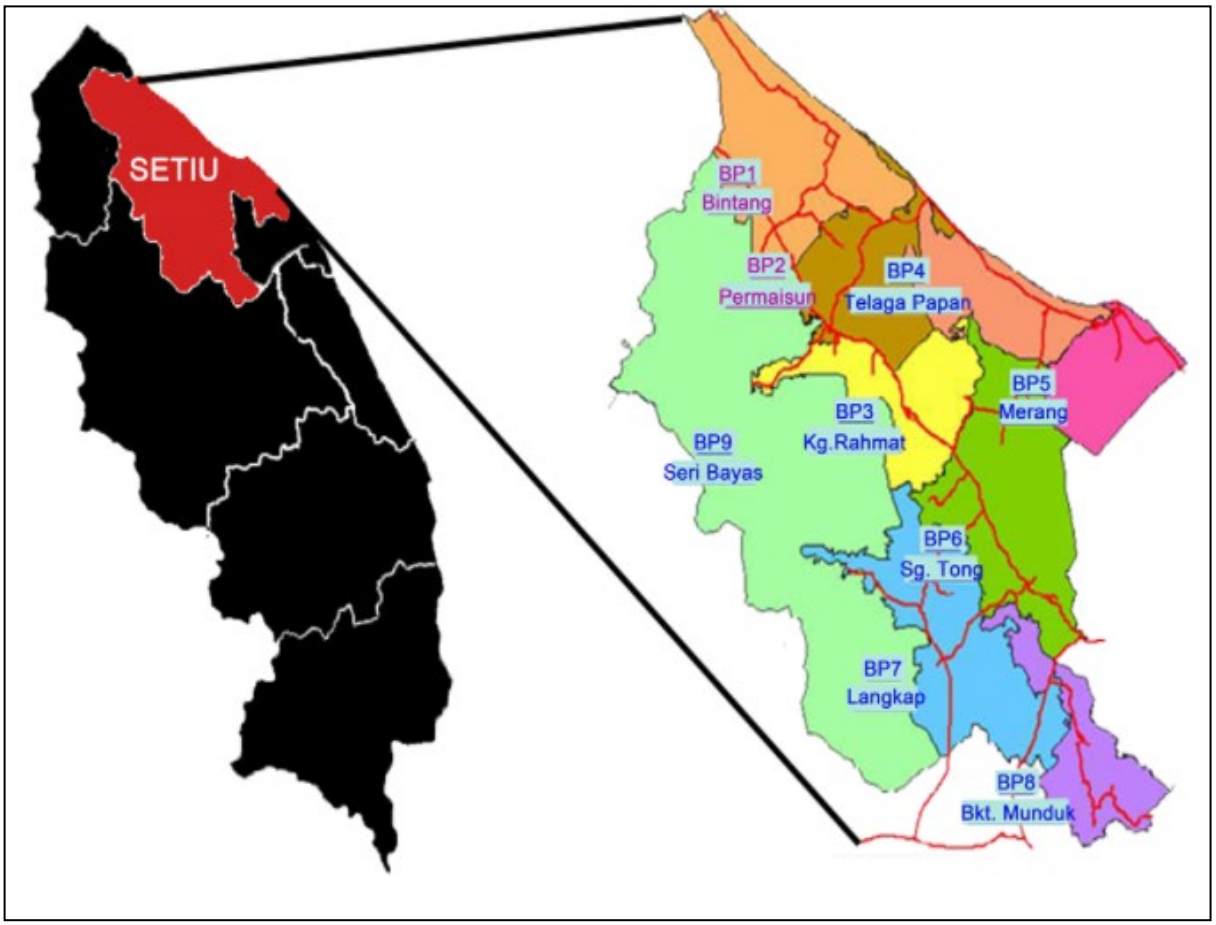
Although BIM practice involves industry deployment and organizational strategies, the cultural resistance embedded in the tourism projects has a substantial influence on the successful implementation of BIM (Eadie et al. 2015; Davies et al. 2017; Ma et al. 2018). Some studies such as Cao et al. (2016) and Liao and Teo (2018) have associated BIM with the project, but strategies to advance the use of BIM in projects remain to be explored. Thus, this study identifies the strategies and frames them in the tourism project context for enhancing BIM toward integrated collaboration, thereby promoting BIM in the industry. Because of the sophisticated features of BIM, the strategies are in details and cover different aspects of BIM implementation in tourism projects. This study contributes to the better strategies planning by adoption of BIM in Malaysian tourism in Setiu Wetland practices and escalating levels of BIM use in the tourism industry.

Study Area

Setiu, Terengganu Coastal Wetland area located about 55 kilometres from Kuala Terengganu, Setiu also offers many interesting places to visit (Figure 1). Setiu is situated along the coast with crystal clear water and white sandy beaches which it is sure to offer memorable memories for those who visit it. Setiu is rich in flora and fauna, cultural art and beautiful beach scenery. consits of: 1. Pantai Penarik, 2. Setiu Boardwalk, 3. Terrapuri Heritage Village.

Figure 1

Terengganu Beaches and Islands



Note. Source: http://scirp.org

This research shows that BIM has begun to invest in-depth research in the efforts of tourism industrial in combination with the integration of BIM and nature, determine the starting point and foothold, and summarize and apply them to the tourism field, so as the strategic planning to meet the ecological design methods. Function and other aspects meet the urban wetland landscape design and its sustainability also maintain tourism developability. This paper will also conduct in-depth research and analysis in combination with the above relevant theories through literature review and interviewing various level of expertise background to promote wetland tourism development using Building Information Modelling (BIM).

LITERATURE REVIEW

Some studies refer to critical factors to develop strategies for BIM adoption. Ozorhon and Karahan (2016) identified five focuses encompassing people, projects, the industry, regulations, and resources that are primary importance to implement BIM. Jin et al. (2017a) clarified the correlations of BIM benefits, value-realized factors, and barriers in BIM practice. The integration of BIM into IPD is necessary to improve project performance (Miettinen and Paavola 2014; Rowlinson 2017). However, systematic BIM implementation in AEC projects falters due to the complexity of the construction work (Mancini et al. 2017). Although BIM practice involves industry deployment and organizational strategies, the cultural resistance embedded in the tourism projects has a substantial influence on the successful implementation of BIM (Eadie et al. 2015; Davies et al. 2017; Ma et al. 2018). Others studies such as Cao et al. (2016) and Liao and Teo (2018) have associated BIM with the project, but strategies to advance the use of BIM in projects remain to be explored.

Furthermore, the international study by Dainty et al. (2017) emphasized the technical study of BIM and training of the BIM personnel as key factors in the adoption of BIM. This study aims to identify the strategies from the project planning execution by using BIM. The strategies drawn from the literature review are listed in Table 1.

METHODOLOGY

Factor studies are widely applied in many academic areas. For example, the research on critical success factors (CSFs) prevails in strategic management and project management.

Identification of the strategies through Literature Review

The comprehensive review of BIM implementation studies helps to identify the strategies. Firstly, the initial literature review referred to the factor studies, such as those of Eadie et al. (2015), Rogers et al. (2015), and Jin et al. (2017b), to provide an overview of BIM implementation. The following examination focused on qualitative research about BIM practice such as that of Ahn et al. (2015), Liu et al. (2017), and Dainty et al. (2017). Strategies were synthesized from these two types of studies. However, as strategies shall be practical and contribute to enhancing BIM implementation in projects, the strategies are based on qualitative studies that directly research BIM practice rather than empirical factor studies, and they have at least one source of qualitative BIM practice studies. Through the review, 7 strategies related to BIM implementation in projects were identified as presented in Table 1.

Table 1
The previous study of the strategies for BIM implementation

Code	Strategies	Sources
S1	Clearly defined plans and objective	*Dainty et al. (2017); Ding et al. (2015); Liu et al. (2017)*
S2	Financial support	*Dainty et al. (2017); Jin et al. (2017b)*
S3	Capabilities and skills	*Ding et al. (2015)*
S4	Collaborative working to execute	*Eadie et al. (2015), Liu et al. (2017)*
S5	Managing changes and risks in projects	*Jin et al. (2017a); Ding et al. (2015)*
S6	Organizational and delivery measures	*Liu et al. (2017)*
S7	Government policy and incentives	*Ding et al. (2015)*

Identification of the strategies through interview

Data Collection

The study utilized an explorative qualitative research approach (Binder et al. 2016), based on qualitative data collected from primary sources. Primary data was collected recently through in-depth interviews (focus group), In-depth interview starts with open ended questions to explore themes was done with 8 expertise from the BIM modeller, program and project manager, AEC, town planners and Setiu wetland expertise that related to tourism and BIM implementation.

The interviews have been recorded with recording device both for face-to-face interview, video call and the online interview (zoom). The transcription of the audio interview into text write up was done manually by the researcher and was analyzed using Nvivo software. The interview transcripts were categorized based on the simple themes and analyzed using a pattern coding technique.

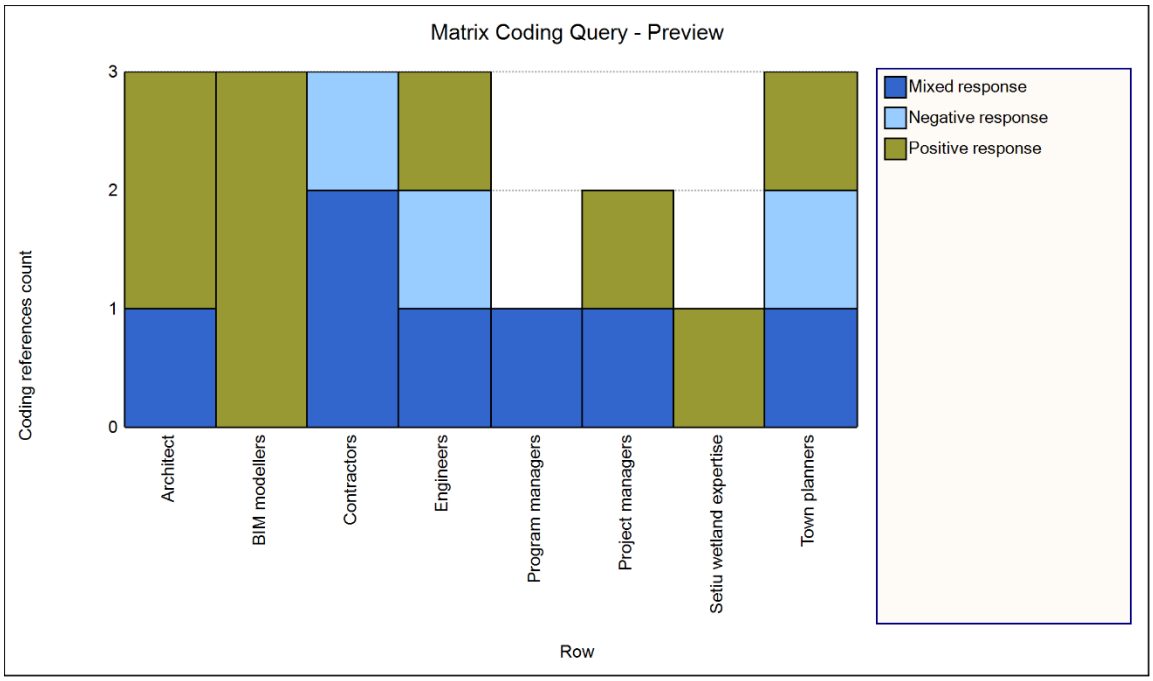
Data Analysis

During the research study, the thematic analysis was carried out using NVivo software. By inductive approach we identify and also learn from the views, opinions, knowledge, experiences and values of the research expertise because the literature for BIM adoption for sustainable wetland tourism is not emerging yet. Hence, we easily sorted out broad themes using NVivo software.

FINDINGS AND ANALYSIS

Figure 2

Perception of interviewed expertise towards the needs to adopt BIM for strategic planning in wetland



The research was analyzed by gathering and transcribing the interviews document and audio into NVivo software. The result of the analysis indicated different level of stakeholders' perceptions towards adoption of BIM for sustainability of wetland buildings for tourism attraction. The analyses indicate that the expertise adoption decisions would be based on their knowledge of BIM and their accessibility to functionality of BIM applications. Figure 2 shows the various perceptions of expertise and several managers towards adoption of BIM for complex wetland building projects. The positive response reaction indicate that theses expertise believed adoption of BIM is possible for the wetland building case study project, mixed response indicates expertise who are not quite sure if there are any BIM benefits for adoption on wetland building project case study while negative response expertise perceptions indicate they are not ready to adopt BIM yet.

From Figure 2, most of the architect has enough knowledge about BIM, and hence, have greater positive response or influence. While, engineers and town planners don't have enough knowledge about BIM, and hence, some have mixed response. The manager representative organizations are completely neutral and are not sure about BIM even though they fully know the benefits of BIM for such projects. The BIM modelers and Setiu wetland expertise are fully informed and are ready to accept BIM while some of the engineer, town planner and contractor seem to depend on the clients for their decision to implement BIM. Other expertise such as BIM managers, project managers and contractors' attitudes are unbiased to implement BIM for the adopted multi-purpose buildings in wetland.

DISCUSSION

This study examined the strategies planning awareness and adoption of better strategies planning for enhancing BIM implementation in wetland Malaysian tourism practices and escalating levels of BIM use in the tourism industry.

The results focus on the need to adopt BIM for strategic planning in wetland and latent factors of strategies adoption of BIM. Thus, the discussion covers the implications of the criticality analysis and planning of the strategies. The current study identifies Setiu wetland, Terengganu as a case study. Previous literatures mainly focus on the technical aspects of BIM (Chong et al.2017a) for the building construction itself.

In the present study, the interpretative research has been analyzed by gathering and transcribing the audio into Nvivo software. The results indicated different level of expertise perception towards adoption of BIM and its flexibility in the construction and planning at Setiu wetland. Referring Figure 2, shows the various perceptions of various level of BIM expertise in construction and development also Person in charge in Setiu wetland (expertise) towards future development and planning in tourism sector. The positive response reaction indicates that expertise agreed to adopt BIM in the wetland planning is possible for the case study projects as future strategic planning, mixed response indicates for those who are not quite sure for BIM adoption while negative response indicates they are not ready to adopt BIM. Although BIM benefits includes improved productivity, enhanced decision making, informative, competitive advantages and better risk management by minimized project error during construction. (Chen et al. 2011; Bryde at al. 2013). Other benefits include reduction of costs, redundant works, easily for monitoring and co-ordination. In addition, by implementing BIM in whole project life cycle in the Built Environment to solving problems or risk occur during the construction and development process (Arayici et al. 2009). However, negative response indicates they are not ready to adopt BIM because they were still lacking in set of skills and understanding to operate BIM for the project lifecycle. Then, mixed response indicates for those who are not quite sure for BIM adoption because no proper instruction and government policy to refer and follow. Others reason was less financial support to adopt BIM.

Table 2
The critical strategic planning of BIM implementation in wetland.

Code	Nodes
S1	Clearly defined plans and objectives on the given project time-line basis.
S2	Financial support to adopt BIM software for each level of construction team or consultants in order to maximize the values of project delivery.
S3	Capabilities and skills will be developed by provide the BIM training workshop for the construction team or consultants that will be organize by professional BIM trainer.
S4	Collaborative working before project execution by doing VA/VE evaluation in BIM adoption.
S5	Managing changes and risks in projects by using BIM integration solution.
S6	Organizational and delivery measures department should be setup for each consultant's department consists of AEC team and planning team.
S7	Formulate government policy to implement BIM at the very beginning stage and incentives should be given for wetland development project in order to increase values in tourism industry.

Table 2 shows the critical strategic planning of BIM implementation in wetland based on various perceptions of expertise and several managers towards adoption of BIM for complex wetland building projects. For exploratory interpretative research, the analysis is semi-structured, therefore the interview starts with open ended questions to allow the responses further.

In order to enhance BIM implementation there is 7 (S1-S7) critical strategic planning of BIM implementation in wetland were identified. Hence, we summarized the summary of the main points through the nodes by coding similarity as shown in Table 2 critical strategic as majority of interviews identified S2, S3, S7 as the saturation intersection results. After reviewing the need to adopt BIM for strategic planning in wetland projects suggested by the participants, solutions were offered for existing or new development of multi-purpose building in wetland.

Hence, by referring code S2, financial support would be from the government assistance in terms of financial resources to adopt BIM in the whole project life cycle for each level of construction team or consultants in order to maximize the values of project delivery. While referring the code S3, Capabilities and skills will be developed by provide the BIM training workshop for the construction team or consultants that will be organize by professional BIM trainer from the legal company such as Autodesk to develop set of skills by using BIM tools. Lastly, by referring code S7, formulate government policy to implement BIM at the early stage of projects will educate awareness among stakeholders. Thus, incentives should be given for wetland development project in order to attract interest among public and private industry players, at once increase values in tourism industry.

CONCLUSION AND RECOMMENDATIONS

This research will help bridge the gap between existing research and lead to an integrated planning platform in the future. Although BIM has wide application in the industry and attracts a lot of attention in academic field, a systematic implementation in tourism projects in Setiu, Terengganu, Malaysia will face various challenges. The current COVID-19 outbreak and the high riskof future pandemics have given rise to new challenges for sustainable tourism development (Streimikiene et al., 2021) This research summarizes the potential use of BIM planning strategies according to experts' perceptions and the previous study for BIM implementation through literature review. In conclusion, the identified experts' perceptions and literature review of the needs to use BIM in wetland area for the benefit of the tourism industry can be used as a guide to investigate the research gaps involving the complexity for planning phase and design aspects, particularly for the building placement, layout, and materials, environment and surrounding, management and communication, coordination of projects as well as refurbishment in line with passage of time.

This study also has some limitations. In this study, there is no specifically references about BIM implementation in wetland area in Malaysia. The knowledge and information derived from this study could provide future research insights and bring about collaborative efforts with policymaker, experts (AEC), stakeholders and communities involved during the project design phase, project execution and future project development, especially with respect to an awareness and sensitivity to the environment sustainability. Thus, there is a need an appropriate guideline for design and planning strategies by using BIM to encourage tourists, designers and industry players to participate in research on wetland area in Setiu, Terengganu to create the flexibility projects planning in the future.

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