ARCHITECTURAL TECHNOLOGY AND THE BIM ACRONYM:

Critical Perspectives of Evangelical and Evolutionary Paradigms for Technical Design

T. KOUIDER, G. J. PATERSON
Scott Sutherland School of Architecture and Built Environment, RGU
Email address: t.kouider@rgu.ac.uk
Urbahnstudio Ltd
Email address: urbahnstudio@googlemail.com

Abstract. The United Kingdom Government's intent to embed collaborative Level 2 BIM into publicly procured building projects from 2016 (BIM Task Group, 2012) trails the General Services Administration's (GSA, 2012) earlier and similar initiative to require the adoption of BIM protocols in the USA from the 2007 fiscal year. The built environment scene is currently awash with a panoply of initiatives sharing a mission to disseminate the BIM message via around 350 organisations which represent built environment professional interests in the UK. These developments raise challenging and complex agendas for an industry which historically (Latham, Egan et al) has been perceived as being fragmented and lacking in the research and development resource base necessary to introduce and effectively disseminate new knowledge, understanding and practice. Race (2012) has noted that engagement with the BIM agenda should be tempered by the critical perspective which Shon (2009) argued is a key component of the reflective practitioner's skill set.
Technical design has been perceived as a core skill for the architectural technologist. Making reference to a range of theoretical models, this paper will critically assess the technologist's contemporary engagement with BIM related paradigms. The paper will also review BIM in historical and broader contexts of object oriented technical design, both within the built environment and across other design and manufacturing industries. In considering how the architectural technologist may move forward as key built environment player, reference will also be made to relationships with co-professionals and BIM futures including digital design/fabrication.

Keywords: BIM, evangelical, evolutionary, context, technical design, architectural technologist

1. Introduction

The UK construction supply chain consists of around 300,000 companies, (LEK, 2009) 90% of which have ten or less employees. (King et al. 2011) The industry is largely dominated by smaller SME's (Small and Medium Enterprises). In addition, no less than 350 organisations represent the industry and its interests (professional, statuary and regulatory bodies, associations and similar groups). These statistics suggest a majority representation of small and very small firms within the sector and the clear potential of opposing interests given that the construction industry is not a professionally homogeneous unit . The interests of a surveyor are not always the same as an architect or architectural technologist.

This paper is a snapshot of a process of investigation, information gathering, critique and evaluation of an ongoing research being undertaken by the authors. The focus of this research is a critical perspective of Building Information Modelling (BIM) and its impact on technical design, particularly in the context of the UK government proposed legislation mandating the use of building information modelling from 2016. Given the constantly evolving debate on BIM and its application, the information flow for this study involves an ongoing dialogue with academic developments and innovation on the one hand and professional practice and its responses to practical and implementation issues. The paper is intended to be critical and shed the spotlight on evangelical and evolutionary paradigms that the authors feel are not being subjected to rigorous scrutiny in the current debate.

Within the UK construction sector, BIM propaganda (the evangelical model) with all its facets and mantras (collaboration, communication, project efficiency, carbon reduction, whole life asset management etc) has focused on implementation in large design and construction companies, for example HOK and Skanska. These organisations operate at a much larger business scale than the SMEs representing the majority interests in the sector (certainly by numbers, if not financial clout). For large organisations, engaging with BIM may offer competitive advantages which can be easily afforded, not only to maintain leadership in the market but also to harvest business benefits BIM may bring to the table. In that context, where does the debate leave the SME's in the sector? Where is the polemic on BIM; the argument and counter-argument necessary to feed informed decision making, particularly for small companies (the so called micro-SMEs)?.

It seems that until recently, this 90% majority stakeholder interest has been left on the margins of the debate With the cut-off date for the UK Government's mandate now just over a couple of years away, will there be a gradual awakening, realisation and actions in respect of how BIM may impact on UK construction in the round (the evolutionary model) From the sub-groups set up to deliver on the Government's BIM agenda, BIM4SME, has developed as a cross discipline grouping of interests championing BIM and promoting, in particular, the interests of construction sector SMEs.

BIM4SMEs is a working group made up of individuals from SME organisations that have a passion for BIM and desire to help SMEs in their understanding and engagement of the BIM process. Its primary and only focus is to support the SME community in its understanding and use of BIM, whether they be consultants, contractors, specialists, suppliers or manufacturers. (BIM4SME, 2013)

As BIM paradigms continue to emerge, develop and evolve across construction disciplines, the idea of BIM requiring new business models has become more established and is challenging traditional methods of delivering building projects. Typically, in a traditional model, the overall process consists of two interlocking sub-processes or activity nodes, design/construction activities and policy and codes. Technology is normally embedded within the activities of each node with limited cross over. In a BIM business model, Razvi (2008) noted that a third technology node which interlocks with the other two has become critical to process development (Fig. 1)

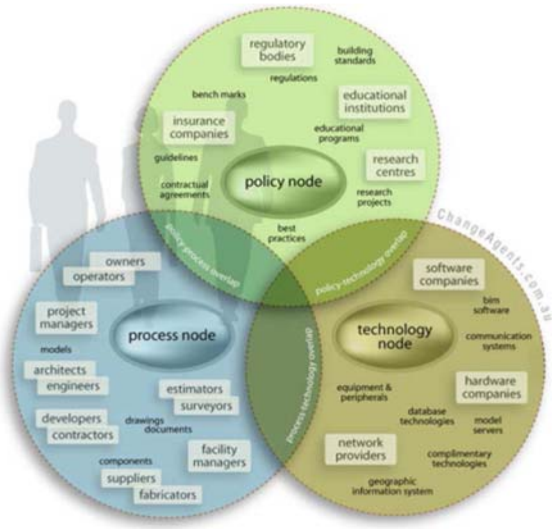

Figure 1. The 3 Interlocking nodes of BIM

The IT infrastructure and expertise required to support a BIM model are sufficiently complex that they need to be run and managed often by external network agencies. A number of these companies are already active in the market including Asite, BIW Technologies and similar providers of web and cloud based construction collaboration technologies. Such a business model could be considered imperative for an organisation in the construction sector to capitalise on the benefits of implementing BIM, (efficient workflow, collaborative working, building partnerships, good communication etc) and add value to their business.

2. Context and Government Objectives

2.1. DRIVERS

It is important to remember the drivers and critically the objectives sought behind the legislation mandating BIM by 2016 on all government projects above £5 m. (Cabinet Office, 2011) The principal objectives include:

- Achieve 20% savings on the overall cost of projects
- Build up a reliable and effective data sets for the efficient management of assets using COBie (Construction Operations Building Information Exchange)
- Carbon reduction to meet international and local targets
- Improving competitiveness of the construction industry

One can only speculate that the impact of the policy will reverberate beyond the state to the private and charity sectors, possibly an intended consequence.

2.2 CAPACITY OF BUILT ENVIRONMENT PROFESSIONS TO COPE

A latent and lingering question central to the BIM debate is quite simply can the industry cope? In migrating to BIM, it seems reasonable to suggest that UK construction will travel through a transition phase in relation to current work practices and may challenge the capacity of education and training to support change in the workplace . A number of key issues need to be seriously considered, particularly for SMEs. Firstly, the timescale i.e. 2016 is very short given the practical and cultural issues involved. Secondly the fast moving pace of Information and Communication Technologies (ICT), in particular the constantly evolving BIM systems software and the inevitability of change will impact on any organisation trying to introduce and implement a new business model. And thirdly the human, financial and expertise resources needed to effect change may put a considerable strain on the industry; in particular, micro-SMEs, defined in EU terms as having less than 10 employees. (EC, 2013) In addition, with the ongoing economic recession predicted to continue beyond the 2016 UK Government BIM deadline will continue to impact heavily on the capacity of the built environment professions to cope with significant change.

2.3 IMPACT OF THE BIM MATURITY INDEX

The BIM Maturity Index (Fig. 2) assumed that all built environment professionals should be aiming to be operating at the top end of Level 2 by 2016. What is the level of progress towards this goal? It has been noted that some, but not all reference standards are in place (Snook, 2012) although a key document (PAS1192-2) was published in the spring of 2013 (CE, 2013) The reality is less certain and predictble, particularly amongst the majority of small organisations operating across built environment design, development and facilities management.

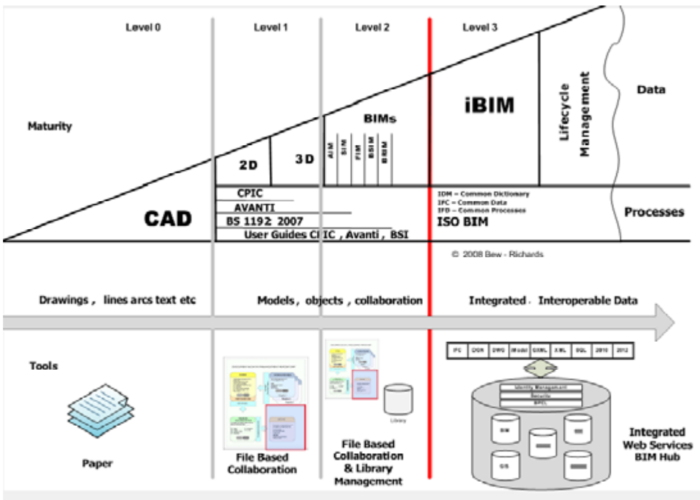

Figure 2. BIM Maturity Index

The reality of BIM engagement, particularly amongst the majority of small built environment organisations is and remains an unknown quantity in the

UK. Protocols used for communication and data handling form a wide spectrum of activities. For example, anecdotal evidence suggests that some small contractors do not use e-mail and a recent straw poll of surveyors in Ulster suggested that under 40% of listed organisations have a website. The range extends through organisations sharing data electronically via Word files, Excel spreadsheets and 2D dwg or pdf formats towards file management, for example set up by a contractor, local authority or corporate commissioning client. It could be argued that at best most of these repositories are there to achieve compliance, for example with tender pre-qualification requirements and at best provide a level of passive data exchange which may assist coordination, primarily during design and construction phases. In practical terms, achieving Level 2 BIM by the 2016 deadline may not be within the reach of all.

3. Construction industry response

Following the Latham report (Latham 1994) and the Egan report (Egan 1998), the construction industry as a whole attempted to implement the various recommendations and improve its performance, shake off the silo culture and exploit new Information and Communication Technologies (ICT). Sample Key Performance indicators (Fig. 3) demonstrate the relatively low performance and the improvements that still need to be achieved.

The adoption of ICTs, in particular BIM authoring and ancillary software along with associated data management systems, has accelerated in recent years in the UK. Associated commercial interests may be significant and large design and construction companies have taken the lead and continue to dominate. The debate on BIM and collaborative working has been fuelled by publication of the Government construction strategy (Cabinet Office, 2011) and subsequent BIM Task Group initiatives.

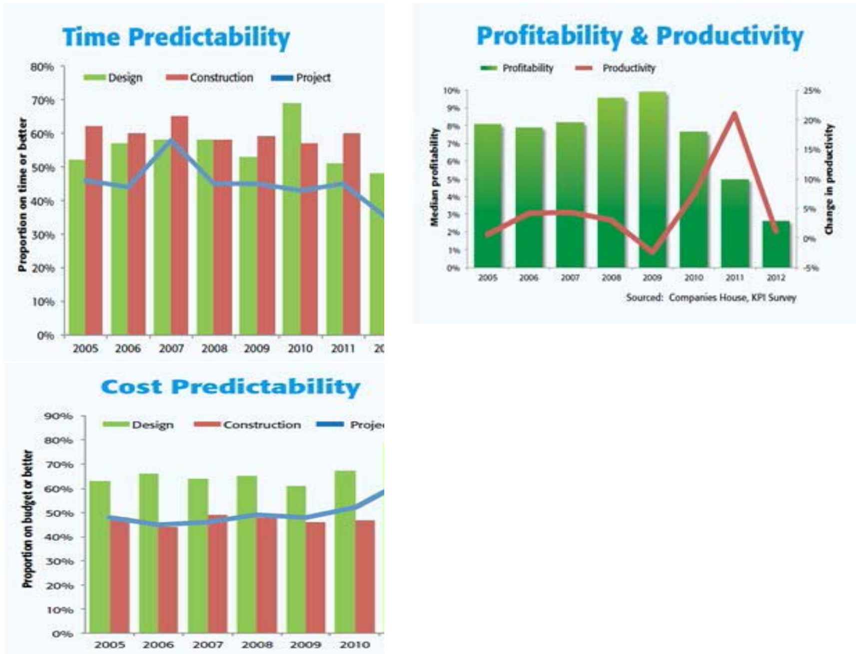

Figure 3. Economic KPIs 2012 – All construction. After Glenigan (2012)

In the lead in to full implementation of the Government's objectives per the 2016 threshold for Level 2 BIM uptake, it remains difficult to form a complete and realistic picture of levels of engagement with BIM across built environment organisations in the UK. To some extent, individual professional bodies are on the case, but there is little evidence of concerted and collaborative effort across disciplines. In that respect, the picture painted by Latham, Egan et al. has not changed significantly. A lack of representative and reliable data does not help. For example, although one 2012 cross-discipline survey (NBS, 2012) gathered feedback on BIM from around 1000 respondents that level of data return was equivalent to just 2% of combined CIAT/RIBA membership, to name just two from many representative organisations. As further points of reference, from other professional bodies, RICS has around 140,000 members, CIOB 39,000, IStructE 27,000 and so on.

As a consequence, whatever the Government's will to effect change, UK construction is currently subject to many challenges in relation to BIM uptake and more widespread implementation. These include:

Mixed messages on BIM:

- Lack of objective advice and critique across the industry

- The evangelical few and the great silent majority, primarily smaller organisations
- Research and development culture not prevalent in construction
- The current fiercely competitive economic situation suggests that those with knowledge and experience (e.g. early adopters) may be reluctant to share it
- A certain degree of BIM Delusion Syndrome: e.g. UK can lead the world with BIM; an evangelical message as promoted by some given the fact that other countries may have at least equivalent, if not more advanced knowledge
- Downstream dissemination of UK Government strategy relying on volunteer effort in the lead-in to Digital Britain: BIM 4SME, CIC BIM Hubs etc

Lack of specificity:

- Some but not all industry standards extant
- Unclear legal framework (are risks perceived or real?)
  Absence of rule based protocols for online submission of statutory approvals. Planning Department and Building Control services could act as a catalyst for change but lack a clear mandate for BIM implementation
- Parallel information flows on BIM from Government bodies, construction industry organisations (CIC, CIRIA, CPIC, NBS, BRE etc.) and professional bodies
- BIM overload Syndrome leading to an Anti-BIM backlash particularly from micro-SMEs
- Little evidence of exemplars for collaborative working, particularly with small projects

These factors highlight a number of pressing issues including lack of effective coordination across UK construction, mixed and sometimes ambiguous information and perhaps some conflicting interests. What the industry needs is an authoritative and reliable message based on evidence and experience which could help to lead the way for BIM uptake in a clear and unequivocal fashion.

4. Macro versus Micro built environment organisations

4.1 TECHOLOGY GAP

It is argued that a significant technology gap exists between large companies and micro-SMEs in UK construction. Amongst the former, ICTs are pervasive and have become a key element of enabling infrastructure covering all aspects of business including design, construction, whole life asset management, life cycle, marketing, cost management etc. Amongst the latter however, ICT use is in the main limited to traditional 2D drawings, perhaps some static 3D visuals, email and possibly a symbolic internet presence. The 2012 NFB survey suggested that among large contractors (250 or more full-time equivalent employees) 54% recorded experience of working with 3D drawings while for SMEs the figure dropped to 25%. (NFB, 2012) That perceived status quo creates a divide and may result in a Macro versus Micro effect that will certainly hamper efforts for collaboration on BIM within the industry. One dares to challenge those large organisations with experience and expertise in BIM to match their marketing discourse with a similar level of actions by providing reliable and credible case studies and even collaborate with SMEs to raise industry awareness and help to achieve faster and smoother transition towards a consistent approach to BIM uptake across UK construction.

4.2 SME'S ACCES TO BIM

SME's and in particular micro-SME's may lack the ICT infrastructure to be able to cope with a quick deployment of BIM. Working in a dynamic and collaborative IT-centric environment may represent major shift in working practices and extend beyond acquiring expensive hardware and software. A radical change of attitude and business model may be an additional prerequisite. Furthermore, the learning curve is lengthy and may demand sustained training and up skilling of personnel, (Miller, 2013), including graduates who may have already have undergone up to five years of full-time university education. A recent study examining BIM as a collaborative tool concluded that

"*contrary to the literature review, the case study has shown that the present investment, in terms of time, cost, and effort required to implementing the technology means that BIM is unlikely to be adopted on small simple projects or by SME's where conventional CAD is adequate"* (Kouider, 2008)

The burden of the additional expenditure is not insignificant in the current economic climate in which small businesses are struggling to stay afloat. When asked in a conference how much does it cost to install a full BIM station, the HOK BIM manager replied £30 to £70 k. And in the absence of a clear and coherent national/professional strategy on BIM on the one hand and the lack of clarity on the level and time scale of return on investment makes it even more difficult to make substantial financial commitments as highlighted by BIM4 SME working group.

"Moreover, as the group are SMEs themselves the equation of cost is foremost In our minds, but perhaps the more important question is 'what do I get for my money, what are the benefits and how long before my investment is paid off" (BIM4SME, 2013)

The lack of explicit engagement by clients is a feature of the debate. If the push /pull concept as described in the BIM Industry Working Group (BIS, 2011) is to be effective, a much greater more and more explicit presence of clients at all levels of project value would be needed. Who owns the model/s? Who pays for it/them? Who initiates it/them? All are well documented questions in the literature and will remain vague and not fully represented without client involvement.

5. Technical design and BIM:

5.1 EDUCATION

"Technical design" is the terminology utilised by the Chartered Institute of Architectural Technologist (CIAT) and its practitioners (Wienand, 2007) to characterise the specialist skills of their members and is, to a large extent, reflected in contemporary undergraduate training for technologists. In the UK, unlike his/her counterparts in Europe, a practising architectural technologist may be commissioned to design and build any type of building and he/she is expected to possess the appropriate design and related skills. Furthermore, there exists the expectation that any building designer will deliver a product that not only meets the requirements of the client's brief but also meets, in addition to the technical, the socio-cultural expectations of society as a whole.

The technologist's educational curriculum, with a focus on technology and management (QAA, 2007) falls short of the historical and philosophical aspects of architecture compared with an architect's training (RIBA, 2003). For technologists, this subject emphasis is arguably what provides specialism and identity to their discipline. But there is also the issue of balance between subjects and the educational experience in the round in relation to workplace expectations. Is there a mismatch between professional and societal expectations on one hand and the architectural technologist's contemporary education in the UK?. From that perspective, the following question may be raised. Is technical design still a valid representation of the architectural technologist's specialism? Or, would the term "design" be more appropriate.? A robust and consistenly applied outline syllabus for architectural technology undergraduate education would be helpful.

Being technically focused, the architectural technology curriculum covers various aspects of ICTs. In recent years many undergraduate courses extended their programmes to include 3D modelling, environmental analysis and some aspects of BIM. The latter would naturally be expected to feature more prominently in the curriculum throughout built environment courses in anticipation of the 2016 government deadline. On that point, there is an view that developing projects using data rich architectural software packages is not in itself BIM. (Rosenbloom, 2011) Being able to demonstrate evidence of collaboration across disciplines in developing workflows is an essential ingredient of the mix.

Currently, there is a lack of clear educational standards for BIM despite a number of recent initiatives. For example, the UK Construction Industry Council (CIC) published a BIM protocol targeted at built environment professionals and their clients. (CIC, 2013) The BIM Academic Forum (BAF: a grouping of a number of academics from UK Universities) in conjunction with the Higher Education Academy (HEA) recently produced a document outlining proposed level learning outcomes for BIM education and training. (HEA, 2013) In addition, a number of Master courses dealing directly or indirectly with BIM (Glamorgan, RGU, Northumbria, etc) are being offered together with a plethora of short courses and CPD events provided by software houses, professional bodies and other agencies.software. All these initiatives seem to lack a solid point of reference in terms of clear benchmark standards or national guidelines on which academic and training programmes could be based. This lack of clarity has the potential to create confusion amongst practitioners and the industry as a whole in identifying the skills to meet the 2016 challenge and beyond.

5.2 PROFESSIONAL ASPIRATIONS

It is generally acknowledged that in the digital age there is a generational skills gap within the construction industry. First, a new young generation of graduate professionals well trained and versed in ICT tools and working methods has been entering the construction industry professions next to a well-established older generation whose knowledge of these technologies may be limited. Also for micro-SMEs in particular, there may be a resistance to looking beyond tools required to do the job, (MacKay, 2013) particularly in the current economic climate. Small, medium sized and large organisations may not share the same attitudes and values regarding the potential of these technologies. Second, the managerial power within the industry dominantly resides with the older generation; often sceptical and reluctant to adopt unfamiliar technologies and working practices in which are perceived to embody high risks. Clearly the industry is going through a major transition and the BIM Task Group's push/pull strategy may help to firm up minds, shorten the transition period and open the doors wider for the aspirations of younger professionals.

5.3 GRADUATE SKILLS AND IMPACT ON PROFESSIONS

Graduate architectural technologists are entering an industry in which traditional working methods are in the process of being replaced by a new order based on multi-disciplinarity, collaboration and fast communication all primarily driven by ICTs. With a technically focused education and training, architectural technologists are perceived as well positioned to take a significant role in a changing construction industry. Hard evidence from practising technologists is limited to support this assumption but a number of useful initiatives exist. Some of these have been identified by the authors as part of this study. One could argue that the architectural technology profession should take a lead in promoting its members and further developing its accredited education and training programmes in order to meet a changing and developing market. A number of specialist titles are developing with the spread this technologically driven process of change include Design Manager, Information/Data Manager or consultant and BIM Manager. The latter is well established in the USA, increasingly in the UK and has evolved from the historical CAAD manager role. Execution of these roles may be enhanced by extended professional education and development at Masters level. Undoubtedly more specialist course and bespoke training will appear to prepare for a new skills market and the architectural technology profession may exploit its position and capitalise trough further diversification of programmes and professional scope.

6. Practical Experiments: BIMtoolkit

6.1 RATIONALE AND DESIGN

As a practical consequence of the discussion, BIMtoolkit is an experimental project set up to develop and encourage collaboration between architectural technology academics, undergraduates and small practices across built environment professional disciplines. A sub-text of the principal objective is to challenge some of the norms being propagated by evangelical BIM paradigms. The rationale for following that path is grounded in the observation that while there is some evidence that micro-SMEs may be receptive in principle to migrating to BIM, there may be difficulty in understanding the language of BIM and resistance to engaging with some of its mantras; data rich architectural models, COBie data drops, adoption of IFC file format, use of proprietary 3D BIM objects and the like.

There is also the key issue highlighted in this paper of clients being on board, both when projects are commissioned and in facilitating decision making as workflows progress over a project's whole life development and use. Challenges and opportunities are well documented and populated with useful dialogue via authoritative social media sites such as the NBS Objects forum on Linkedin. (NBS, 2013) In the context of the global economy, tapping into the online dialogue also raises the paradox of BIM standards being framed and applied locally and internationally. Simultaneous propogation of the Uniclass and OmniClass schemas for construction classification is a case in point which may impact on, for example, the forthcoming EU procurement directive (CIOB, 2013) which will may lead to fresh and interesting pan-European conversations on BIM.

BIM toolkit was defined by setting out a series of precepts and pointers for experimentation and testing using freeware and/or low cost software. These included:

- achieving collaborative working online using 3D tools as one of the underpinning principles of BIM
- for BIM to work effectively and universally, the skills to facilitate collaboration need to be be embedded across the construction industry. From large multi-disciplinary organisations, through micro-SMEs to sole practitioners. Clients also need to be included in the mix. Without commissioning clients, there would be no buildings. Clients also have a key role to play in decision making, reviews, approving budgets etc as workflows progress
- even for a small domestic scale development, a typical team could include client/s and a range of built environment players to steering the project from design though costing, project, planning, construction, occupation and maintenance in use
- it is reasonable to assume that each of the players would have different skills. As a starting point for BIMtoolkit, it would be a useful exercise to filter out the attributes which all participants need to have from the skills which might be considered to be more discipline specific, eg cost planning, or carrying out detailed energy calculations
- In that context, and as a shared entry level skill, a prerequisite was that participants should be able to engage with and manipulate 3D models using a viewer at a basic level. For example, to suit a client who could use a PC or laptop and was familiar with basic graphic

software like photo editing, computer games and the like. As a starting point for developing BIM toolkit, familiarity with 3D AEC data rich authoring software was not required. The issue of alphanumeric data flow was not considered at this stage, beyond information which could be accessed, modified and shared within the viewing environment.

6.2 PRESENTATION OF EARLY FINDINGS

Preliminary work identified a range of 3D model viewers available online. These are all available as freeware, although there may be qualifications. For example software houses may tempt users with a free download but limit full functionality to subscription versions. Viewers sampled are listed below. It was found that some downloads are much larger than others eg SketchUp viewer is around 11Mb whereas Autodesk Navis Freedom 2013 has a file size of around 500Mb. There may be a relationship between resident file size and functionality, but it is too early to confirm at this point in time. Listed alphabetically, the model viewers reviewed and/or software which incorporating 3D viewing capability were:

- Adobe Acrobat Reader XI (3D functionality claimed from Adobe Acrobat 9)
- Autodesk Navisworks Freedom 2013
- DDS-3D CAD viewer
- SketchUp viewer
- Softplan Review 3D
- Solibri Model Viewer V7.1
- Tekla BIMsight

Each of the viewers tended to demonstrate key features. One of the most significant is that some, for example SketchUp, will only upload one model at a time, while others like Solibri or Tekla BIMsight will allow multiple 3D models to be loaded for simultaneous viewing and manipulation.

SketchUp viewer in particular was found to be very easy to use. The next stage of enquiry would be to test functionality, particularly feedback from clients on the effectiveness of the viewer to navigate and read 3D concept and preliminary design models online. SketchUp also interacts well with Google Earth, (Fig. 4) so linking with site specific data is also a possibility; site location, topography, site context etc.

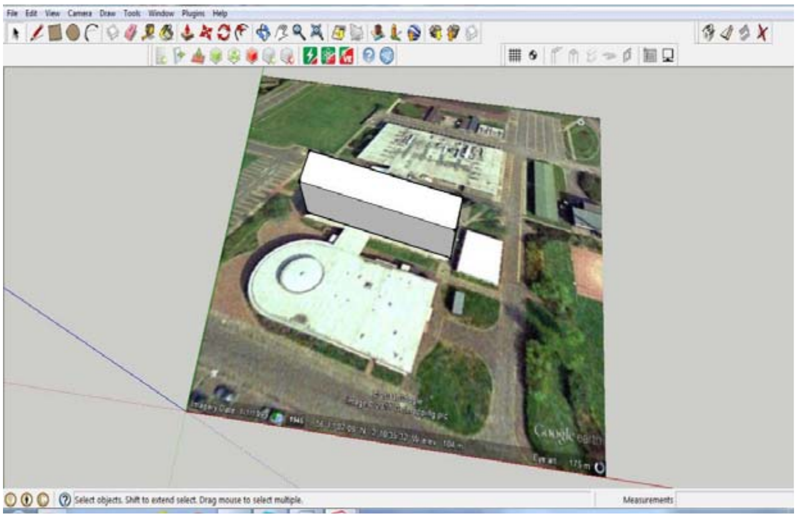

Figure 4. Site model with embedded GIS information. Native file source .skp

From the multiple model viewers sampled, Tekla BIMsight, for example, offered extended functionality including the possibility to combine federated models, (Fig. 5) read/write, scaling, markup and potential for dialogue/data exchange across disciplines via a browser environment. (Fig. 6) One feature noted from the more sophisticated model viewers was a sensitivity to imported file type and, even with very limited sampling, a perceived loss of geometric data in migrating from a native file source to, for example, the IFC format. Possibly single and multiple model viewers could work in tandem. That premise has not been tested to date and the work continues.

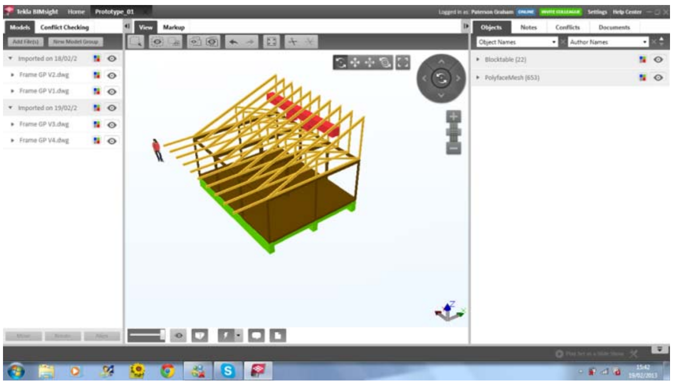

Figure 5. BIMtoolkit: federated model combining four separately designed instances in the Tekla BIMsight viewer. 1) Substructure + floor slab, 2) superstructure general arrangement, 3) specialist timber roof trusses, 4) Heat Recovery Ventilation (HRV) ducting.

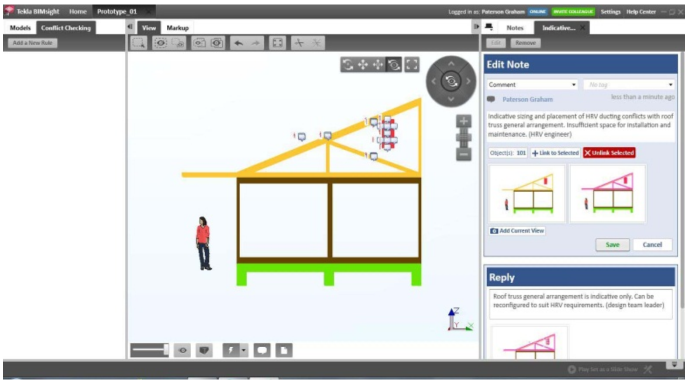

Figure 6. BIM toolkit: orthographic view of suite of federated or reference models showing markup and "first steps" identification and resolution of potential conflicts between building structure and mechanical, electrical + plumbing (MEP) services.

7. Conclusions

This paper has discussed BIM in relation to the UK Government's intent to embed Level 2 BIM into publicly procured projects from 2016. Associated issues have been reviewed including perceived models for implementation, identified as *evangelical* and *evolutionary* paradigms. A range of challenges has been raised, highlighted and evaluated. These include the structure of the UK industry as it may relate to BIM uptake, and consideration of whether the evangelical paradigm may be appropriate to effectively reach and modify the behavior of the SMEs representing the industry's majority stakeholders. The need to identify, review and apply a range of business models relevant to BIM uptake has also been appraised in relation to best fit with organizational cultures, discipline characteristics and requirements. These issues relate primarily to the use of ICTs as process enabling tools. In the UK, the spectrum of organisations across construction characteristics across construction is very broad in relation to size, characteristics etc and raises questions as to whether or not a *one size fits all* approach is likely to be effective, or indeed desirable if the message is likely to inhibit rather than encourage BIM uptake among micro-SMEs in particular.

Drivers for BIM uptake have been examined raising the key issue of whether or not the UK built environment professions will be able to cope with significant change to culture and work practices by the Government's 2016 deadline. Consideration of macro versus micro organizational typologies has identified a perceived technology gap in relation to the need/ability of SMEs to engage with the ICT infrastructures prevalent among larger organisations.

Technical design has been discussed in relation to architectural education in general and architectural technology in pedagogy in particular. The need for a robust and consistently applied outline syllabus embodying BIM has been raised as a question for the architectural technology profession to consider. In that context, maintaining connections between undergraduate education, research and professional practice is critical. Industry studies have consistently demonstrated a dearth of R+D in construction. One key facet of an evolutionary paradigm for BIM uptake is that it should follow a reasoned, evidenced based and consensual pathway towards implementation. Collaboration across disciplines and the involvement of clients is thought to be key to achieving that objective.

BIMtoolkit has been initiated and developed as an experimental project to propose and test methodologies for facilitating collaboration across disciplines, possibly by-passing the need to engage with data rich AEC software authoring tools to achieve more universal engagement with UK Government Level 2 objectives. That work continues into 2014.

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