Development of a Digital Adoption Plan for Construction Companies

Dr. Henry Abanda
Reader (Associate Professor) in Construction Informatics

Faculty of Technology, Design & Environment
School of The Built Environment
Oxford Institute for Sustainable Development
Oxford Brookes University
Oxford, United Kingdom

4th International Conference on Building Information Modeling

چهارمین کنفرانس بین‌المللی مدل‌سازی اطلاعات ساخت

Maged Abdel-Tawab

[Student, MSc BIM & Management]

Henry Abanda

[Reader, Construction Informatics]

Agenda

Context

Aim & Objectives

Method

Results & Discussions

Conclusions

Resources

Context

3 **BIM implementation plans exist**

How do we set up a BIM department in our company?

Context

Chapter 18
Making a Business Case for BIM Adoption

K. Whitlock and Henry Fonbeyin Abanda

Abstract Emerging Building Information Modelling (BIM) is one of the most promising developments in the architecture, engineering and construction (AEC) industry. It has been hailed as a revolutionary technology and information management process that facilitates collaboration and more efficient design and construction processes through innovative 3D modelling software, open access to information and multidisciplinary integration. The deadline of compliance to BIM level 2 on all centrally government procured projects recently expired leaving many construction firms scrambling to adopt BIM. However, globally, many practitioners are still reluctant to adopt BIM. A clear business case for BIM adoption will facilitate decision-making whether to adopt it or not. This study uses a SWOT analysis planning tool to conduct an appraisal of BIM adoption on the chosen residential case study project in London. By integrating SWOT and the UK RIBA plan of Work, the different BIM systems required to address the various aspect of SWOT are identified. Furthermore, a cost appraisal of the different items required to adopt BIM is undertaken.

Chapter 11
Developing a Business Case for BIM for a Design and Build Project in Egypt

K. F. Amin and Henry Fonbeyin Abanda

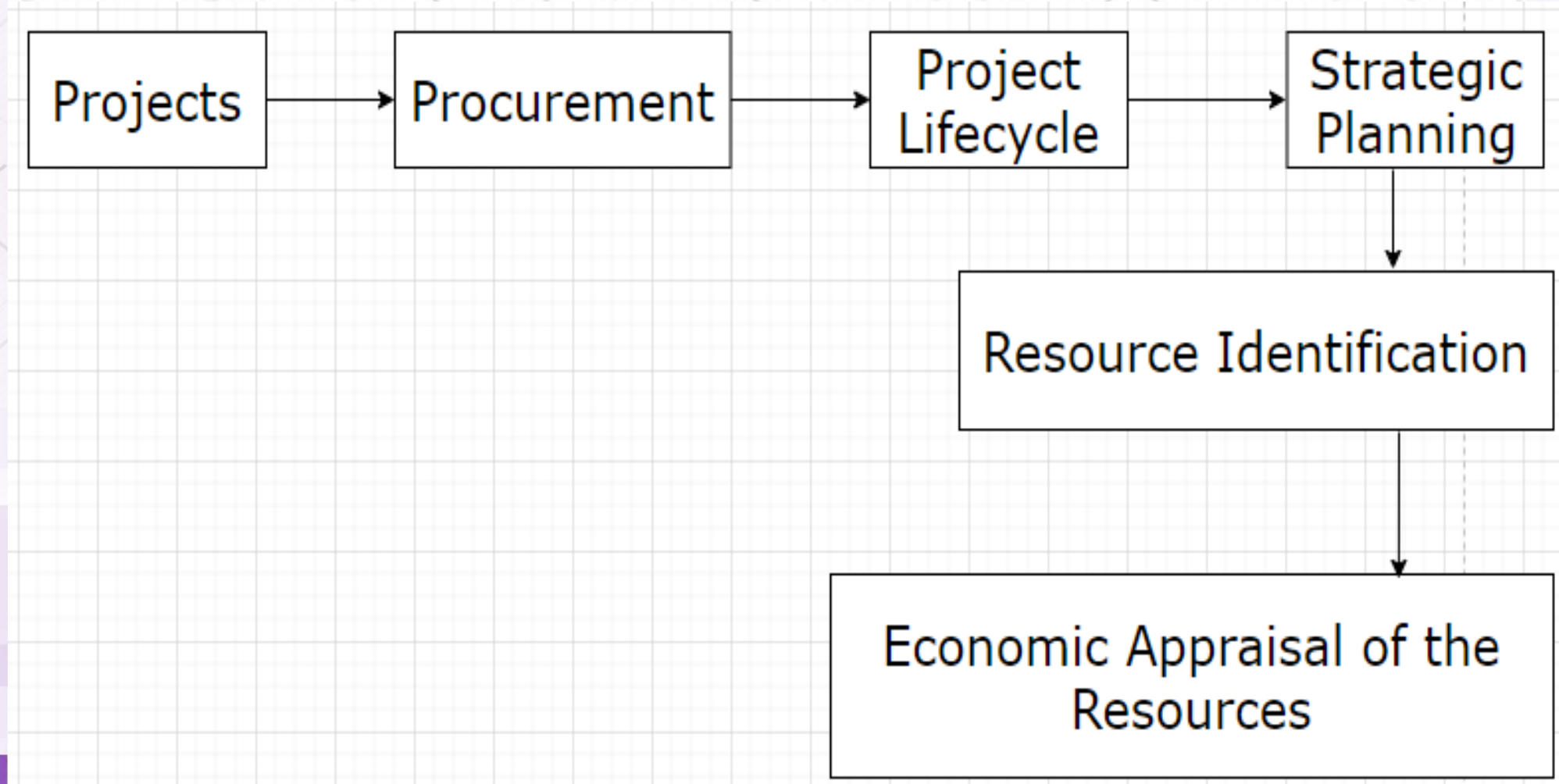
Abstract Emerging Building Information Modelling (BIM) is one of the most promising developments in the Architecture, Engineering and Construction (AEC) industry. It is hailed as a revolutionary technology and information management process that facilitates collaboration and provides more efficient design and construction processes through innovative 3D modelling software, open access to information and multidisciplinary integration. However, globally, many practitioners are still reluctant to adopt BIM. A clear business case for BIM adoption will facilitate decision-making whether to adopt it or not. This study uses a SWOT analysis planning tool to conduct an appraisal of BIM adoption on a chosen commercial case study project in Egypt. Furthermore, by integrating SWOT and the UK RIBA plan of Work, the different BIM systems required to address the various aspects of SWOT are identified. Furthermore, a cost appraisal of the different items required to adopt BIM is examined.

Aim & Objectives

The aim of this workshop is to enhance the skills of participants to be able to develop a BIM adoption plan required for setting up a digital (BIM) department in a construction firm in COVID-19 and post COVID-19 era.

- **To propose a method (process map) of how to develop a digital adoption plan,**
- **To establish content of such a digital adoption plan (e.g., software, hardware, enabling devices, personnel, etc.)**
- **To conduct the economic appraisal of the digital adoption plan**

Method


Projects
Procurement
Project Lifecycle
Strategic Planning
Resource Identification
Economic Appraisal of the Resources

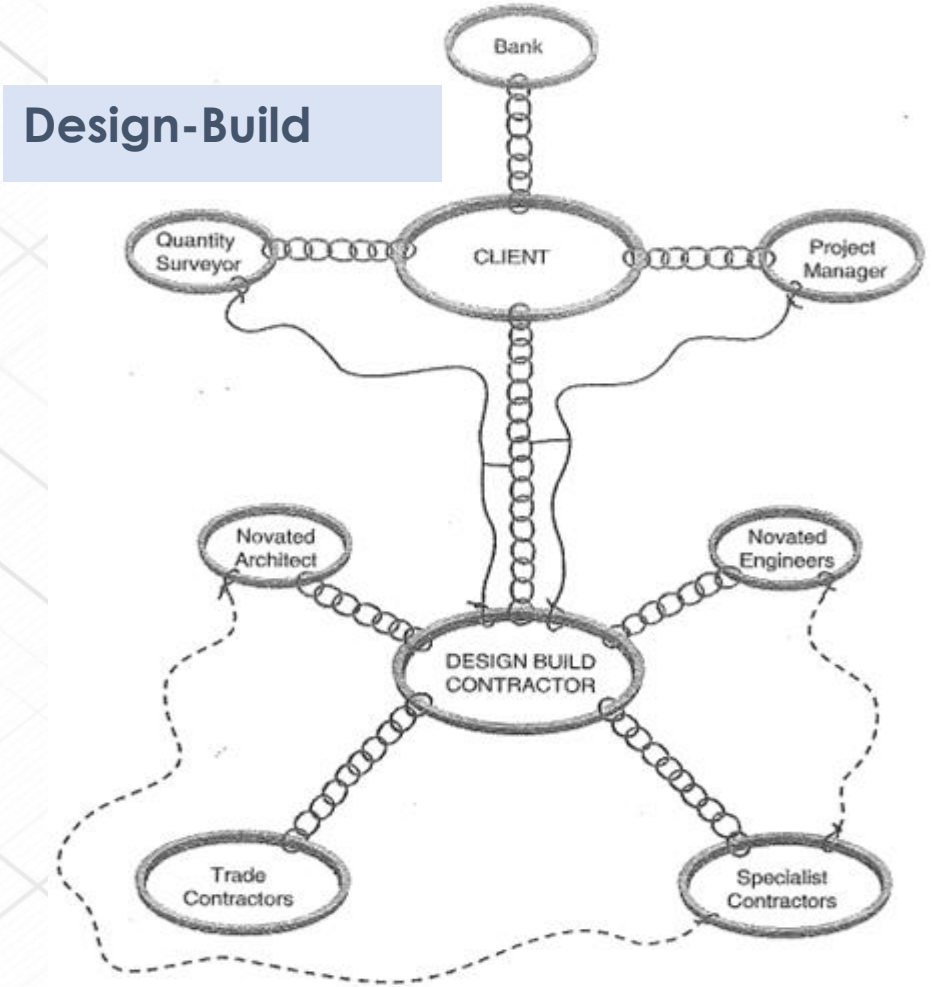
Projects

- Buildings
- Bridges
- Roads
- Heavy construction
  - Water and sewer line projects,
  - Dams, sewage treatment plants and facilities,
  - water treatment plants and facilities

The kind of project is needed in roughly determining the kind of resources needed. For example, the software needed for road designs will be different from those for building design.

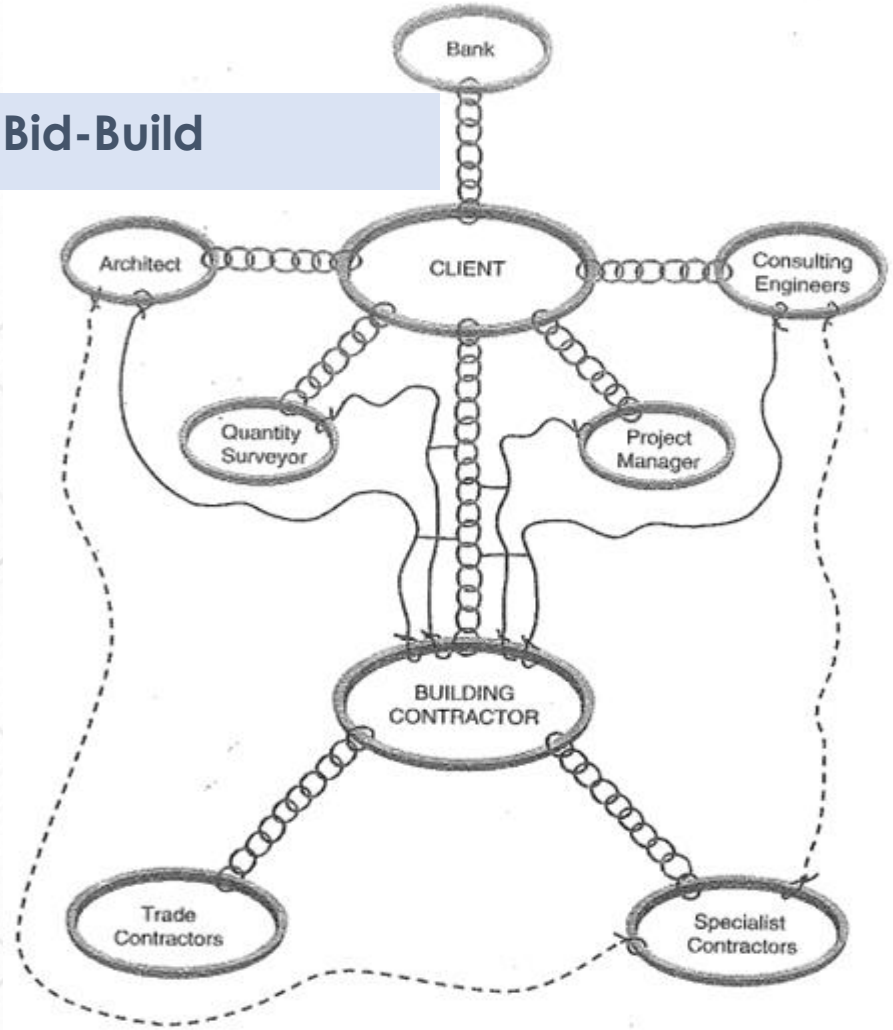
Procurement

Design & Build: Under this method, an owner typically hires a single entity, the design/builder, to perform both design and construction under a single contract.



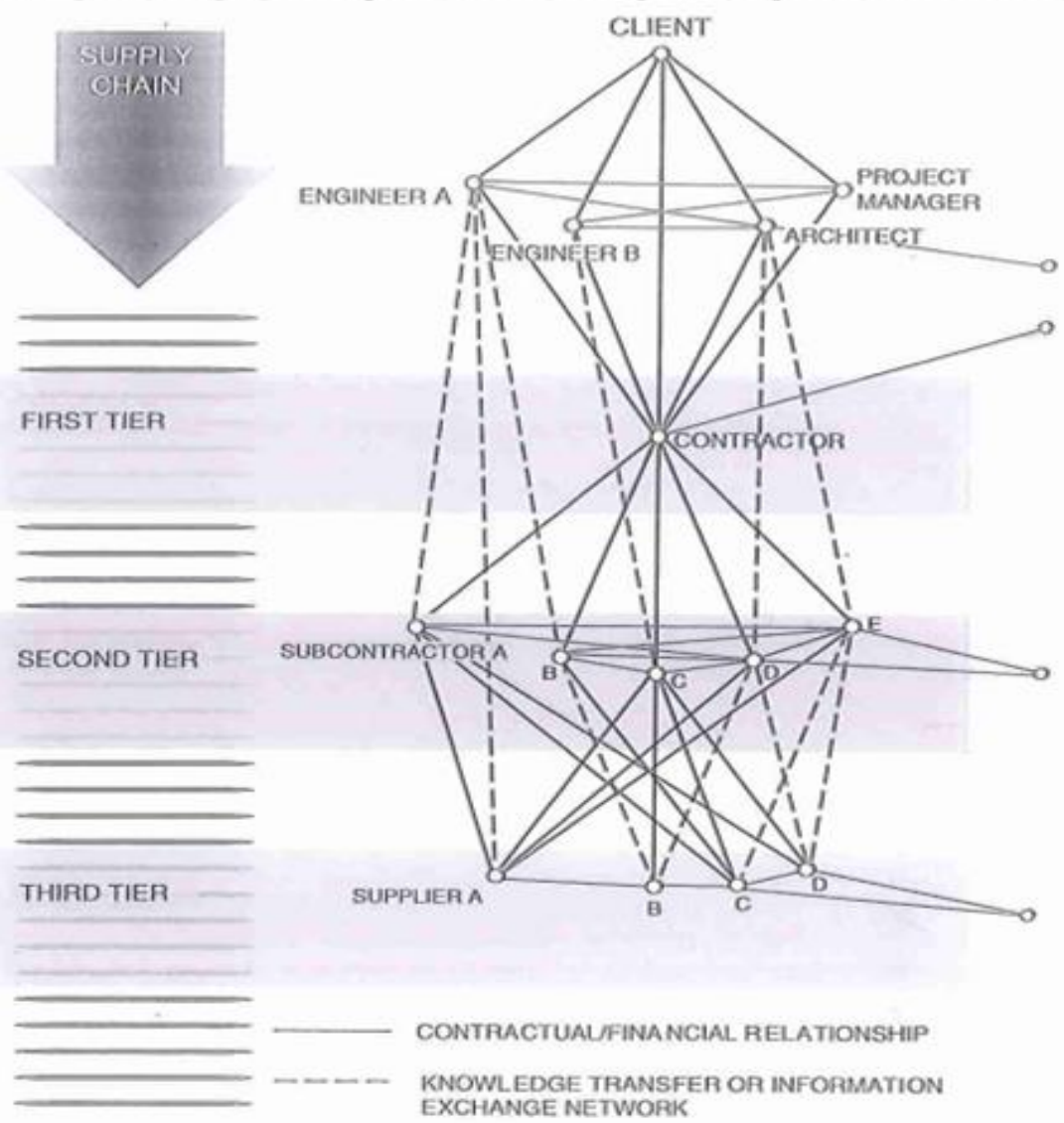
Procurement

Design-Bid-Build



Design-bid-build (traditional):
This is often called the traditional method in the construction industry, an is a type of procurement where the owner contracts separately with a designer and a contractor.

Procurement



Knowing your supply chain is important as it can lead to savings in the kind of software chosen. It fosters collaboration and limits the choices of redundant or duplicated software.

Project Lifecycle

Association for Project Management	CIOB Code of Practice for Project Management for Construction and Development	Office of Government Commerce (OGC)	British Standards BS6079-1:2000	British Property Federation	Royal Institute of British Architects (RIBA)
Concept	1 Inception 2 Feasibility	Gate 0 Strategic assessment Gate 1 Business justification	1 Conception 2 Feasibility	1 Concept 2 Preparation of Brief	A Appraisal B Design brief C Concept
	3 Strategy	Gate 2 Procurement strategy Gate 3 Investment decision		3 Design Development *Includes applications to and permissions from statutory authorities*	D Design Development *Includes planning application*
Definition	4 Pre-construction *Includes applications to and permissions from statutory authorities*	Gate 4 Readiness for service	3 Realisation	4 Tender documentation and tendering	E Technical Design *Includes statutory permissions* F Production information G Tender documentation H Tender action J Mobilisation
Implementation	5 Construction 6 Engineering services commissioning			5 Construction	K Construction to practical completion
Handover and close-out	7 Completion, handover and occupation 8 Post-completion review/project close-out report	Gate 5 Benefits evaluation	4 Operation 5 Termination		L, M Post-practical completion

Project Lifecycle

		RIBA Work Stage	Description of Key Tasks	Core BIM Activities
Preparation	A	Appraisal	Identification of client's needs and objectives, business case, sustainability, life cycle and Facilities Management aspirations and possible constraints on development. Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.	• Advise client on purpose of BIM including benefits and implications. Agree level and extent of BIM including 4D (time), 5D (cost) and 6D (FM) following software assessment. Advise client on Integrated Team scope of service in totality and for each designer including requirements for specialists and appointment of a BIM Model Manager. • Define long-term responsibilities, including ownership of model. • Define BIM Inputs and Outputs and scope of post-occupancy evaluation (Soft Landings). • Identify scope of and commission BIM surveys and investigation reports. • Data drop 1.
	B	Design Brief	Development of initial statement of requirements into the Design Brief by or on behalf of the client, confirming key requirements and constraints. Identification of procurement method, project sustainability and BIM procedures, building design lifetime and project organisational structure and range of consultants and others to be engaged for the project, including definition of responsibilities.	
Design	C	Concept	Implementation of Design Brief and preparation of additional data. Agreement of Project Quality Plan including BIM and Change Control protocols. Preparation of Concept Design including outline proposals for structural and environmental strategies and services systems, site landscape and ecology, outline specifications, preliminary cost and energy plans. Review of procurement route.	• BIM pre-start meeting. • Initial model sharing with Design Team for strategic analysis and options appraisal. • BIM data used for environmental performance and area analysis. • Identify key model elements (e.g. prefabricated component) and create concept level parametric objects for all major elements. • Enable design team access to BIM data. • Agree extent of performance specified work. • Data drop 2.
	D	Design Development	Development of concept design using project BIM data to include structural and environmental strategies and services systems, site landscape and ecology, updated outline specifications and cost and energy plans. Completion of Project Brief. *Application for detailed planning permission.*	• Data sharing and integration for design co-ordination and detailed analysis including data links between models. • Integration/development of generic/bespoke design components. • BIM data used for environmental performance and area analysis. • Data sharing for design co-ordination, technical analysis and addition of specification data. • Export data for Planning Application. • 4D and/or 5D assessment. • Data drop 3.
	E	Technical Design	Preparation of technical design(s) and specifications, sufficient to co-ordinate components and elements of the project, BIM data and *information for statutory standards, sustainability assessment and construction safety.*	
Pre-Construction	F	Production Information	F1 ~~Preparation of production information~~ Development of BIM data in sufficient detail to conclude co-ordination of design team inputs, to enable performance specified work to commence and enable a tender or tenders to be obtained. *Application for statutory approvals.* F2 ~~*Preparation of further information for construction required under the building contract.*~~ *Development of BIM data to integrate performance specified design work into model.* Review of BIM information provided by contractors and specialists, including integration into project BIM data.	• Export data for Building Control Analysis. • Data sharing for conclusion of design co-ordination and detailed analysis with subcontractors. • Detailed modelling, integration and analysis. • Create production level parametric objects for all major elements (where appropriate and information exists this may be based on tier 2 supplier's information). • Embed specification to model. • Final review and sign off of model. • Enable access to BIM model to contractor(s). • Integration of subcontractor performance specified work model information into BIM model data. • Review construction sequencing (4D) with contractor. • Data drop 4.
	G	Tender Documentation	Preparation and/or collation of tender documentation in sufficient detail to enable a tender or tenders to be obtained for the project.	
	H	Tender Action	Identification and evaluation of potential contractors and/or specialists for the project. Obtaining and appraising tenders; submission of recommendations to the client.	

Project Lifecycle

RIBA Work Stage			Core BIM Activities
Preparation	A	Appraisal	• Advise client on purpose of BIM including benefits and implications. Agree level and extent of BIM including 4D (time), 5D (cost) and 6D (FM) following software assessment. Advise client on Integrated Team scope of service in totality and for each designer including requirements for specialists and appointment of a BIM Model Manager. • Define long-term responsibilities, including ownership of model. • Define BIM Inputs and Outputs and scope of post-occupancy evaluation (Soft Landings). • Identify scope of and commission BIM surveys and investigation reports. • Data drop 1.
	B	Design Brief	
Design	C	Concept	• BIM pre-start meeting. • Initial model sharing with Design Team for strategic analysis and options appraisal. • BIM data used for environmental performance and area analysis. • Identify key model elements (e.g. prefabricated component) a create concept level parametric objects for all major elements. • Enable design team access to BIM data. • Agree extent of performance specified work. • Data drop 2.
	D	Design Development	• Data sharing and integration for design co-ordination and detailed analysis including data links between models. • Integration/development of generic/bespoke design components. • BIM data used for environmental performance and area analysis. • Data sharing for design co-ordination, technical analysis and addition of specification data. • Export data for Planning Application. • 4D and/or 5D assessment. • Data drop 3.
	E	Technical Design	
Pre-Construction	F	Production Information	• Export data for Building Control Analysis. • Data sharing for conclusion of design co-ordination and detailed analysis with subcontractors. • Detailed modelling, integration and analysis. • Create production level parametric objects for all major elements (where appropriate and information exists this may be based on tier 2 supplier's information). • Embed specification to model. • Final review and sign off of model. • Enable access to BIM model to contractor(s).

Software	Hardware	Devices	Training	Salary

Strategic Planning

Lifecycle approach is great. But, tasks can be missed. We need reinforcement of the approach. This the need for a strategic planning tool.

PEST Model is also an acronym—it stands for "**p**olitical, **e**conomic, **s**ociocultural, and **t**echnological."

Issue-Based Strategic Planning

Goal-Based Strategic Planning

Strengths, **W**eaknesses, **O**pportunities and **T**hreats (SWOT)

Integration of Strategic Planning and Project Lifecycle

Additional comments		0 Strategic Definition	1 Preparation and Brief	2 Concept Design	3 Developed Design	4 Technical Design	5 Construction	6 Handover and Close Out	7 In Use
In this task bar, the Core Objectives and the principal activities for each stage are set out.	CORE ACTIVITIES	Identify client's Business Case and Strategic Brief and another core project requirement. S1	Develop Project Objectives and develop Initial Project Brief. Undertake Feasibility Studies and review of Site Information. O1 O2	Prepare Concept Design, including outline proposals for structural design, building services systems, outline specifications and preliminary Cost Information along with relevant Project Strategies in accordance with	Prepare Developed Design, including coordinated and updated proposals for structural design, building services systems, outline specifications, Cost Information and Project Strategies in accordance with Design Programme.	Prepare Technical Design in accordance with Design Responsibility Matrix and Project Strategies to include all architectural, structural and building services information, specialist	On-site Construction in accordance with Construction Programme and resolution of Design Queries from site as they arise.	Handover of building and conclusion of Building Contract.	Undertake in Use services in accordance with Schedule of Services.
The task shows the BIM activities from the BIM Overlay to the RIBA Plan of Work	BIM ACTIVITIES	• Advise client on purpose of BIM including benefits and implications. Agree level and extent of BIM including 4D (time), 5D (cost) and 6D (FM) following software assessment. S1 • Advise client on Integrated Team scope of service in totality and for each designer including requirements for specialists and appointment of a BIM Model Manager. • Define long-term responsibilities, including ownership of model. • Define BIM Inputs and Outputs and scope of post-occupancy evaluation (Soft Landings). • Identify scope of and commission BIM surveys and investigation reports. • Develops BIM training programme. O2	• BIM pre-start meeting. • Initial model sharing with Design Team for strategic analysis and options appraisal. O5 • BIM data used for environmental performance and area analysis. O5 • Identify key model elements and create concept level parametric objects for all major elements. O5 • Enable design team access to BIM data. O5 • Agree extent of	• Data sharing and integration for design coordination and detailed analysis including data links between models. O5 • Integration/development of generic/bespoke design components. O5 • BIM data used for environmental performance and area analysis. O5 • Data sharing for design coordination technical analysis and addition of specification data. O5 • Export data for	• 4D and/or 5D assessment. • Data sharing for conclusion of design co-ordination and detailed analysis with subcontractors. • Detailed modelling, integration and analysis. • Embed specification to model. • Final review and sign off model. • Enable access to BIM model to contractor(s). • Integration of subcontractor performance specified work model information	• Review construction sequencing (4D) with contractor. • Agree timing and scope of 'Soft Landings'. • Co-ordinate and release of 'End of Construction' BIM record model data. • Use of 4D/5D BIM data for contract administration purposes.	• FM BIM model data issued as asset changes are made. • Study of parametric object information contained within BIM model data.	

Integration of Strategic Planning and Project Lifecycle

Strengths:

S1: As part of a Build & Design contractor, the client/owner will only need to deal with the company, whereas the traditional method, where the clients need to deal with both contractor and designer.

S1: Good company reputation with a well-established network of clients and partners.

S2: The team is a mix of experienced and young personnel, which will help dramatically in the adoption of a new technology.

S3: As a SME with less than 50 members in the office, the staff have great professional working relationships that are based on mutual respect and liking. Therefore, the level of internal bureaucracy is minimum.

S4: The whole architectural team is aware of the importance of a BIM integration into the company for the business to succeed.

S5: There is a member of the architectural team who is fully enrolled with BIM. As the project develops, this person will be part of the new BIM department.

S6: Strong relationship with site sub-contractors and constructions team, as historically, the company has been using the same teams for over 10 years. Consequently, the relationship with the project management team is optimal.

Integration of Strategic Planning and Project Lifecycle

Weakness:

W1: Despite the friendly environment at the office, the communication between departments is very poor. Furthermore, the exchange communication system is purely through emails. Moreover, there is a big percentage of miscommunication between personnel because of "pocket conversation" happening daily.

W2: The company is working without a Common Data Environment (CDE) and located between level 0 and 1 (BSI, 2013) on the BIM maturity diagram.

W3: Prior to the BIM adoption plan, the company did not want to invest into new technologies. The managing directors have an outdated mindset, (Rogers, 1962) falling clearly within the "late majority stage" according to the Diffusion of innovations theory.

W4: The project managers team does not consist of young personnel and the experienced managers are quite sceptical about the BIM implementation.

W5: Bearing in mind this project will be the first one using BIM, mistakes are expected to happen as part of the learning process.

W6: Revit is currently being used in the architectural team but only as a visualisation tool which is not the full potential of BIM software.

W7: Lack of coordination between disciplines. As a result, some of the problems cannot be identified until they appear on site.

W8: Due to working in a 2D CAD environment, the creation of construction drawing packages is not as fast as it would be working with BIM software. For instance, when there is a change in the proposed layout plan, all elevations and section views need to be changed manually.

Integration of Strategic Planning and Project Lifecycle

Opportunities:

O1: After so many years working in a disorganised way, the BIM adoption plan will create an opportunity to develop a standardised project design and management system. The creation of using a CDE, will dramatically improve the existing lack of communication between disciplines and stakeholders.

O2: The staff member who is already fully enrolled with BIM will be a key factor for the success of the BIM implementation in the company. Furthermore, the rest of the team will see them as learning support during the process.

O3: BIM software will create an easy and faster workflow during the creation of construction drawing packages, in contrast with the existing 2D CAD environment.

O4: Working in a BIM environment will let the company extend its commercial business opportunities as it could tender projects that require mandatory BIM.

O5: Despite its current sole visualisation value, Revit will be used as a full BIM tool, enhancing all its potential.

O6: The opportunity to create a new and fresh image of the company with the adoption of new

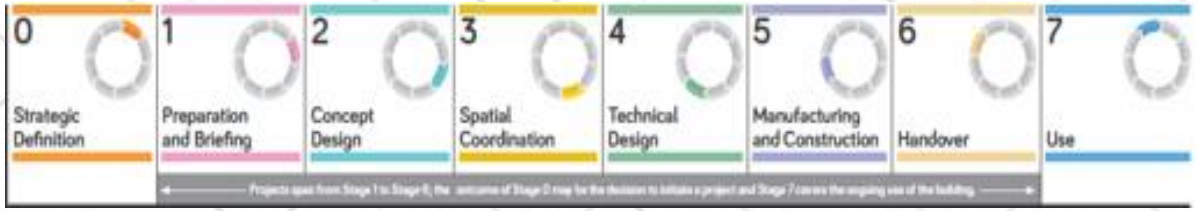
Threats:

T1: The late adoption of BIM implementation in comparison with similar companies in the UK could see the company behind in the marketplace. Certainly, it will take some time to get the BIM adoption up and running smoothly.

T2: The job location (Wales), is an unusual place to work for the company as 90% of its projects are within England.

T3: There are doubts about the integration of the experienced project management team with the BIM adoption plan. Therefore, if the training process is not successful, the company will be looking to find new personnel for that department and losing an important part of the company team.

Integration of Strategic Planning and Project Lifecycle



+

- Rich information
- Validation

Integration of Strategic Planning and Project Lifecycle

Advances in Engineering Software 90 (2015) 183–201

Contents lists available at ScienceDirect

Advances in Engineering Software

journal homepage: www.elsevier.com/locate/advengsoft

A critical analysis of Building Information Modelling systems used in construction projects

F.H. Abanda*, C. Vidalakis, A.H. Oti, J.H.M. Tah

School of the Built Environment, Oxford Brookes University, Oxford, OX3 0BP, UK

ARTICLE INFO

Article history:
Received 14 May 2015
Revised 23 July 2015
Accepted 30 August 2015
Available online 25 September 2015

Keywords:
BIM
Classification
Construction
Decision-support
Interoperability
Plug-ins

ABSTRACT

Building Information Modelling (BIM) is now a global digital technology which is widely believed to have the potential to revolutionise the construction industry. This has been mainly a result of worldwide government initiatives promoting BIM uptake to improve efficiency and quality in delivering construction projects. This push has been accompanied by the release of a tremendous amount of BIM software systems which are now available in the market. Although this can be seen as a positive development, one cannot ignore how it has overwhelmed many professionals who cannot easily distinguish between the uses of these software systems. Previous studies about different BIM systems have generally been limited in scope focusing predominantly on operational issues. This study aims to conduct a comprehensive and critical appraisal of a wide range of BIM software systems currently being used in managing construction project information. To achieve this, five main methods are adopted. These include a systematic review of the literature, a structured questionnaire survey, action learning, focus group discussions and email surveys. It has to be noted that, although it is impossible to examine the totality of BIM systems, the study adopts a holistic approach looking at most of the major BIM system categories and 122 application examples which are common in the architecture, engineering and construction (AEC) industry.

© 2015 Elsevier Ltd. All rights reserved.

ternational Conference on
ng Information Modeling

Integration of Strategic Planning and Project Lifecycle

	Specific applications	Import	Export	Plugins
Building services				
MagiCAD	Design and calculation capabilities for heating, cooling, ventilation, air conditioning and water systems, as well as sewer, sprinkler and specialist systems, including energy-efficiency calculations. Coordination and clash detection.	DWG, RVT, IFC, Spreadsheet	IFC, Spreadsheet	Voids Manager for Revit
Revit MEP	Accurate design of MEP (mechanical, electrical, plumbing) and HVAC (heating, ventilation, and air conditioning).	DWG, DXF, RVT, IFC, gbXML	DWG, DXF, RVT, IFC, gbXML	i-model plugins
AECOsim Building Designer for Electrical Engineers	AECOsim Building Designer provides electrical engineers with key features that help them improve project quality, reduce risk, and save money in the design and documentation of building electrical systems.	DWG, DXF,IFC	DWG, DXF,IFC	i-model plugins
Clima-Win	Thermal calculations.	gbXML, IFC, Neutral Building Data Model(NBDM)	XML, Excel, NBDM, Passive House Planning Package	Plug-in for Revit, ArchiWizard
AECOsim Energy Simulator v8i	Design, simulate, and analyse Building Mechanical Systems, Environmental Conditions, and Energy Performance. It is capable of performing, simulation, and analysis of building mechanical systems, environmental conditions, and energy performance. Used in both design and retrofit work, the software contributes to better-performing, more sustainable buildings that consume less energy; provide greater occupant productivity, comfort, and safety; and control lifecycle operational energy costs for their owners.	gbXML, DXF, DWG		i-model plugins
DDS-CAD Electrical	For design of complete electrical installations and distributor documentation, including lightning protection and fire & security systems.	ArchiCAD, Allplan, Vectorworks Bentley, or Revit, IFC, DXF, DWG	DWG, DXF, IFC, gbXML	Polysun Inside
DDS HVAC & Plumbing	For plumbing, heating, air conditioning and ventilation. Integrated calculations and advanced control features facilitate optimal mechanical and plumbing design.	ArchiCAD, Allplan, Vectorworks Bentley, or Revit, DWG, DXF, IFC	DWG, DXF, IFC, gbXML	Polysun Inside
Project management/design coordination				
Calcus	Cost analysis, What-if simulation, Carbon Footprint Analysis (CO_2), Lifecycle Cost Analysis (LCC).	IFC	MS Excel	
Tocoman Quantity Management Solution	Quantity take-off, cost estimating, visualisation.	IFC	Export to MicroSoft Project	iLink add-on for Revit, ArchiCAD and Tekla
Synchro	Clash detection, scheduling optimisation (4D).	DWF, IFC	IFC, Primavera P6, MS Project XML, MS Excel	Primevera API Revit plugin Projectwise plugin MicroStation plugin SketchUp plugin
Vico	Coordination, quantity takeoff, cost estimation (5D), project scheduling, and production control.	IFC, DWG, DXF	XML	Plugin for Revit
Causeway Professional Design Suite (PDS).	Software provides a range of modules for all aspects of earthworks design and quantification, development site infrastructure design and highway design.			
BIMMeasure	Provides the ability to measure directly from federated or individual models and drawings whether presented in	Supports DWF, DWFx, IFC		

Integration of Strategic Planning and Project Lifecycle

Improvements identified in SWOT analysis and associated BIM tasks, software, and users

	RIBA STAGE		IMPROVEMENTS IDENTIFIED DURING SWOT ANALYSIS	AUTODESK BIM SOFTWARE REQUIRED	USERS / PARTIES INVOLVED
PREPARATION	0	STRATEGIC DEFINITION	N/A	N/A	Employer's Agent; Archite Advisers
	1	PREPARATION AND BRIEF			
DESIGN	2	CONCEPT DESIGN	N/A	Revit; Robot; BIM 360	Employer's Agent; Architect; Structural Engineer; Advisers
	3	DEVELOPED DESIGN	N/A	Revit; Revit Structure; Robot; BIM 360 Glue	Employer's Agent; Architect; Structural Engineer; Advisers
	4	TECHNICAL DESIGN	Improved cohesion between project teams through shared design participation; 4D / 5D assessment improves programme / budget control	Revit; Revit MEP; Revit Structure Robot; Navisworks; BIM 360 Glue	Contractor's Design Team; Planners; Quantity Surveyors
			Collaborative Sub-Contractor involvement reduces design / cost risk, and increases budget engineering opportunities; 4D/5D assessment improves cost / time certainty; Consolidation of design reduces potential clashes		Contractor's Design Team; Quantity Surveyors; Specialist Sub-Contractors & Suppliers
CONSTRUCTION	5	CONSTRUCTION	More accurate logistics strategies improve interaction with surround area and general public and reduce associated risk; Collaborative design query resolution, and improved contract administration efficiency reduces delays	Navisworks; Revit; BIM 360 Glue	Contractor's Design Team; Quantity Surveyors; Sub-Contractors & Suppliers

Integration of Strategic Planning and Project Lifecycle

Item	Units	£ Price/Unit	£ Total Cost	Notes
Personnel				
BIM Manager	1	2000	2000	
Information Manager	1	1000	1000	
Coordination Manager	1	1000	1000	
BIM Application Specialist	3	1000	3000	
BIM Lead	4	800	3200	
BIM Reviewer/Modeler	16	600	9600	
BIM Detailer	6	500	3000	
Quantity Surveyors	3	500	1500	
Hardware				
BIM Private cloud	4	7000	24,000	Each cloud can hold up to 7 users
Monitors	42	210	8820	32 Monitors for BIM Modelers, 4 for BIM Lead, and 6 for BIM Detailer
Laptops	7	700	4900	
Smartphones	4	400	1600	For Management Level
iPads	4	350	1400	For Site Managers
Video Conferencing Equipment	1	600	600	
Software				
Autodesk Design Building Suite Ultimate	4	1930	7720	Annual subscription (Upgrade is free for subscription license)
Training				
For Management Level (2 Modules) *	3	400	1200	
For Production Level (8 trainees per month) (9 Modules) *	8	1800	14,400	* Price refers to the cost of assigned training modules (Module = £200)
For Quantity Surveyor and Site Team (4 Modules) *	3	800	2400	
Data Migration				
BIM Standards Development	3	1500	4500	Project Templates for Architectural, Structural, and MEP Disciplines
Converting CAD Library to BIM Library		6000	6000	
Publication				
Documentation of BIM Standards and Workflows (BIM handbook)		4000	4000	
System Integration				
System Integration		1500	1500	
Emergency and troubleshooting		4000	4000	
BIM Consultancy				
Support		10,000	10,000	
Overall Management		40,000	40,000	

Results

$$\frac{\left(B-\left(\frac{B}{1+E}\right)\right)x(12\cdot C)}{A+(B\,x\,C\,x\,D)} = \text{First Year ROI}$$

A = cost of hardware and software (dollars)
B = monthly labor cost (dollars)
C = training time (months)
D = productivity lost during training (percentage)
E = productivity gain after training (percentage)

AUTODESK® REVIT® BUILDING INFORMATION MODELING

BIM's Return on Investment

This paper delves into the return on investment (ROI) for building information modeling solutions - what variables to consider, a sample formula and typical numbers, and a heads-up as to what the ROI metric overlooks.

Results

Total monthly labor cost B = (2000+1000+1000+3000+800+600+500+500) + (1200+14400+2400) ≈ £42,300

Total cost of hardware + software + BIM Consultancy A = (24000+8820+4900+1600+1400+600) + (7720) + (4500+6000+4000+1500+4000+1000+40000) ≈ £119,000

Training time = 3 months

Productivity lost during training: 70% (4 hours training, and 2 hours for practice of 8 hours working day)

Productivity gain after training: 25%

First year ROI = [42300 - (42300 / 1 + 0.25)] * (12 - 3) / [119000 + (42300*3*0.7)] = 36%

The decision to invest in BIM should be weighed heavily against the scale and complexity of a project. Considering the scale and complexity of the ‘XX’ project, the ROI seems to be a healthy indication.

Results

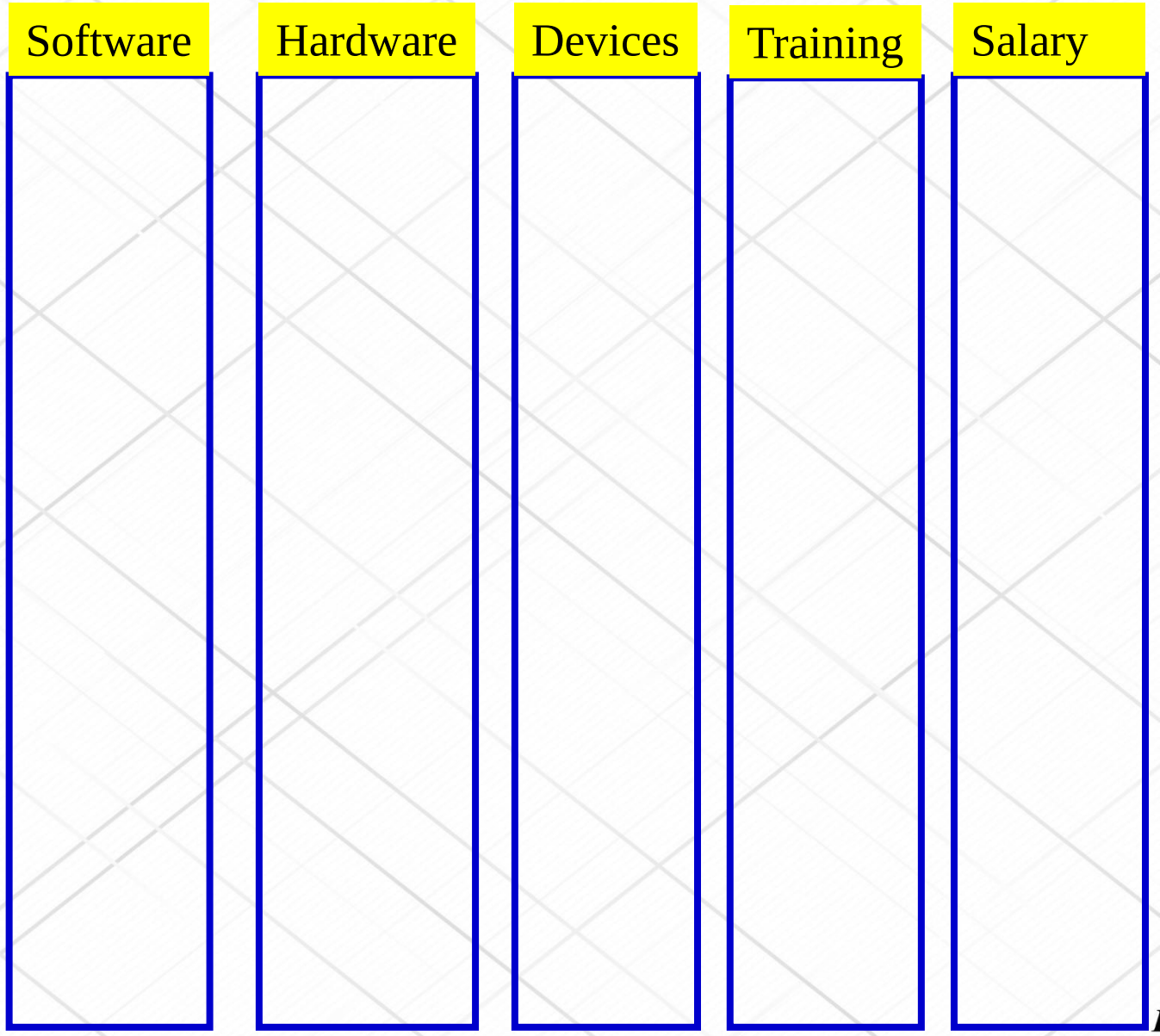
Where do you get the salary rates, unit rates of software and hardware, etc.

- ❑ Vendors' website
- ❑ Website of advertised jobs
- ❑ Make calls

Results

Challenge (Assumptions)
C: Training time
D: Productivity lost during training
E: Productivity gain after training

Results



Conclusions

- Project lifecycle+SWOT+Brainstorming
- Technology
- Cost

Resources

Abanda F.H. & Whitlock K. (2017) Making a business case for BIM adoption. In: ICEASSM, 18th - 21st April, Accra, Ghana

Abdel-Tawab M. and Abanda F.H. (2021) Digital Technology Adoption and Implementation Plan: A Case of the Egyptian Construction Industry. 4th International Conference on Building Information Modeling, 18-20th October 2021, Iran. http://bimconf.com/en/

Amin K. F. & Abanda F.H. (2017) Developing a business case for BIM for a design and build project in Egypt. In: ICEASSM, 18th - 21st April, Accra, Ghana