Building Information Modelling (Bim) within the Australian construction related small and medium sized enterprises: awareness, practices and drivers

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BUILDING INFORMATION MODELLING (BIM) WITHIN THE AUSTRALIAN CONSTRUCTION RELATED SMALL AND MEDIUM SIZED ENTERPRISES: AWARENESS, PRACTICES AND DRIVERS

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Review of literature on BIM reveals a bias towards focusing on large companies and overlooking SMEs in Australia. To bridge this gap of knowledge, this study explores the level of awareness, practices and drivers of BIM among SMEs within the Australian construction industry through the lenses of theories of innovation diffusion in construction companies. In so doing, a questionnaire survey was administered and 41 responses received from these SMEs engaged in commercial, industrial and public works. Accordingly, seven face-to-face interviews were conducted to compensate for the small sample size and to expand the survey data in more depth. The findings brought to light that current knowledge of BIM in SMEs is one-sided and negatively biased with a tendency towards highlighting challenges and overlooking the advantages. Besides, a significant association was spotted between the awareness of values of BIM and the practices related with BIM in SMEs. Additionally, the most influential drivers for BIM were turned out to be all associated with economic gains for the business of the companies alongside clients’ demands. Furthermore, it was revealed that practices associated with BIM and awareness of BIM are similar across different sizes of SMEs.

Keywords: building information modelling, SMEs, drivers, innovation, Australia.

INTRODUCTION

BIM implementation is around 20% lower in Australia compared to North America (Stanley and Thurnell, 2014). On the other hand, the construction industry in Australia is dominated by SMEs which make up about 98% of all construction businesses and have the largest portion of total income (ABS, 2013). It is estimated that around 94% of firms in the Australian construction industry have fewer than 4 employees and only 0.5% of companies around Australia have employed more than 13 people (Mills et al., 2012). This brings to light the profound positive impacts envisaged for promoting BIM within SMEs in the construction industry given the large amount of SMEs that are engaged within the construction supply chain as pointed out by Poirier et al. (2015). BIM is hitherto regarded as a technological innovation for construction

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organisations (Poirier et al., 2015). In this respect, evidence demonstrates that SMEs treat innovations in glaringly different ways in comparison to large-sized companies (Sexton and Barrett, 2003). As acknowledged by McGraw-Hill (2014) “...those not engaged with BIM tend to be smaller companies.” As asserted by Sexton and Barrett (2003) “this difference must be understood, and underpin policy and corporate guidance.” Yet, understanding any innovation within a certain context such as SMEs in Australia requires deployment of innovation diffusion models as urged by Poirier et al. (2015). That is, grounding any context-oriented study in innovation diffusion models enables researchers of recognising the complexity of the context at hand and incorporating the mediating forces of the geographic and market context on diffusion of the innovation (Poirier et al., 2015). Against this backdrop, review of literature reveals an absence of studies on BIM in SMEs within the Australian construction industry. In response to such a gap in the body of knowledge, this study is intended to provide a picture of the status quo of BIM implementation among SMEs in Australia drawing upon the principles of innovation diffusion in construction companies. This contributes to the field as according to Taylor and Levitt (2007) presenting a picture of different aspects of the current state of an innovation is a precursor to identify the most effective measures to supress the barriers and enhance the uptake of the innovation. Additionally, the study intends to unearth the main drivers for Australian SMEs regarding implementing BIM on their projects. This is deemed necessary inasmuch for promoting BIM in any context the main purposes, the drivers of organisations and the level of their awareness of the requirements and challenges of BIM should be investigated (Gu and London, 2010).

BACKGROUND

Implementing BIM in construction projects would foster effective exchange of information among project members through establishing efficient logistics and procurement systems as pointed out by Demian and Walters (2014). In spite of such proven advantages, studies such as Newton and Chileshe (2012) demonstrate a grim picture when it comes to the implementation of BIM within the Australian construction industry particularly in SMEs. That is, according to Newton and Chileshe (2012) “…none of the firms with an annual turnover of less than $10 Million were currently using BIM...”. The mantra of increasing the uptake of BIM within Australia has been an item of the agenda for both the federal and state governments, as well as professional associations as pronounced by AIRAH (2013). Nevertheless, it seems such attempts are merely focused on large-sized projects due to the common belief that larger firms possess the level of expertise and resources to adopt BIM as pointed out by McGraw-Hill (2014). Yet, projects delivered by SMEs might take advantage of BIM even more than large-sized projects as maintained by Arayici et al. (2011). That is, due to their shorter duration, small projects present more opportunities to introduce the use of BIM and the smaller size of organisations is advantageous in driving higher levels of implementation as enunciated by Engineers Australia (2014). Additionally, 3D visuals enhance the quality of multi-party communications and improve the outcomes of projects as asserted by McGraw-Hill (2014), which equally apply to small-sized projects delivered by SMEs. SMEs in the construction industry are relatively lower in terms of innovativeness and face particular barriers to harness the benefits of innovations including lack of resources and knowledge alongside unavailability of skilled personnel (Sexton and Barrett, 2003). On the other hand, increasing implementation of BIM in an organisation is contingent upon the positive perception of potential adopters of the ability of BIM in fulfilling their organisations’
particular requirements and attending to their drivers (Gu and London, 2010). In essence, an evaluation of benefits against challenges and required resources is the basis for making decision whether to adopt an innovation such as BIM or otherwise as described by Hosseini et al. (2015).

In this respect, the study by Aranda-Mena et al. (2009) in Australia and Hong Kong revealed that perceptions and drivers for implementing BIM were not identical for small and large-size companies. The study pointed out the discrepancy between the drivers, yet the nature of drivers for SMEs remained unnoticed. In the study by Olatunji (2011) it was revealed that different organisational models of SMEs require different training and hardware requirements to implement BIM and the cost of BIM implementation for SMEs was estimated to be higher compared against large companies. The former study paid scant attention to revealing the driving forces behind SMEs for adopting BIM and the effective practices specific for SMEs for embracing the benefits of BIM. The findings of the study by McGraw-Hill (2014) on BIM in Australia and New Zealand showed that contractors are lagging behind designers and architects in embracing the benefits of BIM while the most important drivers for BIM were almost entirely associated with abilities of BIM in reducing the number of errors and clashes and preventing reworks on projects. It also came to light that the level of BIM engagement for SMEs in Australia is noticeably lower compared against larger companies (McGraw-Hill, 2014) without providing reasons to justify such observations. In the same vein, Swapan and Craig (2014) argued that benefits of BIM for Australian companies are challenged by a number of barriers such as hardware and software requirements and the necessity of training alongside lack of necessary personnel particularly for SMEs and companies with fewer than 20 employees. As such the study was concerned with the barriers rather than the drivers for SMEs.

Within the south Australian construction industry, Newton and Chileshe (2012) argued that the main drivers for using BIM on construction projects include improving constructability, improving visualisation, detecting clashes and enhancing productivity on projects. The influence of the size of companies and lack of awareness as barriers to implementation of BIM on South Australian construction projects were also emphasised by Newton and Chileshe (2012). However, the study remained silent regarding the specific drivers for adopting BIM and the status quo of BIM in SMEs. In essence, review of literature as discussed above shows that previous studies on BIM in Australia have mostly used case studies of high-profile projects with a bias towards discovering the barriers to implementation of BIM in large-sized projects. Consequently, scant attention has been paid to the impacts of the firm size and uncovering the drivers explicitly relevant to SMEs. Thus, there is a conspicuous absence of studies on BIM in SMEs within the Australian context. Addressing such a gap in the body of knowledge has been the driving force behind conducting the present study as described next.

**RESEARCH METHODS**

The study drew upon a *mixed-methods sequential explanatory design* as termed by Ivankova *et al.* (2006) entailing two distinct phases i.e. a quantitative phase followed by a qualitative phase. This method has become popular for conducting analysis in a wide range of research fields. This is due to its ability to provide a broad understanding of the research problem (in quantitative phase) followed by refining and expanding the quantitative findings in more depth in the qualitative phase as
asserted by Ivankova et al. (2006). The sequence of quantitative → qualitative was considered because it was best applicable to context-based and contextual explanation of quantitative findings (Ivankova et al., 2006). That is, such capabilities were in line with the objectives of the present study to conduct an inquiry in a particular context. The priority was with the quantitative phase and the results of qualitative were integrated into the findings of the quantitative phase as the preferred method suggested by Ivankova et al. (2006) for reporting the findings.

**Quantitative phase**

The sample of companies for the quantitative part was considered as a combination of the authors’ own private contacts in the industry alongside Yellow Pages listing of the South Australia’s telephone directory. This was regarded as a tenable approach for sampling as the same method was used for sampling SMEs by Mills et al. (2012) in Australia. A total of 326 invitations to complete the online survey were sent to SMEs in South Australia, which resulted in receiving 41 duly-completed responses, thus giving a response rate of 13%. Due to the lack of knowledge of the nature of the data and the relatively small sample size of the study, nonparametric tests were deemed more suitable as recommended by the seminal study by Siegel (1956).

**Qualitative phase**

Subsequent to the survey, a qualitative study was considered in order to provide researchers with better opportunities to answer research questions, assist researchers to assess the “goodness” of their findings. As explained in the previous section, the qualitative phase refines and explains the quantitative results through exploring participants’ insights in more depth (Ivankova et al., 2006). Furthermore, the sample size for the survey was considered relatively small, thus as stated by Venkatesh et al. (2013) the subsequent qualitative analysis served in the capacity of compensating the small sample size of the survey questionnaire. Interviewees A, B, C and D were working in SMEs with at least 6 years of experience. Interviewee E was the BIM manager of a large-sized company in which a wide range of SMEs as subcontractors were using BIM. Interviewee F was involved in training and education of BIM while interviewee G was the manager of the government body directly working with South Austrian companies in promoting BIM. It was contended that such diversity in views and experiences would provide a comprehensive insight into the major aspects of implementing BIM in SMEs in South Australia.

**RESULTS AND DISCUSSIONS**

**Profile of respondents**

As illustrated in Table 1, the numbers of employees in the respondents companies were drawn from different sizes of firms whilst still falling within the category of SMEs (Number of employees < 200). As defined by the Australian Bureau of Statistics, (ABS, 2013), the size of construction businesses based on the number of employees could be classified as ‘small’ or ‘medium’ with up to 199 employees and ‘large’ employing more than 200 employees. Therefore, according to Table 1 perceptions of different sizes of SMEs were incorporated within the present study. The majority of the respondents were SMEs with more than 21 years of experience. As a result, the findings were deemed reflective of the perception of SMEs with adequate knowledge and experience within the construction industry.
Table 1. Tenure of the companies and the number of employees

<table>
<thead>
<tr>
<th>Number of employees</th>
<th>Number of years in the construction industry</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-10 years</td>
<td>11-20 years</td>
</tr>
<tr>
<td>24 or fewer employees</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>25-114 employees</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>115-200 employees</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

Practices and awareness

Examination of Table 2 shows around 65.9% of the responses for the highly ranked practice fell into the ‘agree’ and ‘strongly agree’ category. On the contrary, around 75.6% of the respondents were in agreement and aware of the challenges of BIM implementation. The implication of this finding demonstrates that despite the higher levels of awareness (usage, benefits and challenges), the uptake on the practices (usage and interest) remained rather limited. Besides, awareness of challenges is well above the level of awareness of the benefits and know-how to implement BIM. This observation sheds light on one of the major barriers to higher usage of BIM among the SMEs in Australia being a one-sided and negative perception of BIM implementation.

To the best of the authors’ knowledge no previous study on BIM has referred to such negative perception of BIM among SMEs. This finding was further confirmed by the interviewees who acknowledged that the main barriers could all be purported to be stemmed from perceptions and inadequacy of knowledge about the benefits and challenges of BIM implementation.

Table 2. Awareness and practices of BIM in SMEs in South Australia (percentages)

<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
<th>Frequency of responses (%)</th>
<th>MS*</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practices</td>
<td>Currently use BIM on our projects</td>
<td>14.6 22.0 14.6 26.8 22.0 100</td>
<td>3.20</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Interested in and supportive of using BIM</td>
<td>0.0 7.3 26.8 36.6 29.3 100</td>
<td>3.88</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>BIM can be used in projects of all sizes</td>
<td>0.0 12.2 39.0 29.3 19.5 100</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Awareness</td>
<td>Aware of the benefits of BIM</td>
<td>0.0 17.1 22.0 26.8 34.1 100</td>
<td>3.78</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Aware of how to use BIM</td>
<td>0.0 14.6 19.5 29.3 36.6 100</td>
<td>3.88</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Aware of the challenges of BIM implementation</td>
<td>0.0 14.6 9.8 39.0 36.6 100</td>
<td>3.98</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes:*Frequency of responses and mean score (MS) based on valid N = 40 (list wise); MS = mean score where SA = strongly agree; A = Agree; N = Neutral; D = Disagree; and SD = strongly disagree; R = Ranking of individual awareness and practices sub items

Dominance of such one-sided knowledge of BIM in Australian SMEs becomes fathomable in light of the nature of common knowledge management practices in SMEs. As asserted by Scozzi et al. (2005) SMEs might be interested in a particular innovation, yet they usually ignore reliable available knowledge in the literature about the innovation. In the same vein, the interviewees were in agreement that SMEs have a tendency to accept positive aspects merely through first-hand experiences with BIM or through their peers and have not been successful in acquiring a comprehensive awareness of all major aspects of BIM.

Examination of Table 2 also shows that the least ranked practice was “Currently use BIM on our projects” (mean score = 3.20), with less than half (45%) of the respondents (SMEs) indicating using BIM to some capacity on their projects. This
finding further corroborates the assumption suggesting that the level of implementation in SMEs (48%) is lower compared to general implementation rate (64%) in Australia as estimated by McGraw-Hill (2014). The percentage is much higher than the estimation by Newton and Chileshe (2012) in South Australia in 2012 which is justified due to the time factor. Nevertheless, it is indicative of the large number of companies, which have opted to adopt BIM in two recent years in Australia confirming a growing trend towards BIM utilisation on construction projects as observed by Newton and Chileshe (2012). This was acknowledge by all the interviewees that a large number of construction companies are joining the adopters of BIM although they have glaringly different reasons and drivers for adopting BIM. Companies were divided about the suitability of BIM for projects of all sizes with 48% in favour of the idea, 40% with no idea and 12% were against it. This reaffirmed the discussions above implying that SMEs in Australia are not adequately aware of the values of BIM for small projects. Such an insight was explicitly emphasised by interviewees E and G stating that literally SMEs have a limited knowledge of potential benefits of BIM on projects as observed in South Australia by Newton and Chileshe (2012). Another reason for such low level of awareness of the potentials of BIM was ascribed by the interviewees to the simplicity of the projects delivered by SMEs which could be executed with traditional methods without requiring any awareness of innovative methods. In addition, interviewees were of the view that envisaged values of BIM for SMEs only occur through using BIM continuously because investing in BIM for a one-off project is not justified for SMEs. As a result, accelerating the use of BIM in Australian SMEs depends on higher levels of implementation on large projects, incentives by the government to justify the costs, providing knowledge and training by professional bodies and the most important of all, pressure from the clients as asserted by the interviewees. As postulated by the interviewees attempts for promoting BIM in South Australian SMEs should concentrate on clients as the main decision maker and “...the guy who draws the check...”. Nonetheless, 67% of companies expressed their interest in BIM and indicated that they are supportive of BIM implementation on their companies in future. Such avid interest in BIM among Australian companies was reported previously by AIRAH (2013). As observed by Newton and Chileshe (2012) that large number of SMEs will progressively join the adopters of BIM in Australia due to their increased awareness of the technology and the necessity of maintaining their competitiveness in the market. In view of such a strong role ascribed to the awareness of BIM advantages in affecting BIM practices, a Chi-Square test of independence was conducted among the indicators of awareness and the indicators of practices as illustrated in Table 3.

Table 3. Test of dependency of practices of BIM on awareness in SMEs

<table>
<thead>
<tr>
<th>Practices</th>
<th>Awareness of the benefits of BIM</th>
<th>Awareness of how to use BIM</th>
<th>Aware of the challenges of BIM implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently use BIM on our projects</td>
<td>34.41 (0.001, 12)*</td>
<td>38.66 (0.00, 12)*</td>
<td>37.32 (0.00, 12)*</td>
</tr>
<tr>
<td>Interested in and supportive of using BIM</td>
<td>39.35 (0.00, 9)*</td>
<td>18.33 (0.031, 9)*</td>
<td>18.54 (0.03, 9)*</td>
</tr>
<tr>
<td>BIM can be used in projects of all sizes</td>
<td>28.26 (0.001, 9)*</td>
<td>10.06 (0.345, 9)*</td>
<td>8.74 (0.461, 9)*</td>
</tr>
</tbody>
</table>

*Note: values in cells show (Pearson Chi-Square value (Significance level, df)); Highlighted values shows significant dependency

As inferred from Table 3, only “awareness of the benefits of BIM” shows a significant dependency with all the practices associated with BIM (p < 0.05). This resonated
with the statements of the interviewees frequently referring to the necessity of educating clients and companies regarding the values of BIM on projects.

**Main drivers for SMEs**

Nine items extracted from the literature were ranked based on the mean score with the Coefficient of Variation (CV) used for rank differentiation where items had the same mean score. Table 4 summarises the results of analysis of drivers for implementation of BIM based on the overall sample of respondents.

**Table 4. Drivers for implementation of BIM by South Australia SMEs**

<table>
<thead>
<tr>
<th>No.</th>
<th>Drivers</th>
<th>N</th>
<th>Mean*</th>
<th>Std. Deviation</th>
<th>CV</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Facilitating cost-savings during design</td>
<td>41</td>
<td>3.73</td>
<td>.742</td>
<td>0.199</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Increasing the ability to response to requests for information</td>
<td>41</td>
<td>3.66</td>
<td>.762</td>
<td>0.208</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Earlier problems identification (e.g. clash detection)</td>
<td>41</td>
<td>3.93</td>
<td>.818</td>
<td>0.208</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Improving cost estimation and control abilities</td>
<td>41</td>
<td>3.41</td>
<td>.741</td>
<td>0.217</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Increasing clients’ satisfaction</td>
<td>41</td>
<td>3.66</td>
<td>.825</td>
<td>0.225</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Enhancing quality of the finished product</td>
<td>41</td>
<td>3.56</td>
<td>.808</td>
<td>0.227</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Enhancing collaboration on projects</td>
<td>41</td>
<td>3.76</td>
<td>.860</td>
<td>0.229</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Increasing the quality of construction details</td>
<td>41</td>
<td>3.61</td>
<td>.862</td>
<td>0.239</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>Improving the ability to meet sustainability needs</td>
<td>41</td>
<td>3.10</td>
<td>.800</td>
<td>0.258</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Average score</td>
<td></td>
<td>3.73</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** Mean score where 5 = strongly agree; 4 = agree; 3 = neutral; 2 = disagree; and 1 = strongly disagree. The higher the mean, the more important the driver. The CV is reflective of the variability in responses of respondents; hence smaller CVs show higher levels of agreement on the item as indicated by the respondents (Sheskin, 2007). Examination of Table 4 shows that, the mean scores of the nine drivers for implementation of BIM ranged from 3.10 (improving the ability to meet sustainability needs) to 3.93 (earlier problems identification, such as clash detection) with an average score of 3.73. As inferred from Table 4, the nature of the most effective drivers (i.e. drivers ranked 1-4 are all linked with the cost-saving advantages and the values added through use of BIM to the business aspects of companies for Australian SMEs. The findings are consistent with an earlier Australian study by Newton and Chileshe (2012) which established that, among the construction companies in South Australia, the major drivers of BIM were all inspired by envisaged economic values of BIM for their businesses. The findings as reported in Table 4 are also in line with previous studies e.g. (McGraw-Hill, 2014). For example, McGraw-Hill (2014) study implied that reducing costs, reducing the number of clashes on site and clients’ demands are literally the main motivators of non-users to adopt BIM. Similarly, interviewees were in agreement that non-user SMEs become adopters only if they see BIM as an adding-value method for their businesses. Meeting the requirements of clients was ranked as the fifth for SMEs. This insight reaffirms the arguments by Na Lim (2014) denoting that the most influential driving forces for pushing construction companies towards using innovations have roots in the demands of clients. As far as sustainability needs are concerned, SMEs regarded them as the least important driver of BIM implementation. This could be justified in view of the usual lack of awareness of SMEs regarding their environmental impacts (Revell and Blackburn, 2007). Thus,
for Australian SMEs the environmental values of BIM could not be influential to encourage non-users for implementing BIM.

The effect of size (evaluated based on number of employees)

To test the dependency of findings on the size of companies a Kruskal-Wallis \( H \) test as the nonparametric equivalent for the one-way ANOVA as recommended by Cronk (2014) was conducted. The results are reported in Table 5.

Table 5. Results of Kruskal-Wallis \( H \) test

<table>
<thead>
<tr>
<th>Awareness and practices (see Table 2)</th>
<th>Drivers (see Table 4)</th>
<th>Significance level*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A clear understanding of BIM</td>
<td>Facilitating cost-savings during design</td>
<td>.419</td>
</tr>
<tr>
<td>A clear understanding of how to use BIM</td>
<td>Increasing the ability to response to requests for information</td>
<td>.402</td>
</tr>
<tr>
<td>A clear understanding of challenges of BIM</td>
<td>Earlier problems identification (e.g. clash detection)</td>
<td>.179</td>
</tr>
<tr>
<td>BIM fits all sizes of companies</td>
<td>Improving cost estimation and control abilities</td>
<td>.709</td>
</tr>
<tr>
<td>BIM is currently used in our company</td>
<td>Increasing clients’ satisfaction</td>
<td>.678</td>
</tr>
<tr>
<td>We support using BIM in future</td>
<td>Enhancing quality of the finished product</td>
<td>.476</td>
</tr>
<tr>
<td></td>
<td>Enhancing collaboration on projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increasing the quality of construction details</td>
<td></td>
</tr>
</tbody>
</table>

Notes: * Significance set at \( p < 0.05 \)

As illustrated in Table 5, no significant difference (\( p > 0.05 \)) was found among different sizes of South Australian SMEs in terms of their level of awareness, BIM practices and the drivers for BIM adoption on their projects. This finding was also consistent among the interviewees observations as none of them referred to size of the SMEs as a crucial item in defining the policy of company towards BIM implementation.

CONCLUSIONS

The findings of the study revealed that awareness levels of BIM amongst SMEs were much lower, and there is a biased negative perception regarding the requirements and the challenges of BIM implementation among SMEs. Therefore, in addition to providing some valuable insights on the current state of BIM amongst SMEs in Australia, this study goes beyond the available knowledge on SMEs by uncovering a bias amongst SMEs’ awareness on BIM. Regarding the practices associated with BIM, the study revealed a significant association between awareness of the benefits of BIM and all aspects of practices mentioned in the survey. This was regarded as an evidence for the crucial role of raising the awareness of construction practitioners, clients and owners regarding the values of BIM for their projects. In the same vein, the findings on drivers highlighted the importance of business-oriented values of BIM for SMEs and the strong influence of clients’ demands in leading SMEs towards BIM. These findings underscores the need for providing quantitative evidence of the cost savings and the benefits of BIM for businesses of companies in comparison to traditional methods as a fertile area for future research on BIM in SMEs. Finally, future studies should investigate available methods and approaches for customising an affordable BIM for simple and small-scale projects. The limitations associated with
having only South Australian SMEs as the basis of data warrant further research with
in other states of Australia as well as other countries in order to broad-base the
findings of this study.

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