



Simon Ashworth, Mitarbeiter am IFM der ZHAW, Referent

- Sein Forschungsschwerpunkt liegt auf BIM und anderen Digitalisierungsthemen in Bezug auf Immobilien und FM.
- Er verfügt über mehr als 20 Jahre praktische FM-Erfahrung aus den Unternehmen Serco sowie der britischen Verteidigungsakademie
- Kürzlich promovierte er an der John Moores University in Liverpool über FM und BIM.
- Seine Forschungsergebnisse sind unter [Researchgate](#) frei verfügbar



Wolfgang Perschel Vorstand IFMA, conrealis ag, Moderation

- Er studierte an der ETH Zürich Informatik und Architektur
- Er dozierte an der FHS St. Gallen, der ZHAW, der BFH Burgdorf und an der ETH Zürich
- In verschiedenen Gremien setzt er sich für die Weiterentwicklung von Normen und Richtlinien im Facility Management ein
- Er ist Gründer und Mitinhaber der conrealis ag, die sich mit Prozessen, Organisationen und Systemen im Real Estate beschäftigt

IFMA MEETS
KRITISCHE ERFOLGSFAKTOREN FÜR
ERFOLGREICHE BIM-PROJEKTE



**WEBINAR MIT
SIMON ASHWORTH**

Datum: 28.1.2021
Zeit: 16.30-17.30
Ort: online



Critical Success Factors for BIM Projects

28th January 2021



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Researchgate



Link



Klaus Schwab who coined the phrase 'IR4.0' summed up its potential impact:

“We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before” (2015).

WELCOME

Agenda:

1. Introduction
2. Methodology and research design
3. Overview of framework
4. Examples
5. Further information and training

Q&A

1. Introduction

BIM ... is not just a technology or a process. It is a mindset for the entire built environment. It is changing the way we design, build and **operate our facilities**.

Welcome ...to my PhD BIM journey!

Background

Experience:

20+ years in FM
ZHAW Lecturing

Practical management roles:

FM, PM, transition
Design, projects & construction

Qualifications:

MSc-FM, MEng, BEng-Civil
PhD “FM and BIM”



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PhD & 'FM-BIM Mobilisation Framework'

THE EVOLUTION OF FACILITY MANAGEMENT (FM)
IN THE BUILDING INFORMATION MODELLING (BIM) PROCESS:

AN OPPORTUNITY TO USE CRITICAL SUCCESS FACTORS (CSF)
FOR OPTIMISING BUILT ASSETS

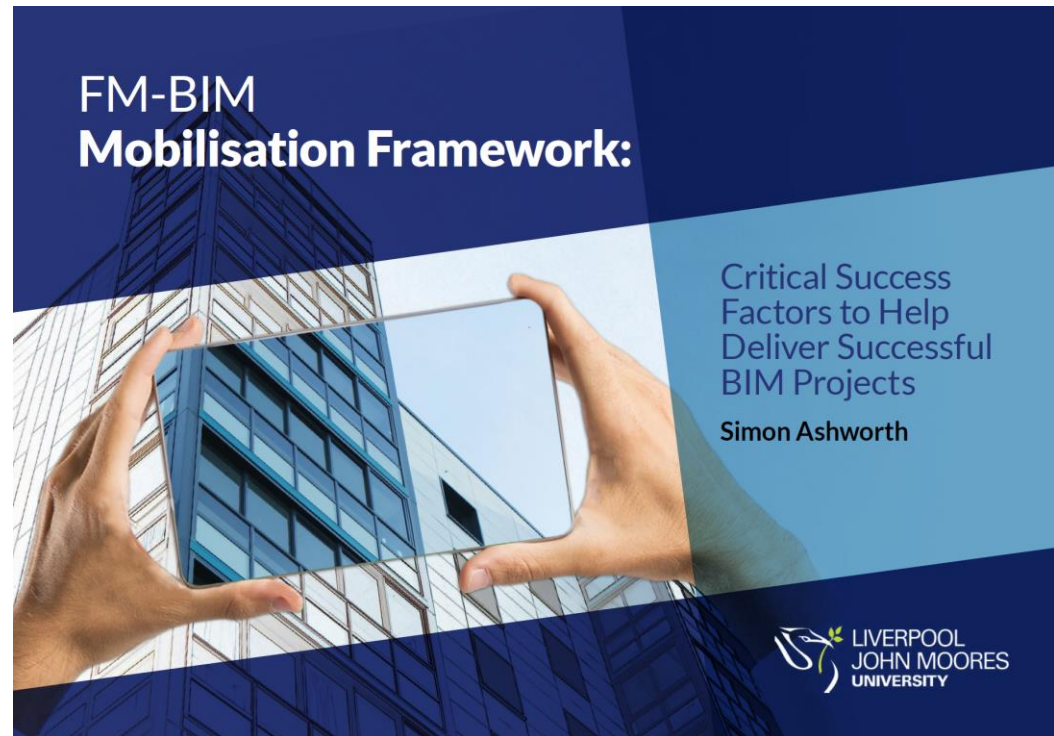
SIMON JAMES ASHWORTH

A thesis submitted in partial fulfilment of the
requirements of Liverpool John Moores University
for the degree of Doctor of Philosophy

August 2020

<http://researchonline.ljmu.ac.uk/id/eprint/14250>

Output: to help professionals in industry

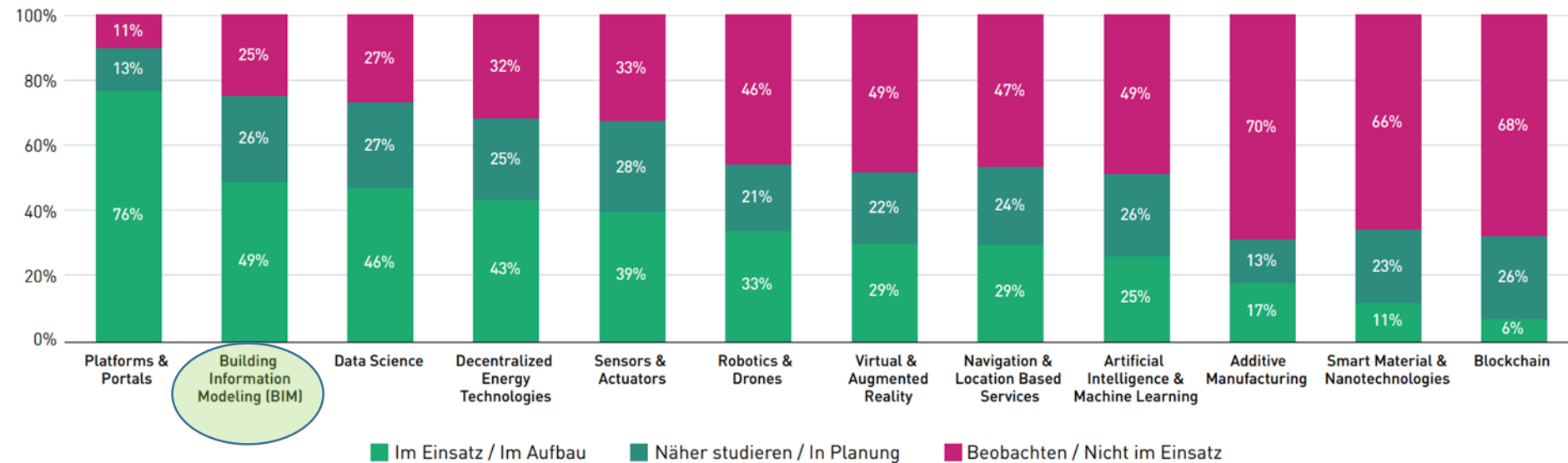


PDF: Checklist with links to useful sources

https://www.researchgate.net/profile/Simon_Ashworth2/research

BIM in the digital-trends landscape

Abbildung 6: Einsatz digitaler Technologien in der Immobilienwirtschaft



pom+ (2020) - <https://www.digitalrealestate.ch/products/digital-real-estate-index-2020>

Unclear requirements



How the customer explained it



How the Project Leader understood it



How the Analyst designed it



How the Programmer wrote it



How the Business Consultant described it



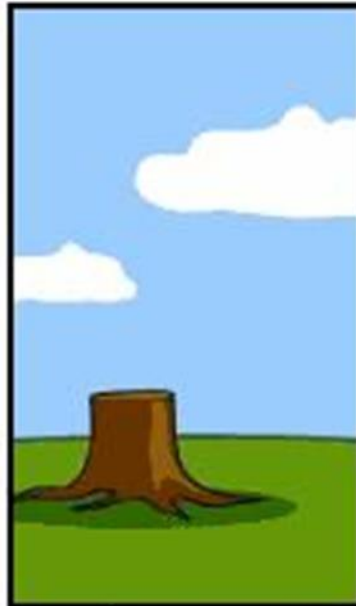
How the project was documented



What operations installed



How the customer was billed



How it was supported



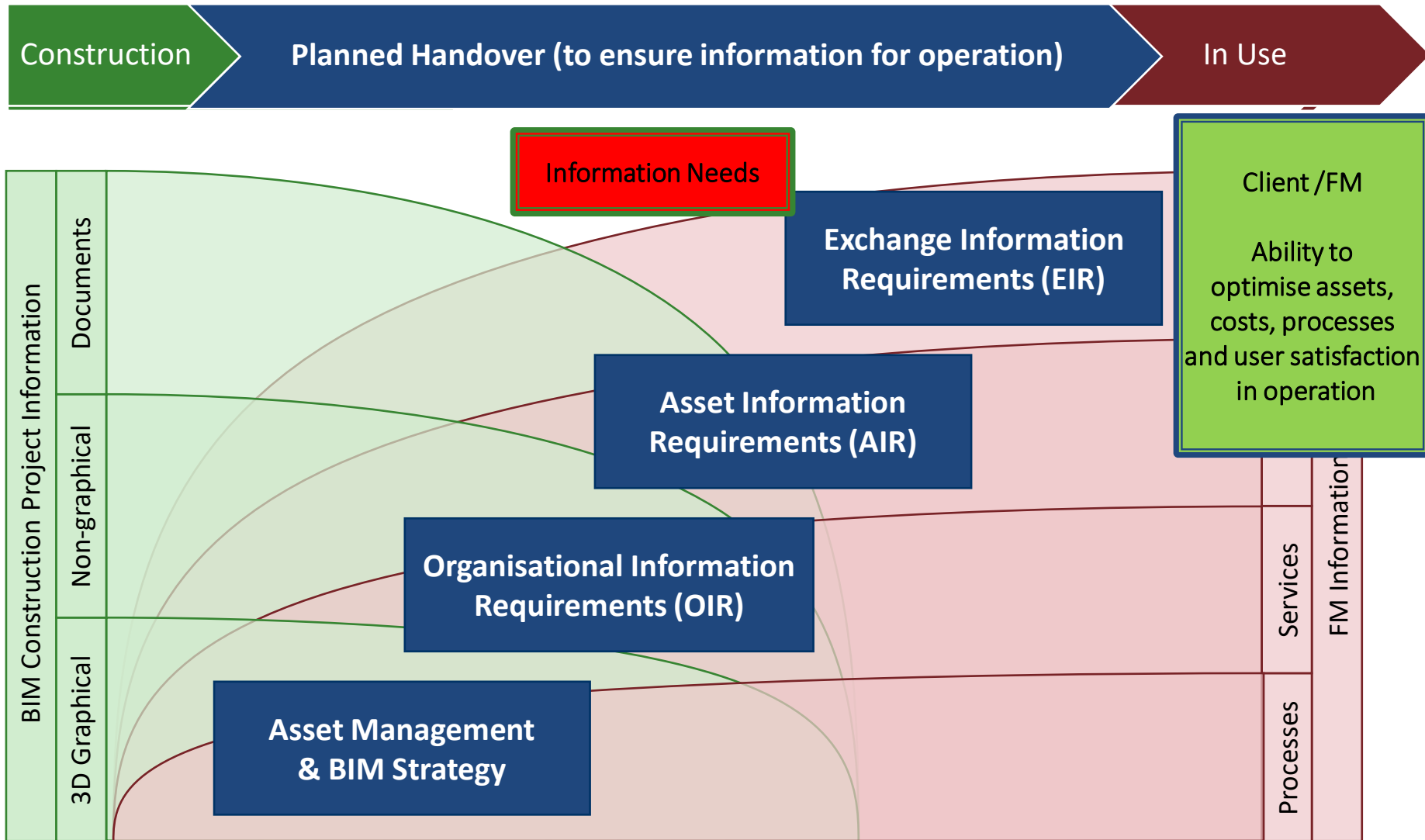
Dissapointment

What the customer really needed

Avoiding disappointment



Challenge: for facility managers

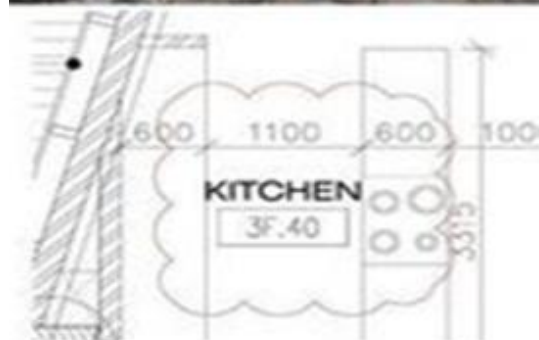
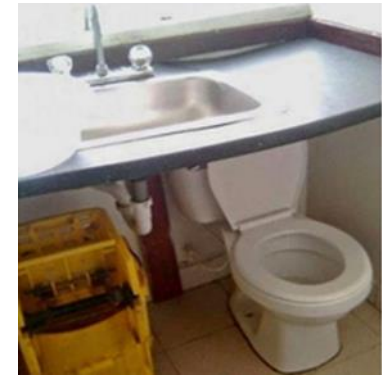


How can FM benefit from BIM?



Avoid poor design decisions

To improve communication/collaboration?



Avoid costly mistakes

To improve design and usability?

Digital Twin: improve a design before its built

Digital Briefing
& Digital
Procurement



Optimised
Operation

- Resolve issues in a virtual world before they become problems
- Understand how asset will work in operation
- Ensure information needed to optimise is available at handover

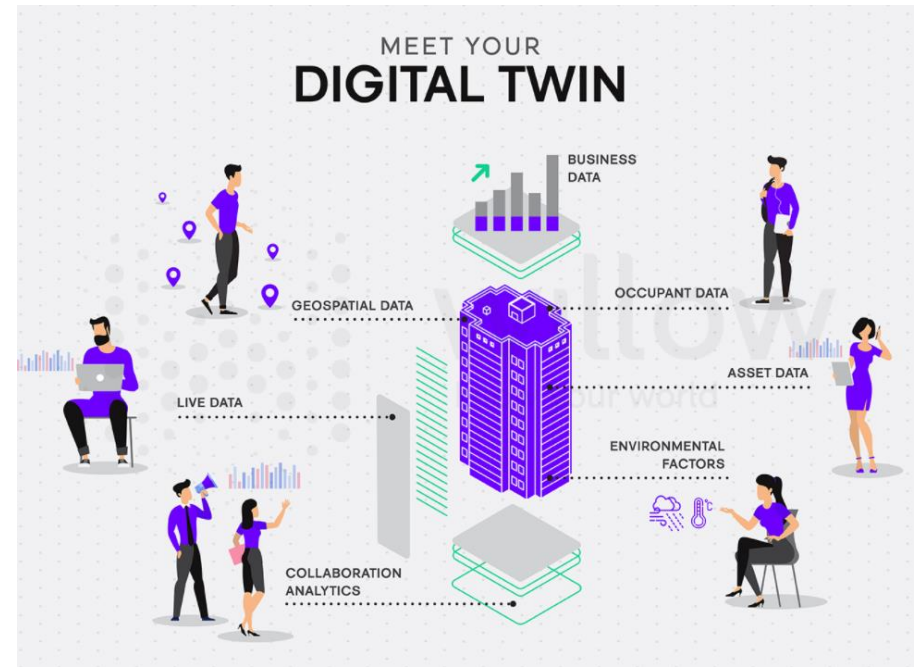
Visualise & solve problems before they occur

To work in digital ways

We need to move
from this to...



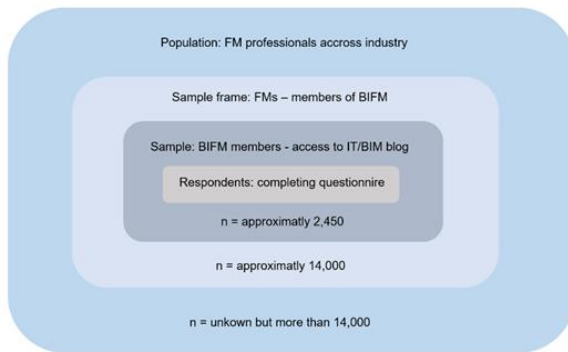
Information



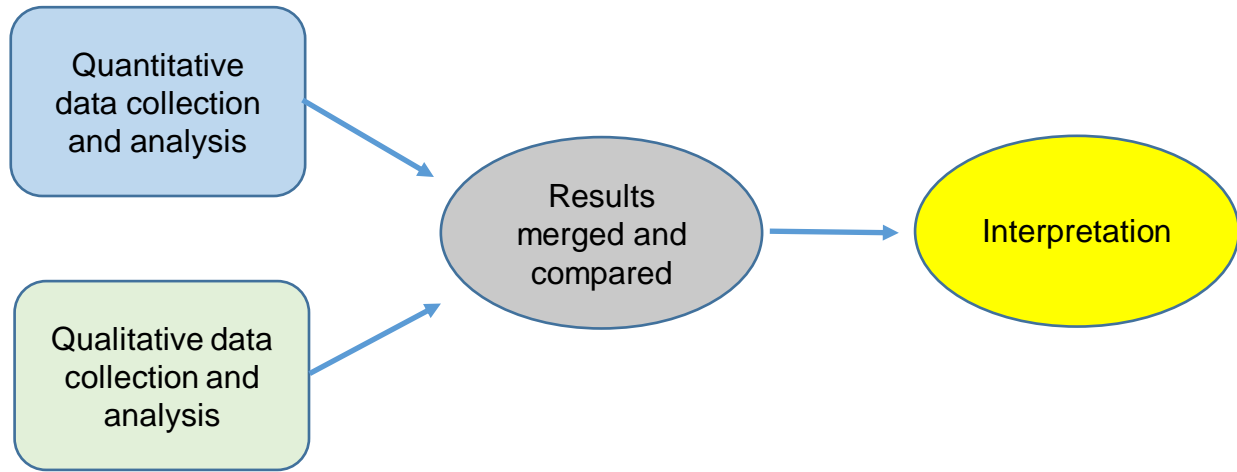
Improve access to information

2. Methodology and research design

What are the CSF in terms of relevant knowledge, skills and competences, which will empower FMs to fully engage with the BIM process and ensure that BA can be optimised in operation?



254 responses



19 FM/BIM experts

CONVERGENT DESIGN

Mixed methods approach with 'side-by-side' narrative analysis

No	Role/Function	Location	Gender	Age	Stakeholder	Work experience	Type of organisation	Interview
1	Director	UK	Female	52	Client and FM consultant	FM, BIM and WLC	FM supplier	08.05.2017
2	Facility Manager	UK	Male	41	Client	FM and BIM	Local government	08.05.2017
3	Director and IT & BIM Consultant	UK	Male	57	BIM consultant & standards advisor	AEC consultancy BIM	AEC & BIM consultancy	09.05.2017
4	Architect & BIM Coordinator	UK	Male	37	Architect & BIM advisor for design teams	Architecture, BIM	Architectural design house	09.05.2017
5	Senior Solicitor	UK	Female	39	Legal advisor & BIM consultant	Legal advice and BIM consultancy	Construction company	10.05.2017
6	BIM Technologist	UK	Female	33	Lead BIM modeller information management	BIM and BIM modelling	Architect practice	10.05.2017
7	Managing Director	UK	Male	53	FM consultant, BIM & CAFM expert	FM, CAFM and BIM software	FM, CAFM & BIM software consultants	11.05.2017
8	Global BIM & Information Director	UK	Male	54	Client advisors for WLC project delivery	WLC projects, BIM, standards	Consultancy, civil and infrastructure	12.05.2017
9	Director for BIM Strategy	UK	Male	50	Advisor for OPEX and CAPEX clients	AEC, BIM policy and standards	All aspects of built environment	12.05.2017
10	Director & Head of Property Management	UK	Male	47	Client, FM and BIM expert and champion	FM, BIM and project management	Financial services and banking	15.05.2017
11	Director Asset Strategy and Maintenance	Australia	Male	59	Client and FM/AM management	FM, BIM, AM and AM strategy	Health (previous Sydney Opera House)	16.05.2017
12	Director of Research and Innovation	UK	Male	42	Advisor for the AEC technical design	BIM, architect, engineer	Information delivery to the AEC industry	17.05.2017
13	Director	UK	Male	50	Advisor to clients & AEC companies	BIM and standards developer	Consultancy to the built environment companies	17.05.2017
14	Strategic Development Director	UK	Male	48	FM and BIM consultant/advisor	FM, BIM, PFI, construction, WLC	Construction company with FM division	18.05.2017
15	Managing Director	UK	Female	50	Client agent, FM advisor and provider	FM, BIM, WLC, construction	FM services globally for private/public clients	08.06.2017
16	Director/Management Consultant	UK	Male	65	FM consultant and service operations	FM, WLC, BIM	Public sector health and education projects	14.06.2017
17	National Acc Director	UK	Male	50	Design consultants	FM, AM, WLC, projects	Higher and further education	15.06.2017
18	Chief Executive	UK	Male	50	AEC design advisors	BIM, information management	AEC industry	16.06.2017
19	Associate	UK	Male	33	Consultant and client advisor	BIM, FM and project management	BIM advisors to clients and AEC professionals	17.06.2017

Quantitative: online questionnaire

254 responses



[https://www.researchgate.net/publication/319159345 FM Awareness of Building Information Modelling BIM August 2017](https://www.researchgate.net/publication/319159345_FM_Awareness_of_Building_Information_Modelling_BIM_August_2017)

Quantitative: CSF list

QUAN_CSF main-themes (MT) and sub-themes (ST)
CSF_QUAN_MT1 - General awareness of BIM and its impact on FM
ST_QUAN_T1.1-Awareness of existence of BIM
ST_QUAN_T1.2-Impact of BIM on FM industry
ST_QUAN_T1.3-BIM supporting FM
ST_QUAN_T1.4-Timescales for BIM to impact on FM
CSF_QUAN_MT2 - General perception/understanding of BIM by FM industry
ST_QUAN_T2.1-FM industry understanding of BIM
ST_QUAN_T2.2-BIM improving collaboration
ST_QUAN_T2.3-FM familiarisation with the RIBA process
ST_QUAN_T2.4-BIM for existing buildings
ST_QUAN_T2.5-BIM adding value to FM
ST_QUAN_T2.6-FM industry readiness for BIM
ST_QUAN_T2.7-BIM improving data transfer
ST_QUAN_T2.8-Early involvement of FM
ST_QUAN_T2.9-BIM as a competitive advantage
ST_QUAN_T2.10-Need for BIM familiarisation
CSF_QUAN_MT3 - FMs experience of preparing/using key BIM documentation
ST_QUAN_T3.1-Experience of a BIM project
ST_QUAN_T3.2-General experience of key BIM documents
ST_QUAN_T3.3-Experience of writing BIM documents
ST_QUAN_T3.4-Confidence levels - reviewing/writing BIM documents
CSF_QUAN_MT4 - Asset management strategy (AMS) and BIM in respondents' organisations
ST_QUAN_T4.1-Lack of key BIM documents in respondent's organisation
ST_QUAN_T4.2-Lack of organisation asset management strategy (AMS)
ST_QUAN_T4.3-BIM documents in place and being used
CSF_QUAN_MT5 - Benefits of BIM to FM
ST_QUAN_T5.1-Key benefits of BIM to FM
CSF_QUAN_MT6 - Possible barriers/concerns to adoption and use of BIM
ST_QUAN_T5.1-Key barriers/concerns to adoption and use of BIM
CSF_QUAN_MT7 - Knowledge of UK BIM standards and guidance
ST_QUAN_T7.1-Knowledge of key BIM standards and guidance (ranked)
ST_QUAN_T7.2-Lack of familiarisation with UK standards
ST_QUAN_T7.3-AM, Planning and LCC standards (Non-BIM specific)
ST_QUAN_T7.4-BIM standards with respect to specific BIM standards/guidance
ST_QUAN_T7.5-BIFM (IWFM) BIM guidance documents
ST_QUAN_T7.6-Other useful BIM guidance documents

- Statistics to test hypothesis
- 10 Main Themes (MT)
- 47 Sub-themes (ST)
- **Numbers & Text – converted to narrative text**

QUAN_CSF main-themes (MT) and sub-themes (ST)
CSF_QUAN_MT8 - BIM supporting the UK Government construction strategy
ST_QUAN_T8.1-BIM helping meet the Government 2025 strategic targets
ST_QUAN_T8.2-Awareness of the UK BIM mandate
ST_QUAN_T8.3-Awareness of maturity levels of BIM
ST_QUAN_T8.4-Awareness of BIM Level 3 strategy
ST_QUAN_T8.5-Awareness of government sponsored BIM websites
CSF_QUAN_MT9 - BIM training within respondent's organisations
ST_QUAN_T9.1-BIM training within respondent's organisations
ST_QUAN_T9.2-Organisation BIM training plans in place for staff
ST_QUAN_T9.3-Organisation resources/funding for BIM training
ST_QUAN_T9.4-Organisation in-house BIM expertise used to conduct in-house training
ST_QUAN_T9.5-Organisation plans in place to actively evaluate BIM training
ST_QUAN_T9.6-Employee benefit from BIM certification or further BIM training
ST_QUAN_T9.7-Level of BIM training, education and support in organisations
ST_QUAN_T9.8-Sources and types of training and education
CSF_QUAN_MT10 - Digitalisation and technology impact on FM
ST_QUAN_T10.1-Impact of digitalisation and technology on FM
ST_QUAN_T10.2-Using BIM to help visualise and market buildings and services
ST_QUAN_T10.3-Using BIM with VR,AR and MR
ST_QUAN_T10.4-Maintaining BIM models
ST_QUAN_T10.5-Software tools to help optimise the use of BIM for FM

Qualitative: 19 FM/BIM experts

NVivo used for analysis

Nodes

- ▶ Name
- A01. Gender
- A02. Job function
- A03. Organisation business sector
- A04. Stakeholder role in WLC
- A05. Interaction with other WLC stakeholders
- B06. Experience of FM, WLC and BIM
- B07. Organisation use of BIM
- B08. Experience of BIM strategy, OIR, AIR, EIR or BEP
- B09. RIBA PoW familiarisation
- B10. BIM project mobilisation experience
- C MAIN THEME 01 - GOVERNMENT POLICY AND ITS IMPACT ON FM INDUSTRY
 - ST 1.1 Realising value over the WLC of built assets
 - ST 1.2 Impact of government policy on the FM industry
 - ST 1.3 FM Industry readiness for BIM
 - Challenges around validating data that is handed over
 - Education about BIM
 - FM readiness and willingness to engage with BIM
 - Issues with OPEX vs. CAPEX perspectives in the BIM process

Identification of qualitative CSF MT and ST

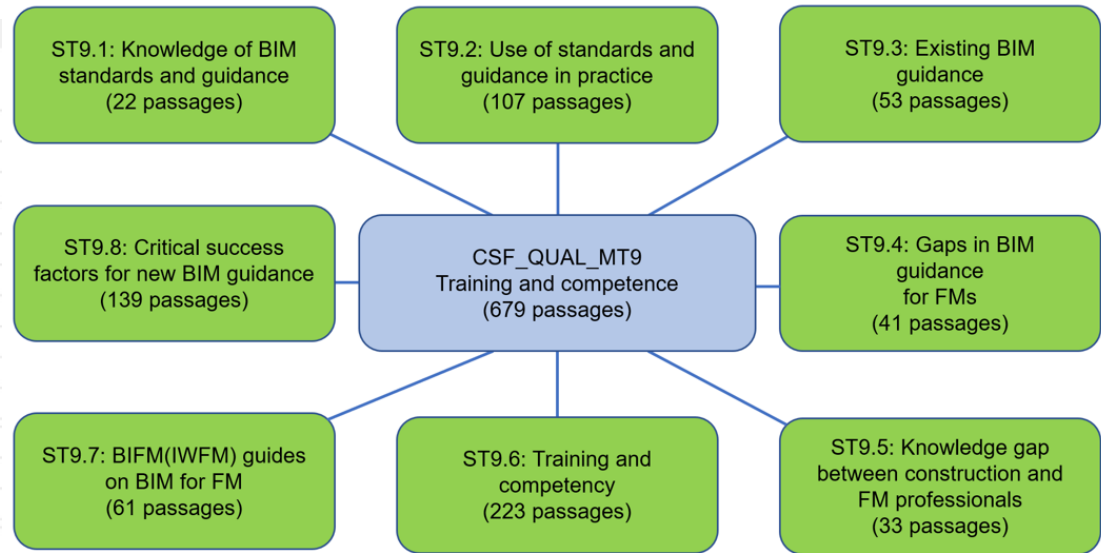


Figure 11.8: CSF_QUAL_MT9: Training and competence

Qualitative: CSF list

- 110,000 words of text
- 3380 passages of text
- 10 Main Themes (MT)
- 45 Sub-themes (ST)

Qualitative CSF MT and ST	Passages
CSF_QUAL_MT1: Government policy impact on FM industry	240
ST_QUAL_T1.1 Realising value over the WLC of built assets	99
ST_QUAL_T1.2 Impact of government policy on the FM industry	82
ST_QUAL_T1.3 FM Industry Readiness for BIM	59
CSF_QUAL_MT2: Barriers and challenges to the adoption and use of BIM	221
ST_QUAL_T2.1 Key barriers and concerns to the adoption and use of BIM	221
CSF_QUAL_MT3: Benefits of BIM to FM	380
ST_QUAL_T3.1 Transparency of benefits	65
ST_QUAL_T3.2 Key benefits of BIM to FM	315
CSF_QUAL_MT4: Digitalisation and technology	206
ST_QUAL_T4.1 Understanding digital trends and their interconnection	39
ST_QUAL_T4.2 Using technology to improve collaboration and access to data	36
ST_QUAL_T4.3 Linking external databases to BIM models	22
ST_QUAL_T4.4 IT systems, security, CDE and BIM related processes	39
ST_QUAL_T4.5 Exchange formats (IFC, COBie etc.), classification and data structure	29
ST_QUAL_T4.6 BIM viewer tools and mobile technology	28
ST_QUAL_T4.7 Webtools, social media and conferences for knowledge and networking	13
CSF_QUAL_MT5: Strategic management and use of information	461

Qualitative CSF MT and ST	Passages
ST_QUAL_T5.1 Importance of linking AM and BIM strategies and having good OIR and AIR	157
ST_QUAL_T5.2 Defining information needed and responsibilities from CAPEX to OPEX	94
ST_QUAL_T5.3 Critical success issues for a good EIR in the BIM process	108
ST_QUAL_T5.4 Maintaining BIM models and the quality of data and information after handover	102
CSF_QUAL_MT6: People in the BIM process and improving collaboration	273
ST_QUAL_T6.1 Perception of FM by other stakeholders	55
ST_QUAL_T6.2 Improved collaboration between stakeholders in the BIM process	58
ST_QUAL_T6.3 Early engagement of FM in the BIM process	77
ST_QUAL_T6.4 The social aspects of BIM supporting people and society	37
ST_QUAL_T6.5 people in the BIM process	46
CSF_QUAL_MT7: Role of FM in the BIM process	299
ST_QUAL_T7.01 Leadership and engaging and advising clients about BIM	43
ST_QUAL_T7.02 Developing AM strategy, (EIR, OIR,AIR) and identifying data requirements	52
ST_QUAL_T7.03 Defining data structures (IFC/COBie etc.) and CAFM systems	21
ST_QUAL_T7.04 OPEX budget and WLC planning	19
ST_QUAL_T7.05 BIM knowledge and guiding people through the BIM process	13
ST_QUAL_T7.06 Helping/providing D&C teams on designs to improve operational & WLC decisions	26
ST_QUAL_T7.07 Giving feedback to D&C teams to improve operational & WLC decisions	33
ST_QUAL_T7.08 Handover planning, soft Landings and lessons learnt	42
ST_QUAL_T7.09 Identifying client needs and using FM knowledge to help improve BIM process	32
ST_QUAL_T7.10 Validating data and keeping BIM models and data up to date	18
CSF_QUAL_MT8: Key BIM standards and guidance for FM	194
ST_QUAL_T8.1 Key standards/guidance perceived as useful to FM (ranked by frequency)	194
CSF_QUAL_MT9: Training and competency	679
ST_QUAL_T9.1 Knowledge of BIM Standards & Guidance	22
ST_QUAL_T9.2 Use of standards and guidance in practice	107
ST_QUAL_T9.3 Existing BIM guidance	53
ST_QUAL_T9.4 Gaps in BIM guidance for FMs	41
ST_QUAL_T9.5 Knowledge gap - construction and FM	33
ST_QUAL_T9.6 Training and competency	223
ST_QUAL_T9.7 BIFM -IWFM guides on BIM for FM	61
ST_QUAL_T9.8 CSF for new BIM guidance	139
CSF_QUAL_MT10: Data and information transfer in the BIM process	427
ST_QUAL_T10.1 Knowledge and transfer of quality data	57
ST_QUAL_T10.2 Transfer of data into CAFM and FM systems	182
ST_QUAL_T10.3 Standardised data transfer using COBie and IFC	145
ST_QUAL_T10.4 Improving data handover processes and future possibilities	43
Total passages of text used in the qualitative analysis	3380

Merging the CSF: Main Themes

CSF: «side-by-side» MT considered – do they «converge» or «diverge»

New MT to help clarify the titles for use by practitioners in the 'FM-BIM Framework'

Qualitative CSF MT	Converge or Diverge	Quantitative CSF MT	No	CSF MT 'Final List' - Renamed for use in FM-BIM Framework
CSF_QUAL_MT1 - Government policy impact on FM industry	Converge	CSF_QUAN_MT8 - BIM supporting the UK government construction strategy	MT1	Implementing BIM with a WLC approach to support sustainability and UK government construction strategy targets
CSF_QUAL_MT2 - Barriers and challenges to the adoption and use of BIM	Converge	CSF_QUAN_MT6 - Possible barriers/concerns to adoption and use of BIM	MT2	Addressing and overcoming perceived barriers and challenges to adoption and use of BIM
CSF_QUAL_MT3 - Benefits of BIM to FM	Converge	CSF_QUAN_MT5 - Benefits of BIM to FM	MT3	Making the benefits of BIM to the operational phase of assets transparent, realistic and achievable
CSF_QUAL_MT4 - Digitalisation and technology	Converge	CSF_QUAN_MT10 - Digitalisation and technology impact on FM	MT4	Recognising the importance of digitalisation and technology to FM and the BIM process
CSF_QUAL_MT5 - Strategic management and use of information	Converge	CSF_QUAN_MT4 - Asset management strategy (AMS) and BIM in respondent's organisations	MT5	Planning the strategic and operational information needs for FM in the BIM process
CSF_QUAL_MT6 - People in the BIM process and improving collaboration	Converge	CSF_QUAN_MT1 - General awareness of the existence of BIM and its impact on FM CSF_QUAN_MT2 - General perception/understanding of BIM by the FM industry	MT6	Improving stakeholder collaboration and understanding of the BIM process
CSF_QUAL_MT7 - Role of FM in the BIM process	Converge	CSF_QUAN_MT3 - FM's experience of preparing/using key BIM documentation	MT7	Clarifying the role and tasks of FMs in the BIM process
CSF_QUAL_MT8 - Key BIM standards and guidance for FM	Converge	CSF_QUAN_MT7 - Knowledge of UK BIM standards and guidance	MT8	Acquiring essential knowledge of key BIM standards/guidance documents for practical use in a BIM project
CSF_QUAL_MT9 - Training and competency	Converge	CSF_QUAN_MT9 - BIM training within respondent's organisations	MT9	Ensuring people have adequate BIM training and competency skills to successfully engage in BIM projects
CSF_QUAL_MT10 - Data and information transfer in the BIM process	Diverge		MT10	Ensuring successful transfer/ongoing management of information/data for the operational phase of assets

Merging the CSF: Sub-themes

CSF: Then ST considered for «convergence» or «divergence»

CSF_QUAL_MT1 - Government policy impact on the FM industry	Converge or Diverge	CSF_QUAN_MT8 - BIM supporting the UK government construction strategy
<p>ST_QUAL_T1.2 Impact of government policy on FM</p>	Converge	ST_QUAN_T8.1-BIM helping meet government 2025 strategic targets
<p>ST_QUAL_T1.3 FM Industry Readiness for BIM</p>	Diverge	
	Diverge	ST_QUAN_T8.2-Awareness of the UK BIM mandate
	Diverge	ST_QUAN_T8.3-Awareness of maturity levels of BIM
	Diverge	ST_QUAN_T8.4-Awareness of BIM level 3 strategy
	Diverge	ST_QUAN_T8.5-Awareness of government sponsored BIM websites

The qualitative and quantitative ST were compared using the 'side-by-side' comparison technique. The second row shows an example where ST were considered to 'converge' i.e. 'QUAL_T1.2' with a focus on 'Impact of government policy on FM' was considered 'similar' with 'QUAN_T8.1' focused on 'BIM helping meet government 2025 strategic targets'

More ST were considered to 'diverge' as often they were not 'similar' when comparing the qualitative and quantitative ST

Final CSF list

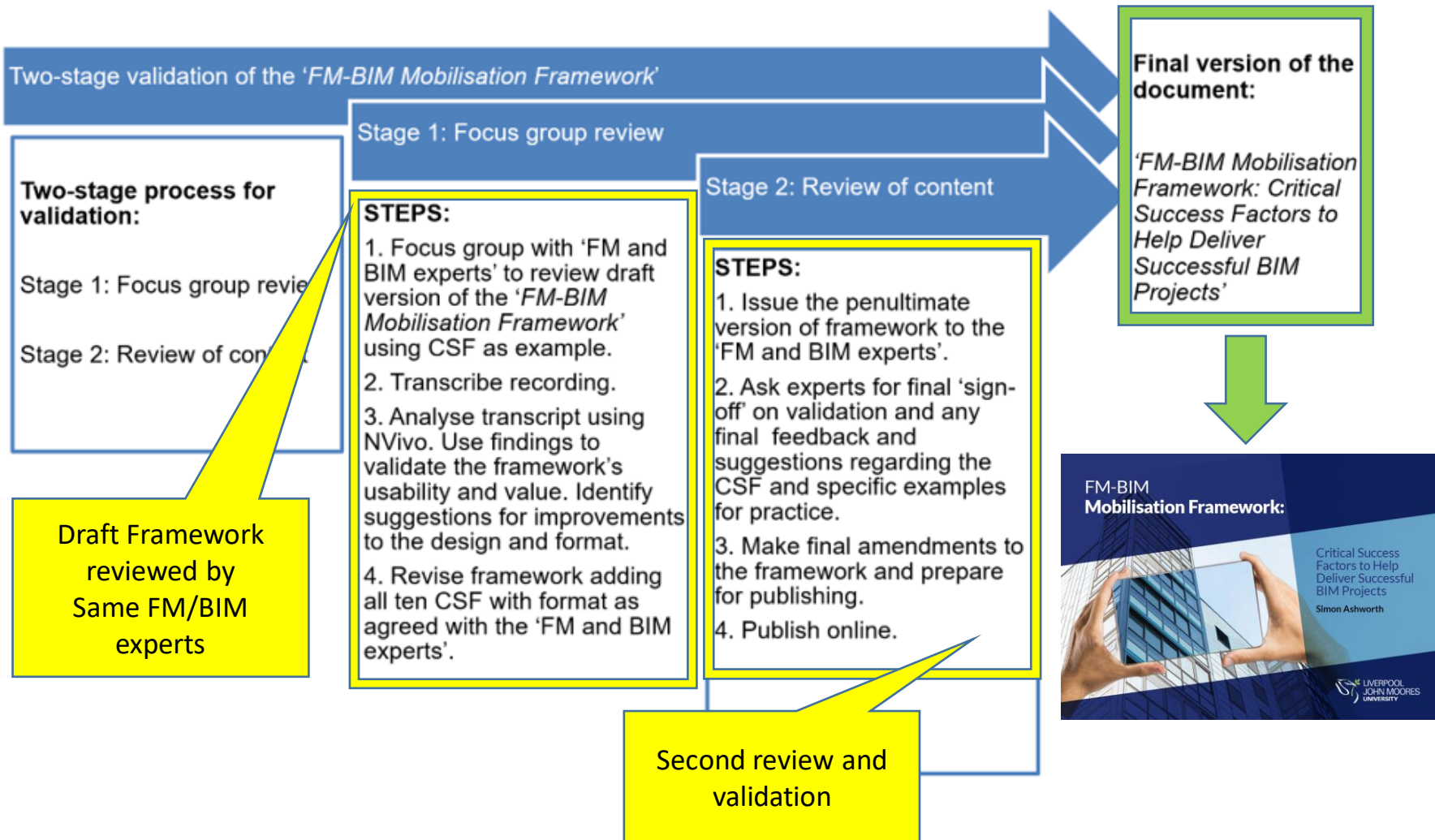
CSF MT1	Implementing BIM with a WLC approach to support sustainability and UK government construction strategy targets
ST 1.1	Using BIM to maximise the long-term value and ROI of built assets
ST 1.2	Using BIM to reduce operational costs, improve sustainability and help meet government 2025 targets
ST 1.3	FM readiness to engage in BIM projects
ST 1.4	Making the benefits of BIM to the operational phase of assets transparent, realistic and achievable
ST 1.5	Planning the strategic and operational information needs for FM in the BIM process
ST 1.6	Improving stakeholder collaboration and understanding of the BIM process
ST 1.7	Clarifying the role of, and tasks of FMs in the BIM process
CSF MT2	Recognising the importance of digitalisation and technology to FM and the BIM process
ST 2.1	Awareness of digital trends and their potential impact on FM
ST 2.2	Using technology/software tools to help improve collaboration and sharing of data
ST 2.3	Linking BIM models to external databases
ST 2.4	Set up of the CDE and ensuring security of BIM data
ST 2.5	Ensuring data is correctly structured for efficient information exchange
ST 2.6	Using BIM viewing tools/mobile technology to help improve FM services and access to information
ST 2.7	Using social media for knowledge sharing and networking
ST 2.8	Maintaining BIM models to ensure they remain up to date
CSF MT3	Addressing and overcoming perceived barriers and challenges to the adoption and use of BIM
ST 3.1	Upskilling FM teams to empower them for successful engagement in BIM projects
ST 3.2	Preparing people and organisations for full engagement in BIM projects
ST 3.3	Addressing concerns about costs associated with BIM and ROI
ST 3.4	Clearly articulating the value and benefit of BIM to FM and the operational phase of assets
ST 3.5	Setting realistic expectations of what BIM can deliver
ST 3.6	Addressing pessimism about BIM
ST 3.7	Understanding the need to focus on the quality of data rather than quantity
ST 3.8	Addressing concerns about the complexity of BIM
ST 3.9	Advising clients about BIM and how it might benefit them
ST 3.10	Deciding on the appropriate IT tools and whether to adopt an open or closed BIM approach
ST 3.11	Using case studies to document the benefits of BIM to FM
ST 3.12	Reviewing CAPEX/OPEX budgets to ensure a sustainable WLC approach
ST 3.13	Understanding legal implications for BIM projects
ST 3.14	Avoiding silo-working mentality and encouraging early FM engagement
ST 3.15	Assessing security and risks associated with BIM information
ST 3.16	Understanding and use of BIM acronyms
ST 3.17	Use of BIM/other standards with a KISS to ensure people can engage with BIM
ST 3.18	Using BIM for existing built assets and capturing 'as-built' records during construction
ST 3.19	Understanding the link between BIM, CAFM and FM management systems
ST 3.20	Ensuring standard classification systems are used to improve access and transfer of data/information
ST 3.21	Ensuring FM is fully and positively engaged with other stakeholders
ST 3.22	Understanding the possible impact of short-term FM contracts and data ownership in a BIM project
ST 3.23	Understanding the limitations of bi-directional transfer of data between BIM and FM systems
ST 3.24	Working with BIM processes and preparing good quality OIR, AIR and EIR documents
ST 3.25	Understanding the use of IFC/COBie for transfer of data into CAFM/other FM management systems

CSF MT4	Making the benefits of BIM to FM transparent, realistic and achievable
ST 4.1	Using case studies as reference material to help provide evidence of the benefits of BIM to FM
ST 4.2	Making the benefits of BIM clear and transparent
ST 4.3	Ensuring a WLC perspective is taken to realise the full potential of BIM to FM
ST 4.4	Measuring the benefits of BIM
ST 4.5	Planning realistic timelines for the realisation of benefits
ST 4.6	Ensuring access of good quality data from one place
ST 4.7	Increasing operational efficiency
ST 4.8	Improving strategic management of assets
ST 4.9	Using the visualisation power of BIM models to help improve FM planning and safety
ST 4.10	Improving the prediction of maintenance costs and ROI
ST 4.11	Improving sustainability and the transparency of WLC
ST 4.12	Helping collaboration with the design and construction teams
ST 4.13	Improving health, safety and risk management
ST 4.14	Supporting innovation, commercial models and use of visualisation technologies (AR, VR and MR) and AI
ST 4.15	Using BIM to improve procurement, tendering and for insurance
ST 4.16	Improving the handover from construction to operation
ST 4.17	Reducing the cost of transferring data from construction into FM management systems
ST 4.18	Avoiding abortive, disruptive or wasteful work
ST 4.19	Using BIM for benchmarking RE
ST 4.20	Providing added value by integrating BIM with other technology
ST 4.21	Using Retro-BIM techniques to provide additional information about existing assets
ST 4.22	Improving the handover process of quality information from construction to operation
ST 4.23	Using BIM to improve the advertising and management of space
CSF MT5	Planning the strategic and operational information needs for FM in the BIM process
ST 5.1	Using BIM to support an organisation's AM strategy
ST 5.2	Defining what FM information is needed from the CAPEX phase for the OPEX phase
ST 5.3	Ensuring a good EIR is in place which addresses client and FM needs
ST 5.4	Ensuring BIM models and quality information are updated and available
CSF MT6	Improving stakeholder collaboration and understanding
ST 6.1	Improving the perception of FM in BIM projects
ST 6.2	Using BIM to improve collaboration between stakeholder groups
ST 6.3	Ensuring FM readiness for early engagement in the BIM process
ST 6.4	Using BIM to meet government targets for improving assets & services
ST 6.5	Motivating and supporting people in the BIM process
ST 6.6	Preparing for the impact of BIM on the FM and AEC industries
ST 6.7	Using BIM to gain a competitive advantage
ST 6.8	Using BIM and other technologies to support FM delivery for clients
ST 6.9	Using BIM to help improve data transfer
CSF MT7	Clarifying the role of and tasks of FMs in the BIM process
ST 7.1	Supporting and advising clients in BIM projects
ST 7.2	Defining the EIR, OIR, AIR and FM information requirements
ST 7.3	Defining the data structure for BIM projects
ST 7.4	Considering the long-term OPEX budget in BIM projects
ST 7.5	Writing key BIM documents and providing guidance for client teams
ST 7.6	Helping design teams understand the information needs of FM
ST 7.7	Giving feedback to D&C teams to improve operational and WLC
ST 7.8	Using BIM to improve the handover process from construction to operation
ST 7.9	Identifying client needs and using FM know-how to help improve FM
ST 7.10	Validating data in BIM projects and keeping the BIM models up to date

CSF MT8	Acquiring essential knowledge of key BIM standards/guidance documents for practical use in a BIM project
ST 8.1	Using BIM standards and guidance in projects to achieve better outcomes for all stakeholders
ST 8.2	Other useful BIM guidance documents
CSF MT9	Ensuring people have adequate BIM training and competency skills to successfully engage in BIM projects
ST 9.1	Acquiring essential knowledge about BIM standards and guidance documents
ST 9.2	Using key BIM standards/guidance in practice
ST 9.3	Sources for EIR guidance, BIM books and BIM training courses
ST 9.4	Ensuring FM have the right guidance for engaging in BIM projects
ST 9.5	Bridging the digital knowledge gap between construction and operation
ST 9.6	BIM training for FM staff to ensure they have the necessary BIM and digital skills competencies
ST 9.7	Using the IWFM BIM guides to help improve FM engagement in BIM projects
ST 9.8	Essential tips for developing BIM guidance
CSF MT10	Ensuring the 'successful transfer and ongoing management' of '3D models, alphanumeric data and documents' for CAFM/FM systems
ST 10.1	Planning the data transfer and quality checking process for BIM projects
ST 10.2	Planning what data to collect and how to transfer it into FM management systems
ST 10.3	Using standards and a specific classification system to ensure data is well-structured to enable easy transfer from BIM models using COBie/IFC
ST 10.4	Bi-directional data transfer and improving data handover processes and future possibilities

- 10 Main Themes (MT)
- 100 Sub-themes (ST)

Validation: Two stages



FM/BIM expert feedback

Look, feel and structure of the Framework

- Nice simple layout and structure of the framework.
- Layout is very clear, organised and easy to navigate.
- CSF section explanations with MT and ST are clear.
- The checklists are a really good idea.
- Could be used as basis for tool (template) for projects.
- The CSF's could be adapted for individual project workflows.
- Information sections at the start of each of the MT act as good signposts to each of the 10 topics.
- Glossary of terms/abbreviations and appendices are well referenced and organised.
- The framework seems clear and very well structured.
- The framework is very well structured against critical success factors which is particular like.
- Will help FMs structure their own BIM journey and breaks the BIM challenge into bite size chunks.
- Provides a wealth of information and research for further reading and guidance.

Usability of Framework to different stakeholders

- Comprehensive end-to-end Framework for all stakeholders involved project delivery using BIM.
- CSF and extensive links will be helpful to all BIM stakeholders.
- Provides good WLC and sustainable asset procurement advice with a cradle-to-grave approach.
- Highlights the need for early FM involvement in BIM projects.
- Comprehensive resource for BIM project teams.
- Provides guidance for all stakeholders about BIM processes.
- Importance resource for designers and contractors to get better understanding of asset information requirements.
- The Framework can help FMs improve their BIM knowledge.
- Useful guide for CAPEX teams re information needed by the OPEX teams.
- Layout is easy to understand, logical in approach.
- Recognises the importance of digitisation and the need for a common data environment for project teams.
- Identifies a need to keep BIM data and models current.
- It should be nationally adopted by the UK BIM Alliance.

FM-BIM Mobilisation Framework

Impact & contribution of Framework to industry

- Framework will have a positive impact on the common understanding, objectives and desired outcomes for the project and the associated data/information.
- Helps professionals providing guidance especially around BIM processes and concepts.
- The guidance needs to be supported by professionals with expertise in the specialist field.
- The framework will have a positive impact on the FM industry because it will help FM acquire the digital skills needed today.
- Is a positive step towards educating FM as a sector about the benefits of BIM.
- Will help create a common language between AEC and FM/Property and Asset management.
- The framework will have a positive impact, taking away the complexity of BIM and bringing together all of the previous research.
- The framework aligns research and information to the specific use case or need.

Usability and flexibility for individual BIM projects

- Users can interpret each CSF for their own purpose.
- The fact you can easily search through the PDF and that it is linked to resources and other sections is very helpful
- Teams can adapt Framework to suite specific needs.
- Superb starter checklist for tailoring to projects.
- Can help delivery teams understanding the best project outcomes and operational deliverables.
- Stakeholders can use sections that are just relevant to them.
- Important to help readers understand the important MT and ST.
- Good reference guide and check list for FMs.
- Good for checking use of BIM during the O&M processes.
- Main benefit is acquiring the necessary knowledge for implementing BIM in FM tasks.
- Can be used to understand BIM at different project stages
- Useful as an upskilling tool.
- Will help people structure the engagement and information needs through the life of the project.
- Will be 'go-to tool' for people getting up to speed and not be overwhelmed by the challenge of being involved in BIM.

3. Overview of Framework

LIVE DEMO

FM-BIM Mobilisation Framework:

Aimed at FMs but
also useful to other
whole life process
professionals

Critical Success
Factors to Help
Deliver Successful
BIM Projects

Simon Ashworth



Online tool
(Searchable PDF)
For industry professionals

4. Examples - 10 CSF

FM-BIM Mobilisation Framework: Critical Success Factors to Help Deliver Successful BIM Projects

Index

1. Introduction
2. Guidance for using the FM-BIM Mobilisation Framework
3. Summary list of Critical Success Factors (CSF)
4. Tables: CSF Main-Themes (MT) and Sub-Themes (ST)

- CSF 1:** Implementing BIM with a WLC approach to support sustainability and UK government construction strategy targets
- CSF 2:** Recognising the importance of digitalisation and technology to FM and the BIM process
- CSF 3:** Addressing and overcoming perceived barriers and challenges to the adoption and use of BIM
- CSF 4:** Making the benefits of BIM to the operational phase of assets transparent, realistic and achievable
- CSF 5:** Planning the strategic and operational information needs for FM in the BIM process
- CSF 6:** Improving stakeholder collaboration and understanding of the BIM process
- CSF 7:** Clarifying the role of, and tasks of FMs in the BIM process
- CSF 8:** Acquiring essential knowledge of key BIM standards/guidance documents for practical use in a BIM project
- CSF 9:** Ensuring people have adequate BIM training and competency skills to successfully engage in BIM projects
- CSF 10:** Ensuring successful transfer/ongoing management of information/data for the operational phase of assets

5. Conclusion
6. Further literature and papers by the author and co-authors
7. Appendices

10 CSF
To guide professionals to
successful BIM projects

Easy to use
and navigate

SUMMARY CSF LIST

INDEX

< 3 >

APPENDICES

FRAMEWORK GUIDANCE

CSF 1: BIM and whole life cycle approach

FM-BIM Mobilisation Framework: Critical Success Factors to Help Deliver Successful BIM Projects

CSF 1:

Implementing BIM with a WLC approach to support sustainability and UK government construction strategy targets

Built assets are often procured with a **lowest price wins** approach. However, research and many industry *best practice reports* such as the CLC *'Procuring for Value'* (2018, p13) suggest that this is not the best approach to achieve long term value. The report recommends that in order to deliver sustainable built assets for society, the procurement should be carried by "exploiting new technologies and processes to focus on delivering the greatest value over the life of the project". BIM offers the opportunity to do this and at the same time to improve the procurement process from an early stage. This will help reduce costs over the life of the asset rather than just looking at the short-term CAPEX solution. The importance of early engagement to influence costs was highlighted by *Patrick MacLeamy* (2004) in his work with HOK and later buildingSMART. This work is based on earlier work, shown in Figure 1 by *Paulson (1976, p 588)* his findings illustrated how the early stages of a project where **high influence** over changes and procurement costs can be achieved at **low expenditure**.

Provides a list of reference reports

Ideas relate back to Paulson (1976)

The screenshot shows the 'Designing Buildings Wiki' website. At the top, there are logos for 'ice' (Institution of Civil Engineers), 'CIOB' (Construction Industry Institute), and 'BSRIA'. Below the logos is the title 'Designing Buildings Wiki' and the tagline 'Share your construction industry knowledge'. There is an 'Edit this article' button and a note that the article was last edited on 19 Dec 2020. The main content is the title 'Procuring for value report' and a thumbnail for the 'CLC Procuring for Value' report, which includes the text 'CONSTRUCTION LEADERSHIP COUNCIL' and 'PROCURING FOR VALUE'.

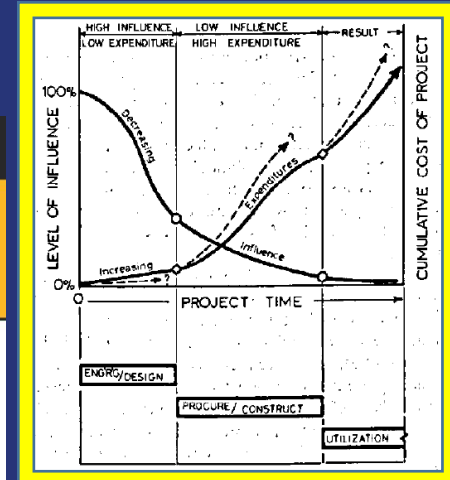


Figure 1

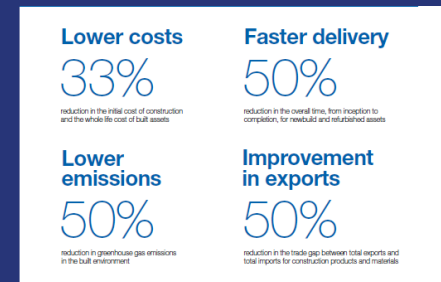
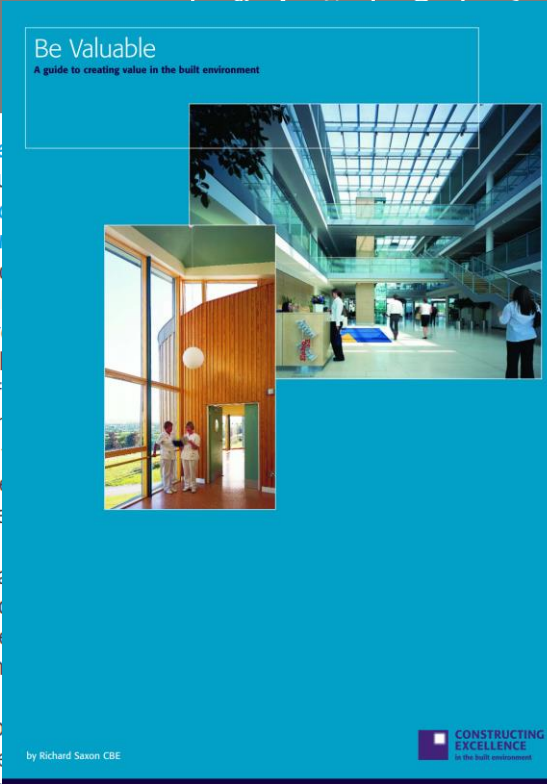


Figure 2

ST 1.1: Maximise long-term value & ROI

ST Ref	CSF Sub-Themes (ST)	Explanation	Examples
1.1	Using BIM to maximise the long-term value and ROI of built assets	<p>Adopting a WLC cradle-to-cradle approach to BIM, rather than short-term capital expenditure (CAPEX) focus, will help maximise best value over the long-term and ROI for built assets. Feedback loops with design teams should review designs, energy systems and quality/longevity of products/systems to reduce frequency of asset replacement (thus waste) and ensure sustainable WLC options are chosen. CAPEX and (operational) OPEX budgets should be balanced to see where more spend upfront will save over the long term. Value engineering should result in increased long term OPEX cost just to get the cheapest CAPEX cost. BIM can help improve procurement and also achieve sustainable outcomes. 'Soft Landings' and 'BS 8536' should be adopted. FMs should also consider setting performance targets to maximise value.</p>	<p>Adopting a WLC cradle-to-cradle approach will make the procurement of built assets more sustainable. The report 'Creating a better future: achieving quality at the end of the built environment' is a good understanding how we should be achieving best value. This requires balancing CAPEX and OPEX costs, rather than just the initial CAPEX cost of an asset (e.g by considering equipment quality and life expectancy, and value engineering in favour of the long-term phase). Research shows it is often worth paying more upfront for quality that will reduce long-term operational costs. Project teams should also consider life cycle costs of built assets. The WLC approach should be adopted where it can account CAPEX and OPEX costs. The WLC guidance standard should also be used to ensure FMs can give input at the right time to achieve a sustainable outcome.</p>

Value: over the whole life of assets



ST 1.3: FM readiness for BIM

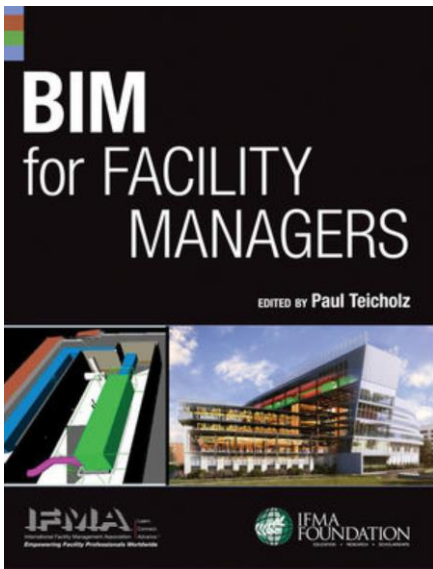
BIM guidance specific to FM and RE

1.3

FM readiness to engage in BIM projects

Educating the FM industry with regards to BIM is critical if FMs are to be ready to contribute towards the success of BIM projects. Organisations like IWFM, IFMA, RICS, etc. are now providing guidance for people engaging in BIM projects in order to improve the overall outcome. People need to understand **BIM is not just about software**, but more about the overall process. FMs need to lead and **engage clients** and provide **evidence of the benefits of BIM** to convince their clients that there is a good business case to engage in BIM.

The **IWFM** have produced a range of FM specific BIM guidance. Several useful books have been produced including **'BIM for Facility Managers'** which is available from the IFMA or online book retailers. RICS have produced an **'International BIM Implementation Guide'**. Some other useful texts include the **'BIM Handbook: A Guide to Building Information Modelling for Owners, Managers, Designers, Engineers and Contractors'** available online at many retailers; and **'BIM for Construction clients'**.



CSF 2: Importance of digitalisation

FM-BIM Mobilisation Fram

BIM Projects

FM as a Digital Change Agent

CSF 2:

Recognising the importance of digitalisation and technology in FM and the BIM process

Digitalisation is having a significant impact across all sectors of industry including the FM and the AEC industries. If FM's are to remain innovative they need to be aware of developing trends and prepared to use these to their advantage. The book 'Facility Management as a digital change agent', (DFM, 2019), illustrates the wide range of technology used in the FM and RE industries (Figure 3).

The figure shows used in FM and R level.

Note: the most in are placed at the

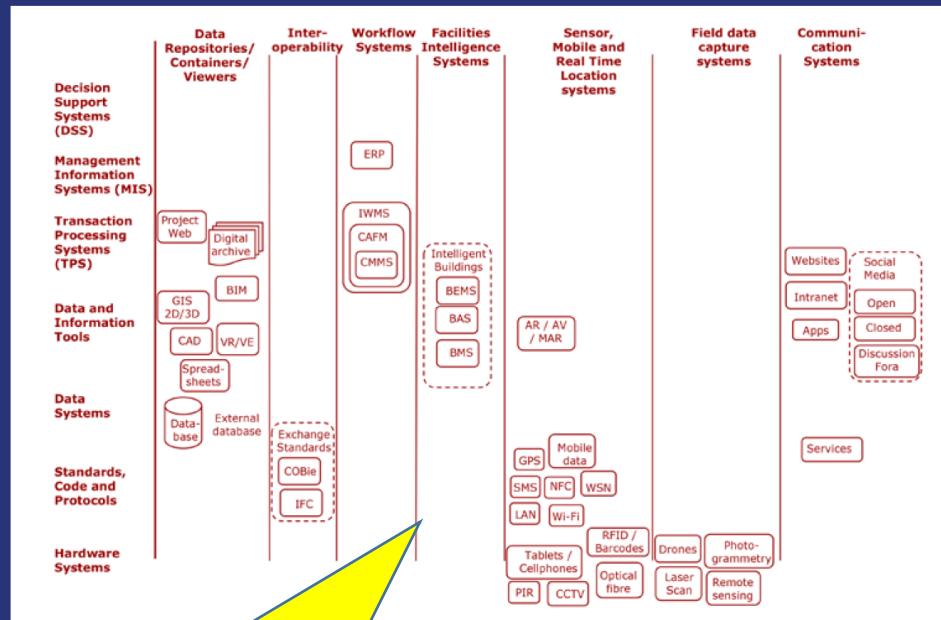
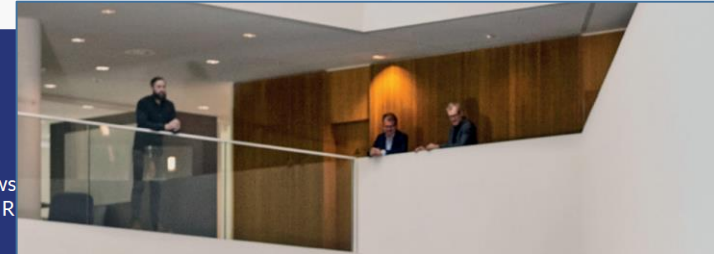


Figure 3

Technology important to FM
Ebbesen (PhD)



Facility Management as a digital change agent

What you need to know about the transformation of FM in the digital age.

The annual Gartner Smart Workspace Survey 2018 assessing the state of smart workspace are already starting to refer to 'Twin Deloitte expectations' in 2018 the digital expectations'. This has already peaked a Plateau of Productivity next 5-10 years (to engage with BIM data that will come both new and existing over to FM in the



ST 2.4: Set up of Common Data Environment

2.4

Set up of the CDE and ensuring security of BIM data

Careful thought needs to be given to **BIM/IT security risks** and BIM data. It is recommended that FMs follow the advice and guidance provided in 'PAS 1192-5'. The CDE which is used to manage and control models, documents, data etc. during a BIM project should be carefully set up with **BIM processes** to control content.

The B1M explains **'What is a CDE?'** in a short video. Further advice about CDEs can be found on the **NBS website**. Advice relating to **security minded BIM** is available in 'PAS 1192-5'. Additional information about **security minded BIM** can also be found on the **NBS website**.



Video: Setting up CDE

THE BIM VIDEOS TECH DOCUMENTARIES ABOUT MORE

What is a Common Data Environment?

The BIM | 2:55

The diagram illustrates the CDE workflow. It starts with 'Information Exchange 1, 2, 3 & 6' (ACCEPTED 5) leading to 'Tier 1 Appointments'. This leads to the 'Client Shared Area' (SHARED) which contains 'Verified design data shared with the project team: Ongoing design development'. This area is linked to 'WORK IN PROGRESS' (Specialist design teams, Specialist Suppliers Team) and 'APPROVED' (4). The 'Client Shared Area' (SHARED) leads to '2 AUTHORIZED' and then to 'PUBLISHED DOCUMENTATION' (ARCHIVE). 'PUBLISHED DOCUMENTATION' (ARCHIVE) contains 'Co-ordination and validated design output for use by the total project team. Production information suitable for Tender or Construction'. This leads to '3 VERIFIED' and then to 'ARCHIVE' (Project history maintained for knowledge and regulatory and legal requirements. Repository of the project information for non asset portfolio employers). The diagram also includes 'Capex Start' (CLIENT SHARED AREA) and 'Employer's Information Requirements' (BUILD, RE-BUILD, REFURBISH or DEMOLISH AND MAINTENANCE).

CSF 3: Barriers to BIM

FM-BIM Mobilisation Framework

Case studies: Applying BIM for FM

CSF 3:

Addressing and overcoming perceived barriers and challenges to the adoption and use of BIM

Kelly et al (2013, p191) highlighted in their paper 'BIM for facility management: a review and case study investigating the values and challenges' that "BIM for FM is an emerging area and there is still limited knowledge available on the subject". They identified four main challenges (2013, p197) for FM:

- "The lack of tangible benefits of BIM in FM despite agreement about the potential of BIM in FM"
- "The interoperability between BIM and FM technologies"
- "The lack of clear requirements for the implementation of BIM in FM"
- "The lack of clear roles, responsibilities, contract and liability framework"

Carbonari et al (2015, p60) in their paper 'How Facility Management can use Building Information Modelling (BIM) to improve the decision-making process' noted a need for "evidence to convince facility managers to fully embrace this new technology". Ashworth and Tucker's (2017, p2) article 'Building a bridge to BIM' suggested there was still "more work to be done" before the FM industry is in a position to be able to reap the full benefits of BIM.



They note a reoccurring barrier various research; "if FM's are not scope very clearly at the beginning the best will of the rest of the design be what they really need" (p3). The FM involvement is illustrated in (2019). It reminds us the three in

Proceedings of the 13th International Conference on Construction Applications of Virtual Reality, 30-31 October 2013, London, UK

BIM FOR FACILITY MANAGEMENT: A REVIEW AND A CASE STUDY INVESTIGATING THE VALUE AND CHALLENGES

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BIM Academy, Faculty of Engineering and Environment, Northumbria University, Newcastle, UK

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Technology Futures Institute, Teesside University, Middlesbrough, UK

ABSTRACT: For many years the issue of how to run buildings efficiently and effectively has posed a considerable challenge. This debate has had renewed significance since the emergence of Building Information Modelling (BIM) processes and the proposition that BIM information, captured during the facilities lifecycle, can help improve the efficiency of Facility Management (FM). Using this proposition as a starting point, the overarching aim of this paper is to investigate the value-adding potential of BIM and the challenges hindering its exploitation in FM. The literature review showed the BIM value adding potential stems from improvement to current manual processes of information handover. It also adds improvement to the accuracy of FM data and increases the efficiency of work orders execution, in terms of speed, to accessing data and locating interventions. It was also revealed that there is lack of real world case studies, especially in the case of existing buildings, despite new constructions representing a small percentage of the total building stock in a typical year. The case study was conducted on an existing asset composed of 32 non-residential buildings in Northumbria University's city campus. This was done to empirically investigate the value of BIM in a specific FM function (i.e. space management). The results provided evidence of the value of BIM in improving the efficiencies of FM work orders and the accuracy of geometric information records.

KEYWORDS: Building information modelling, facility management, computer-aided facility management,

ST 3.3: BIM and ROI

ST Ref	CSF Sub-Themes (ST)	Explanation	Examples	Completed	Initiated	To-do	N/A
3.3	Addressing concerns about costs associated with BIM and ROI	<p>Clear transparency of the benefits is important to ensure BIM is not oversold, and people can see clear added value in engaging in BIM projects. The ROI of BIM is a key issue which should be demonstrated. Clients and project teams should be clear about their investment in BIM and try to evaluate the overall benefits as well as ROI. Note: this may include quantifiable and non-quantifiable aspects e.g. improved communication, reduced RFI etc., and may be dependant on the complexity of the project. A common barrier that needs to be overcome is that BIM just 'adds cost'. Instead people need to see how BIM can help reduce long-term ongoing costs. Research indicates organisations should be realistic and allocate a budget line to BIM models and data up to date - this is essential for implementing processes in order to deliver the full benefits of BIM.</p>	<p>Research indicates that most 'upfront investment' in BIM occurs in the design/construction phases. From the client/FM perspective it is very important to be clear and realistic about the possible benefits and ROI. This includes what BIM can and cannot do. The PwC report 'BIM Level 2 Benefits Measurement Methodology' (BMM) provides a good account of the impact of BIM on asset planning, delivery and operation. The presentation from Autodesk on</p>	✓	✓	✓	✓

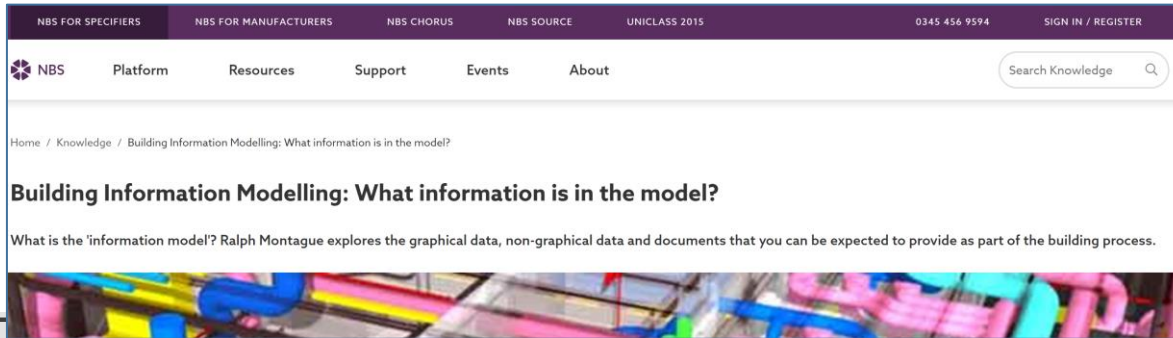
PwC reference report gives specific ROI examples

Table 2: Environment Agency Foss Barrier Upgrade - Estimated benefits by lifecycle stage and benefit category (PV 2017 real prices)

Lifecycle phase	All	Design	B&C + Handover	Operation
Time period over which benefits are realised	April 2016 – June 2043 (27+ years)	April 2016-May 2018 (26 months) Design and B&C undertaken in parallel		July 2019-June 2043 (~24 years) -
Est. cost of Upgrade (without BIM)*	£23,748,302	£2,632,317	17,683,400	£3,432,584#
Est. cost by lifecycle phase (%) (without BIM)	100%	11%	75%	14%
Est. PV benefit from BIM L2	£367,693	£132,317	£12,257	£223,118
PV benefit as % of cost	1.5%	5.0%	0.1%	6.5%
Estimated benefits by category (% of total benefits estimated)				
Time savings in design (36%)	£132,317	£132,317		
Time savings in build and commission (1.6%)	£5,757		£5,757	
Cost savings in design (4.8%)	£6,500		£6,500	
Cost savings in asset maintenance (60.7%)	£223,118			£223,118
% benefits estimated in each phase of lifecycle	100%	36%	3%	61%

Significant savings to be made in the operations phase

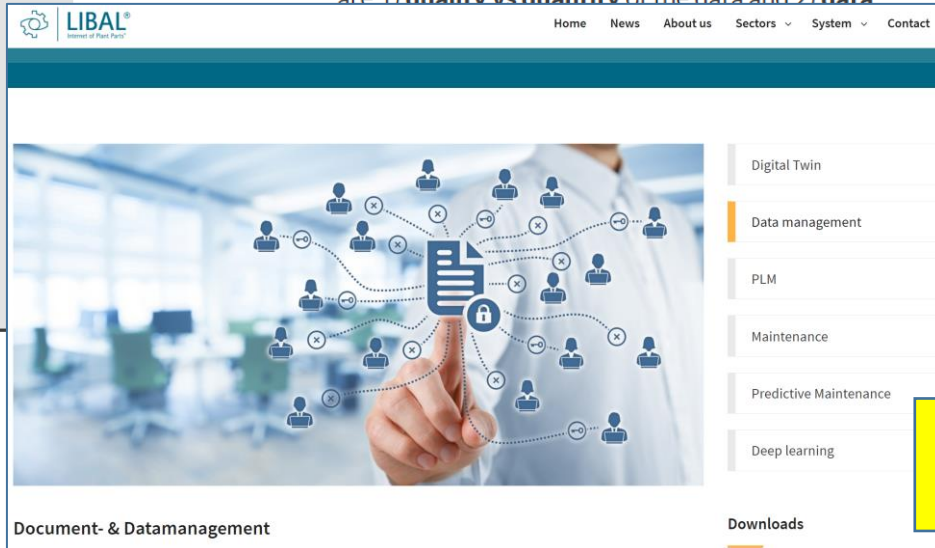
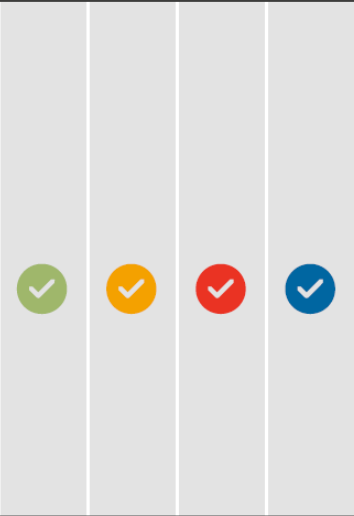
ST 3.7: Quality of data



What should be in BIM models

Poor data quality has often been highlighted as a key issue when transferring from construction to operation. Two important and linked factors are 1) **quality vs quantity of the data** and 2) **data**

In order to ensure data quality it should be: 1) relevant, 2) well structured and 3) easy to access. The NBS article '[BIM: what information is in the model](#)' gives some guidance in this respect. The article '[Is BIM the solution to construction's quality issues](#)' raises some interesting issues; that often the quality comes down to the collaboration and culture of people working in projects. Therefore it is recommended that organisations develop an open and collaborative working environment where people are encouraged to share information. COBie and products like the '[LIBAL Building & Infrastructure software](#)' tool can also be used as tool to check data being transferred. However, with all such tools a human is usually needed to check that what has been transferred is actually of good quality.



Innovative software tools
e.g. LIBAL – improve data transfer

CSF 4: Benefits of BIM in operation

FM-BIM Mobil

Key benefits across whole life

CSF 4:

Making the benefits of BIM to the operational phase of assets transparent, realistic and achievable

1 Time savings

Nature of the benefit: The use of BIM has the potential to result in time savings in a number of different ways, both in asset delivery throughout each stage of the asset lifecycle, and in service delivery (or business as usual) for a government organisation. For example, use of a Common Data Environment (CDE) enables easier ways of working and quicker information exchange.

Measuring the benefit: Time savings resulting from BIM Level 2 can be monetised by calculating the corresponding reduction in (1) *direct labour cost*; or (2) *time-dependent recurring preliminary costs* (in the case of an overall reduction in the duration of a project). If time savings result in accelerated project delivery (and project benefits are brought forward in time), the net present value (NPV) of the project may also increase.

2 Materials savings

Nature of the benefit: Use of BIM Level 2 has the potential to result in materials savings in the 'build and commission' and 'operation and end of life' (maintenance, refurbishment, etc.) stages of the asset lifecycle, by reducing the volume of materials required (including reducing wasted materials).

Measuring the benefit: Materials savings are estimated by calculating the change in the amount or type of materials used, and applying the cost of each type of material to the reduction in quantity. There may also be corresponding environmental benefits from using fewer materials. These are estimated by applying the 'embodied carbon value' as a proxy for the total environmental impact to the reduction in the material's quantity (in line with Green Book guidance).

3 Cost savings

Nature of the benefit: Application of BIM Level 2 has the potential to result in other, broader cost savings across the asset lifecycle where it is difficult to distinguish the component time and materials elements. The benefits framework includes for example, cost savings from fewer changes, better clash detection, and improvements in facilities management and maintenance.

Measuring the benefit: Cost savings may be estimated in a number of ways, depending on the specific saving in question. In general, savings can be quantified by determining the change in the number of instances of a particular event attributable to BIM Level 2 (e.g. the number of changes), and monetised by applying the average cost of each instance (e.g. average cost of undertaking a change).

4 H&S Improvement

Nature of the benefit: The use of BIM Level 2 can contribute to health and safety improvements, throughout both the 'build and commission' and 'operation and end of life' stages of the asset lifecycle. For example, a 3D model provides the visual basis for improved staff briefing and training, with further potential provided through 4D-type simulations, (including construction and demolition activities), to optimise sequencing from a safety perspective.

Measuring the benefit: Benefits from improved health and safety are quantified by determining the difference in the number of fatal and non-fatal injuries and work related illnesses attributable to BIM Level 2; and monetised by applying the cost to society per accident, incident or work related illness (using values published by the Health and Safety Executive (HSE)).

5 Risk reduction

Nature of the benefit: The use of BIM Level 2 has the potential to improve the accuracy of information about a project or asset, and improve visibility about associated costs, delivery timeline, and risks. Because of this increased certainty provided by BIM Level 2, there is a potential for a reduction in the variability of costs and time required for asset delivery and operation. This may result in the ability to reduce the contingency required against capital expenditure and/or operating expenditure, thus resulting in a reduction in costs associated with that contingency.

Measuring the benefit: Benefits from reduced risk are quantified by determining the reduction in contingency attributable to BIM Level 2; and monetised by applying the opportunity cost of capital to the change in value of the contingency. (UK Government opportunity cost of capital = social rate of time preference = 3.5% pa – Green Book).

6 Improved asset utilisation

Nature of the benefit: The use of BIM Level 2 can improve the availability of an asset once it has been constructed; this means that it can potentially be used more productively over its lifetime to provide public services. Better space utilisation planning; faster maintenance and refurbishment through use of an asset information model; and faster BIM enabled response to incidents; can all improve asset availability, or reduce an asset's downtime.

Measuring the benefit: Benefits of improved asset utilisation are quantified by determining the increase in productivity (%) or reduction in downtime attributable to BIM Level 2; and monetised by applying the relevant value for that productivity increase (either the avoided cost of downtime (e.g. cost to rent an alternative classroom while regular classroom is unavailable), or the social benefit that would be lost through downtime (e.g. cost to society of students foregoing education while classroom is unavailable – more difficult to measure)).

7 Improved asset quality

Nature of the benefit: Use of BIM Level 2 brings improved visibility over the process of design and construction, which can enable improved quality of the asset for the end-user. For example, BIM's 3D and 4D visualisation capabilities may result in a building being better laid out, or more pleasant to be in (the building may be angled to get more sunlight for example).

Measuring the benefit: The impact of improved quality depends on the asset, what it is used for, and how improved quality can directly affect user outcomes. Examples of direct quality effects that may be quantified are reduction in staff turnover as a consequence of improved staff morale or satisfaction with the working environment; or reduction in the length of hospital stays due to improved building amenity contributing to quicker recovery times.

8 Improved reputation

Nature of the benefit: The application of BIM Level 2 could potentially improve the reputation of government construction clients and asset owners, and the supply chains involved in asset delivery; by improving the experience of those associated with asset delivery and service delivery. For example, in asset delivery, use of BIM Level 2 may result in better site layout and improved logistics. This could reduce (or avoid) negative impacts on residents, businesses and customers who reside near the construction site.

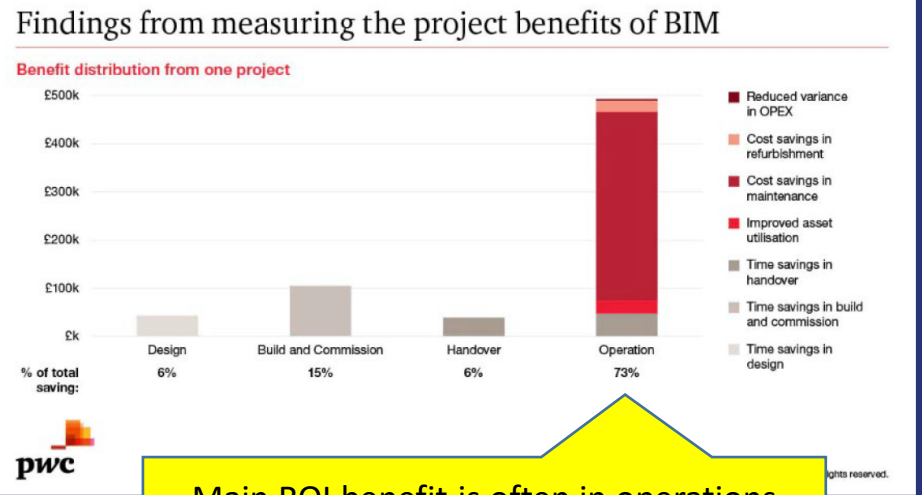
Measuring the benefit: Improved reputation is difficult to quantify, and often intangible. It may be possible to quantify through use of surveys, however difficulty arises in attributing reputational improvements to BIM Level 2 because many factors contribute to reputation, and it is difficult to isolate the extent to which each is responsible.

BIM Level 2 Benefits

2018), is available in the report on the website. It provides a range of benefits identified across the eight Work (PoW) process. The report presents eight key benefits: 1) asset utilisation, 2) material savings, 3) H&S improvement, 4) improved reputation, 5) asset utilisation, 6) improved reputation, 7) improved reputation, and 8) measuring the

Extrapolating this to a wider level the report continues "across the design, build and commission, and handover phases, our quantified estimates were 0.7% and 1.4% of capital expenditure respectively. If this level of saving could be achieved across the National Infrastructure Commission's projected public sector funded infrastructure spend of £31.7 billion in

2018/19, this would imply savings to UK taxpayers of £226 - £429 million (in £2017 prices)". The research also highlights the work by PwC (2018) using the BMM to analyse two projects highlights the importance of BIM in the operational phase; "over 70% of the benefit value occurred during the operation phase" (Figure 8).



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APPENDICES

FRAMEWORK GUIDANCE

ST 4.1: BIM benefits & case studies

ST Ref	CSF Sub-Themes (ST)	Explanation	Examples	Completed	Initiated	To-do	N/A
4.1	Using case studies to help provide evidence of the benefits of BIM to FM	<p>Evidence of BIM benefits is key to establishing a good business case for its use on projects. Providing clear transparency of the benefits will help BIM buy-in from management teams to invest where appropriate. Case studies and standardisation are important to provide solid examples from practice. Having good guidance</p>	<p>Project teams need to be clear and transparent about what benefits can be realised in a BIM project. <i>'The Benefits of BIM to FM Catalogue 2019'</i> provides readers with an extensive list of possible advantages in the literature. Articles of interest include <i>'Top 10 Benefits of Building Information Modelling (BIM)'</i>, <i>'How facilities management can take advantage of BIM'</i>, RICS <i>'Utilising BIM to innovate the management of facilities'</i>. The SIF <i>'Digital Working Case Studies - Interactive Map'</i>, and the CITA <i>'Irish Case Studies'</i> may also be useful. Two Australian examples include the <i>'Sydney Opera House'</i> and the <i>'Perth Children's Hospital'</i>. Other websites showcasing BIM case studies include <i>'BIMhub'</i>, <i>'BIMCommunity'</i>, <i>'Graphisoft'</i> and <i>'BIM Facility AG'</i>. Readers may also be</p>				

BIM benefits catalogue

BIM Facility: Swiss Case Studies

✓
✓
✓
✓


bim facility
 BERATEN & MODELLIEREN

Data File available

The Benefits of BIM to FM Catalogue

April 2019

Tenny Streeter · Simon Ashworth · Carsten Druhmann

Overview Stats Comments Citations References Related research

Description

The Benefits of BIM to FM Catalogue is a part of a Research paper for EuroFM 2019 submitted by the authors and which will be used as an ongoing database to record the Benefits of BIM for FM professionals which Can be accessed and used by practitioners

paper 'The Benefits of BIM to FM Catalogue' as a case study for BIM Facility

Hirslanden Andreas Clinic, Zug
 Several renovations were carried out in the Hirslanden AndreasKlinik Cham Zug. For this purpose, BIM Facility AG has completely developed the project-relevant floors and building parts as a BIM model. In total, several hundred laser scans were made by the sister company Terradala ...
 Reference as PDF
 Open reference

Kino Metropol, Zurich
 KITAD plans to renovate and modernize the Metropol cinema. BIM Facility AG was asked to create 3D laser scans and a 3D model of the interior of the cinema for the purpose of redesigning the complex cinema halls and all ancillary rooms. A special feature are the areas ...
 Reference as PDF
 Open reference
 Video for reference

Swiss Technical College Winterthur
 The Swiss Technical College Winterthur, STW for short, is a training and further education facility for practice. It is very important to you to carry out your new building using BIM and to use the digital twin later in operation. The findings of BIM planning ...
 Reference as PDF
 Open reference

Material collection from stock, SBB Alstetten Depot G
 As the largest property owner in Switzerland, SBB is a member and sponsor of the global digital component register 'Madsister'. In the course of this, an initial investigation was started on how efficiently and to what depth materials can be recorded from the inventory ...
 Reference as PDF
 Open reference

Lucerne through station
 First of all, the 3D model was created from the preliminary project plans for the new underground station. This model was then linked to the existing station model. The existing station model was recorded by us via laser scanning in an earlier order and corresponds to ...
 Reference as PDF
 Open reference
 Video for reference

ST 4.2: Making the benefits transparent

4.2

Making the benefits of BIM clear and transparent

Transparency and credibility are key issues when considering the benefits of BIM. Some of these are illustrated in popular **BIM books** aimed at FM and clients. Where **benchmarks and ROI** examples are provided this will help make the benefits more transparent.

Benefits should be made transparent to ensure BIM is not oversold. Teams should target benefits which are achievable, and if possible measurable. Ashworth (2019) presents in two videos on the topic '*BIM Are You Aware*' and '*The benefits of BIM to FM over built assets life cycle*'. The thesis by Streeter (2019) '*BIM: An Analysis of BIM Benefits for FM over Building Life cycle*' and the follow up paper '*The benefits of Building information modelling (BIM) to facility management (FM) over built assets whole life cycle*' (2019) provide an analysis of many of the benefits. The book '*BIM for Construction Clients*' and the cddb '*Case Study: Towards a digitally enabled estate: the University of Cambridge*' provide some useful insights to benefits on the digital journey. Section ST3.3 provides more information about measuring the benefits of BIM and ROI.



Collection of benefits

The benefits of building information modelling (BIM) to facility management (FM) over built assets whole lifecycle (Ashworth, Streeter & Druhmman, 2019)

Ranking (frequency)		Percentage %
1	Time savings	21.98%
2	Productivity	18.23%
3	Cost savings	16.62%
4	Business added value	14.21%
5	Data accuracy /quality	11.26%
6	Communication and collaboration	7.77%
7	Energy performance	4.02%
8	Improving safety and risk management	3.75%
9	Interoperability	2.14%

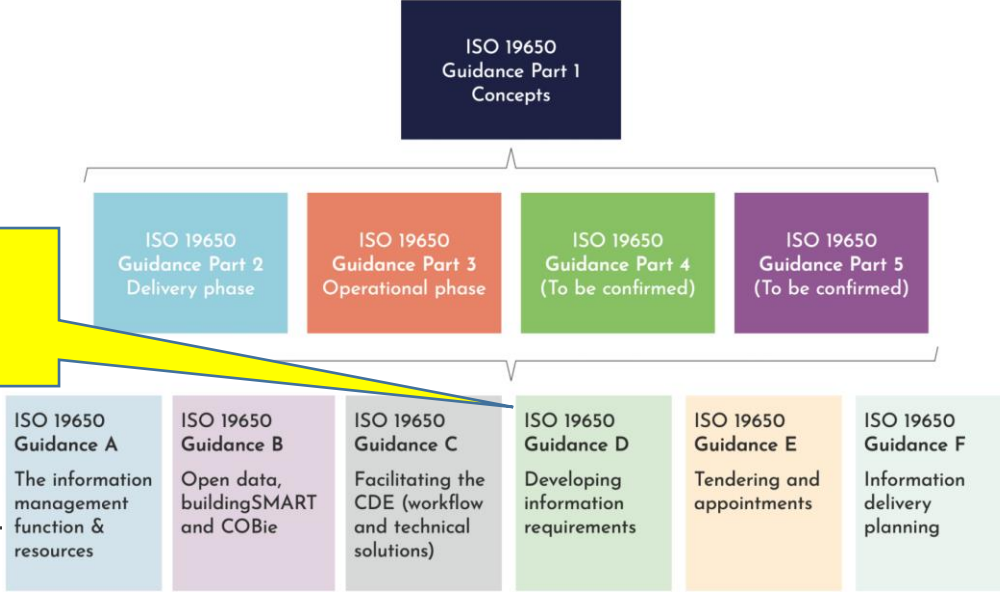
<https://www.researchgate.net/publication/332655772> The Benefits of BIM to FM Catalogue

ST 5.2: FM information requirements

ST Ref	CSF Sub-Themes (ST)	Explanation	Example	Completed	Initiated	To-do	N/A
5.2	Defining what FM information is needed from the CAPEX phase for the OPEX phase	<p>A minimum useful approach should be adopted. The temptation to create huge spreadsheets with 100s or thousands of attributes for BIM models should be resisted. Research shows many are not really needed or then maintained in operation. Therefore careful consideration should be given to OPEX thinking and defining what information is actually needed and its source. This should be defined in the EIR (this might include information outside the BIM models). Research suggest starting by considering what PPM, statutory and facility/asset maintenance tasks are undertaken. This could include reviewing systems such as 'SFG20'. Practitioners have a set of what they call 'W-questions' to help establish the important information. These include: What assets are managed, what systems do you need, what information and management systems and storage systems you need to find data, what systems. It should also be transparent and clear to all parties who is contractually responsible for the delivery of specific information.</p>	<p>The UKBIMA <i>'Data Requirements for the Construction and Management of Buildings - A Guide for Clients'</i> offers good advice. Organisations should establish a list of critical and general assets and information needed to ensure their optimal running. 'The 'PAS 1192-3:' standard, downloadable from the 'standards' section of the UK BIM Framework website, should be referred to when thinking about the information for the operational phase of assets. Note: this will shortly be replaced by 'ISO 19650-2'. The UK BIM Framework (2015) from The BIM Framework (2015) website.</p>				

Full suite of guidance documents

Guidance on Information Requirements



CSF 6: Stakeholder collaboration

CSF 6:

Improving stakeholder collaboration and understanding of the BIM process

Mondrup et al (2012, p3) make the important observation in their paper *'Communicate and collaborate by using building information modeling'* that "BIM is a Socio-technical System". They observe "BIM is as much about people and processes, as it is about technology" (p4). Figure 13 illustrates this as a concept where BIM can be thought of as having a core of *'technical parts'*. However, in order to deliver successful outcomes BIM requires more collaboration and cooperation between all stakeholders, specifically the further social

Collaboration guide

projects to be really successful people must be empowered and provided with the right technology and tools to communicate effectively. There should be open discussion and agreement about using **standardized exchange formats** to assist and empower the free flow of information. We also need to remember that the adoption of BIM, especially where people are inexperienced, often requires significant **cultural change**. **Especially early in this process the BIM project team may require additional support, time and resources.**

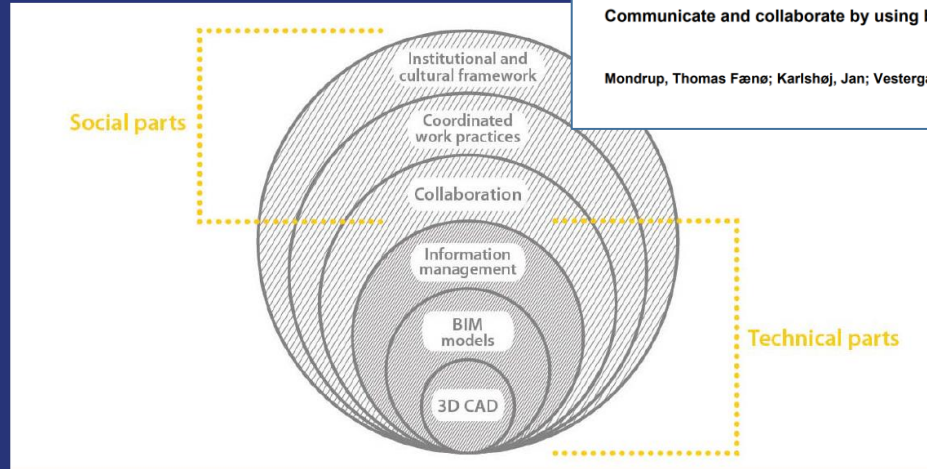


Figure 13

Communicate and collaborate by using building information modeling

Mondrup, Thomas Fæne; Karlshøj, Jan; Vestergaard, Flemming

ST 6.6: Preparing for the impact of BIM

6.6

Preparing for the impact of BIM on the FM and AEC industries

The Gartner hype cycle shows trends such as **'BIM/Digital Twins'** as having peaked in 2018 with the expectation that the predicted 'plateau of productivity' where the trends become 'the norm' will be reached between 2023 and 2028. A bit like trends in the past such as the arrival of the mobile phone, BIM is rapidly moving from being just a trend to becoming the norm. As such, companies need to move to adopt BIM and ensure they are prepared for its impact.

Action Plan: BIM Acceleration

The report *'An Action Plan to Accelerate Building Information Modelling (BIM) Adoption'* serves as a useful source for considering how to ensure BIM adoption in an optimal way. Eyon (2015) provides some useful perspectives in the video *'BIM: People + Process - B1M University Class 2'*.



Video: People and Process



CSF 7: The role of FM in BIM projects

FM-BIM Mobilisation Framework: Critical Success Factors to Help Deliver Successful BIM Projects

CSF 7: Clarifying the role and tasks of FMs in the BIM process

The IWFM guide *'The role of FM in BIM projects'* (Thomas, 2017) outlines how FMs can engage with other stakeholders to achieve the **best outcomes from BIM projects**. The guide (Figure 15) provides a general introduction to BIM and highlights how and when FMs should get involved. It can be downloaded from www.iwfm.co.uk (2017).

GOOD PRACTICE GUIDE The role of FM in BIM projects

Role of FM – EIR for clients

Client important issues are covered including security requirements as outlined in 'PAS 1192-5: Specification for security-minded building information modelling in digital built environments and smart asset management', which is available from the [UK BIM Framework](http://www.ukbimframework.com) website, as well as data drops, the operational use of the AIM, risks of BIM and legal considerations.

Ashworth et al (2016) have two papers outlining 'The Role of FM in Preparing a BIM Strategy and Employer's Information Requirements (EIR) to Align with Client Asset Management Strategy' and the 'Integration of FM expertise and end user needs in

15thth EuroFM Research Symposium

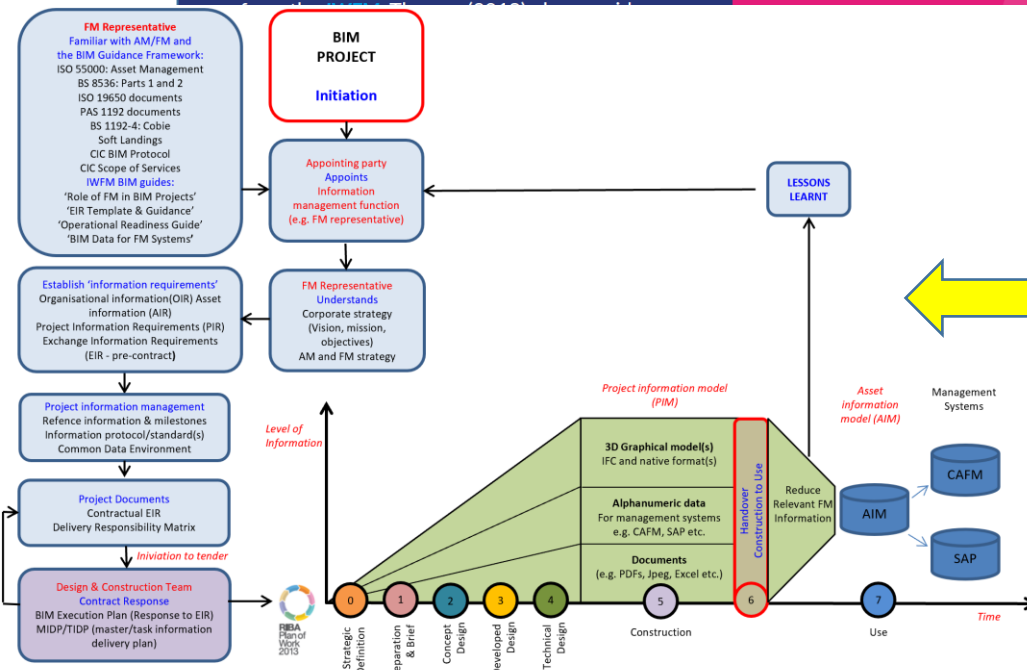
EuroFM Research Papers 2016

The Role of FM in Preparing a BIM Strategy and Employer's Information Requirements (EIR) to Align with Client Asset Management Strategy

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ashw@zhaw.ch, +41 79 138 6852
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ABSTRACT

Purpose: To investigate the role of Facility Management (FM) in developing client strategy for Building Information Management (BIM) and Employer's Information Requirements (EIR) in order to define what information is needed, in which format and when in the BIM process.

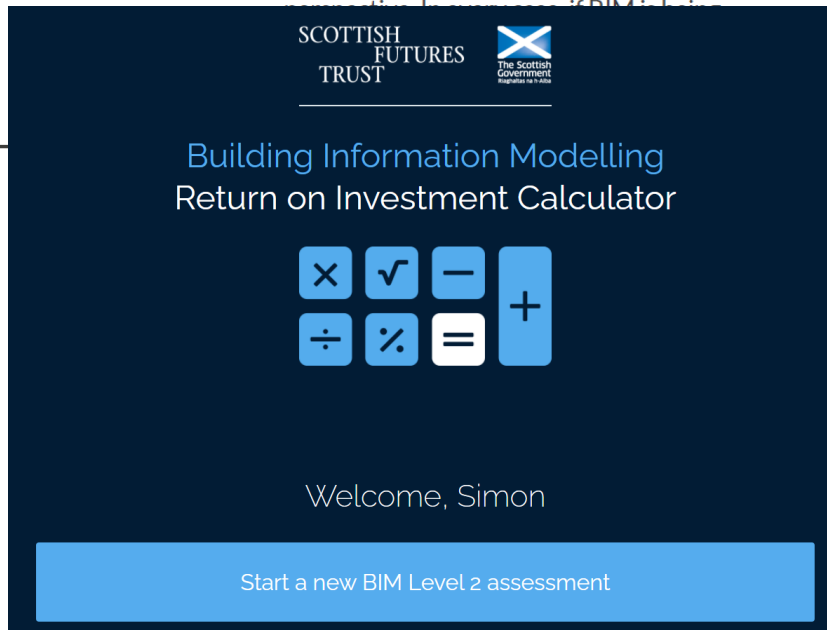


FM-BIM Strategy Concept Model

Ashworth (2016, 2019)

ST 7.1: Preparing for the impact of BIM

ST Ref	CSF Sub-Themes (ST)	Explanation	Examples	Completed	Initiated	To-do	N/A
7.1	Supporting and advising clients in BIM projects	FMs need to be able to help clients to articulate the ROI/benefits of BIM. This is especially important where FMs are helping to manage client information in a 3rd party role. FMs might also consider taking on the role of a BIM champion to help drive BIM from a client perspective.	The PwC report ' BIM Level 2 Benefits Measurement Methodology (BMM) ' sets out a measurement rational and model for ROI on BIM. The paper by Stowe et Al (2015) entitled ' Capturing the ROI of All-in Building Information Modelling: A Structured Approach ' outlines possible approaches to consider savings from a client perspective. Autodesk have produced a report entitled ' Achieving Strategic ROI ' and the SFT have a ' BIM Return on Investment Tool ' available on their website. The BIMhub have also produced a series of articles focused on BIM ROI .	✓	✓	✓	✓



Scottish Futures Trust
Online
ROI Investment Tool

CSF 8: Essential knowledge

CSF 8:

Acquiring essential knowledge of ISO 19650 standards and guidance for practical use in a BIM project

A good **familiarisation of key BIM standards** is essential to ensure that people and stakeholders involved in BIM projects can clearly communicate using the same language, with established terminology and expressions (including many acronyms). Importantly, standards provide guidance to set up BIM processes and empower people to clearly understand one another when discussing BIM projects, which avoids confusion and wasted time and effort. A more standardised approach helps stakeholders involved to deliver the required project outcomes and the many benefits BIM promises. However, in order to do so people need to be familiar to some degree with key BIM standards and guidance. It is recommended people familiarise themselves with the *'UK BIM Framework'* promoted as the *"overarching approach to implementing BIM in the UK"* by the *UK BIM Alliance*, *BSI* and *cdbb* which aims to help individuals and organisations understand the fundamental principles of BIM. This short video

ISO 19650 standards and guidance

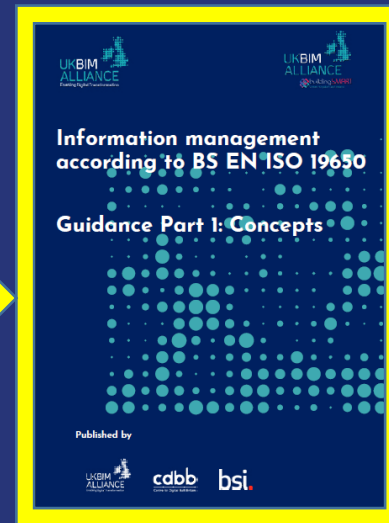
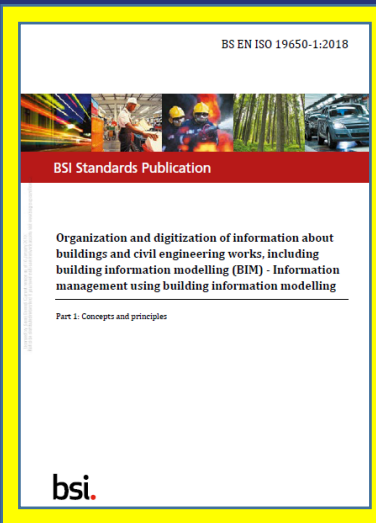


Figure 18

Cdbb – useful website

- 1) *'Information management according to BS EN ISO 19650: Guidance Part 1: Concepts'* (Figure 18) and
- 2) *'Information management according to BS EN ISO 19650: Guidance Part 2: Processes for Project Delivery'* (Figure 19). Also the *'PD 19650-0:2019'* Transitional Guide for moving from the old *'BS 1192'* and *'PAS 1192'* standards to the new *'ISO 19650'* standards.



Video: What is a National Digital Twin?

we can all work together to create a better world






cdbb
Centre for Digital Built Britain

Welcome to the Centre for Digital Built Britain.

The Centre for Digital Built Britain is a partnership between the Department of Business, Energy & Industrial Strategy and the University of Cambridge to understand how the construction and infrastructure sectors could use a digital approach to better design, build, operate, and integrate the built environment. Find out more.

ST 8.1: Standards and guidance

ST Ref	CSF Sub-Themes (ST)	Explanation	Examples	Completed	Initiated	To-do	N/A
8.1	Using BIM standards and guidance in projects to achieve better outcomes for all stakeholders	<p>Research shows positive links between 'confidence in working in BIM projects' and 'levels of familiarisation and use of BIM standards and guidance in practice'. FMs should consider the list of BIM standards and guidance in Appendix 3. These provide useful sources for</p> <p>should be used in practice. It is important</p>	<p>Appendix 3 lists relevant <i>BIM standards</i> and links to access them (note: some are free and some are purchased). FMs should familiarise themselves with <i>BIM Guides</i> which discuss the role of FM in projects and FM standards and how to set up the EIM factor with respect to BIM is having a clear understanding of the organisation's ASM strategy. If one has not improved 'ISO 55000' provides good advice on the reading required to cover all the BIM standards. FMs start with those that are more relevant to their project. <i>Landings</i> aims to ensure all decisions made during the project are based on improving operational performance of the building and meeting stakeholder expectations. 'BS 8536' (parts 1 and 2) for an FM can help to brief design teams about the importance of a building in use. 'ISO 19650' (parts 1 and 2) provides an understanding of the overall BIM process, the production of information. 'PAS 1192-3' specifies how information is created and how that model should be used throughout the life of the asset up to final disposal. 'BS 1192-4' provides a view of COBie. The 'RIBA Plan of Work' helps to define the various stages in a BIM project and provides an overview of IFC. Although not necessary, understanding of classification systems like Uniclass is helpful.</p>				

Video: UK transition to ISO 19650

ISO 55000 Asset Management




BIM: transitioning from UK standards to ISOs

CSF 9: People and training

FM-BIM Mobilisation Framework: Critical Success Factors to Help Deliver Successful BIM Projects

CSF 9:

Ensuring people have adequate BIM training and competency skills to successfully engage in BIM projects

FMs need to be able to offer **strategic advice** to clients about BIM and general issues around digitalisation of the FM sector. They should also be able to **support design teams** with FM knowledge and design input. Figure 22 from the *'FM Awareness of BIM'* (Ashworth and Tucker, 2017) shows that levels of "experience of preparing/using key BIM documents" are generally quite low. The industry needs to support training FM professionals with regard to BIM as research indicates that people have adequate "BIM training and competency skills" are critical to the success of any BIM project. *Chamberlain (2018)* provides some useful guidance and advice about *'PAS1192-3 and BIM training for Facilities and Asset Managers'* which readers may find useful.

BIM/digital-skills training options open to organisations and individuals include basic familiarisation training, to full degree programmes offered by different universities. The IWFM guides; *'The Role of FM in BIM Projects'* (Thomas, 2017) and the *'Operational Readiness Guide'* (Beadle et al, 2016) (Figure 23) are a good starting point for FMs wanting to familiarise themselves with key aspects of the BIM process specifically from an FM perspective. *Section ST9.6* provides further details about a range of professional activities offering

FM in a BIM project

RESPONDENTS WITH EXPERIENCE OF PREPARING/USING KEY BIM DOCUMENTS IN THE BIM PROJECT: CHANGE OF KEY DOCUMENTS USED IN THE BIM PROJECT: FEEDBACK WAS AS FOLLOWS:

	HAVE WRITTEN AND IMPLEMENTED	HAVE IMPLEMENTED BUT NOT WRITTEN
As the devil is so often in the detail, here is Paul Thomas (FM Principal Consultant at Turner & Townsend) to advise how FMs can contribute to provide a far better BIM project outcome.	8.3%	9.4%
During all stages of a building's life-cycle, the role of the Facilities Manager (FM) is to maintain the focus of all parties on the required project outcomes and operational performance. In the design and construction phases, the FM is one of the end user's key representatives. The FM will help to define operational outcomes and performance targets including environment performance.	9.4%	12.6%
As such, the sooner the FM can be involved with the BIM project the greater their influence and steer will be, which then increases the likelihood of a better building. The FM's function and focus of influence changes throughout the building lifecycle, as outlined below.	10.2%	8.7%

BIFM
ADVANCING OUR PROFESSION

Operational Readiness Guide

A guide to ensuring long term effectiveness in the design and construction process

BIM JOURNAL 24 |



Six:
THE FACILITIES MANAGER'S ROLE IN A BIM PROJECT

"The FM will help to define operational outcomes and performance targets"

Before the Project Starts

- A large part of the FM role is to influence other stakeholders when it comes to the operational stage of the building. Early engagement with stakeholders can help here. As people generally collaborate better with people that they know and trust. Establishing a strong rapport early also facilitates an even stronger influence during the design process.
- Invest time before a BIM project starts to improve and expand your network. Meet other members of the likely design team by using the BIFM membership of the Construction Industry Council (CIC) to network outside of your normal FM circle. The BIM community likes to collaborate so pin your local BIM region too.
- Consider what the BIM data will be used for when the building is complete and how the data will be maintained as a valid trusted source of information for the whole life of the facility. Dependent upon the size and complexity of the building, also check that you have a suitable CAFM/CMS/IWMS that is capable of managing the data and processes to update the asset information. If you do not have a suitable system, start the process to obtain one. The BIFM have a useful good practice guide 'Selecting FM Software' and a flow chart is included in the BIFM good practice guide 'The Role of FM in BIM Projects' which will help.
- Consider the need to develop a clearly defined space naming protocol, which may be linked to other locations to allocate assets to a named location.
- Learn about your core business. As the end user's representative, you need to fully understand the requirements and the culture of the business. This knowledge needs to include maintenance strategy, health and safety requirements, critical business systems and environmental considerations.

Figure 22



Operational Readiness Guide

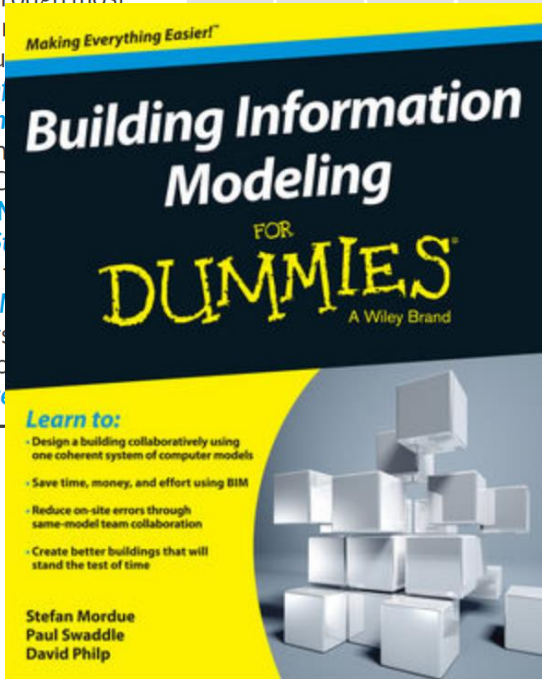
ST 9.3: EIR guidance and books

ST Ref	CSF Sub-Themes (ST)	Explanation	Examples	Completed	Initiated	To-do	N/A
9.3	Sources for EIR guidance, BIM books and BIM training courses	<p>There are many resources available to help FMs on their BIM journey. For example several example EIRs are available to help people when creating the EIR (contractually the completed with the an FM orientated the supply chain that they know project requirements are guidance (some familiarisation training resources and BIM courses have become online.</p>	<p>The IWFM 'EIR Guidance and Template' can be downloaded and amended to suit a specific project. Other EIR examples include: the cdbb, Procure22, Airgeadis Department of Finance, CLAW, NHS and MOJ. Several books (available through most retailers) may also be useful to FMs including 'BIM for Facility Managers' (IFMA Foundation), 'BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers' and 'Building Information Modeling For Dummies'. Other BIM resources include the 'NBS's BIM Periodic Table' and 'BIM Object Specification'. 'NRM Digital Life Cycle Toolkit' and 'BIM guidance websites are referred to in the information about BIM training courses. Many BIM case studies can be found on the SFT and the NATSPEC website.</p>				

EIR Template and Guidance



Guidance Books



CSF 10: Transfer – information to operation

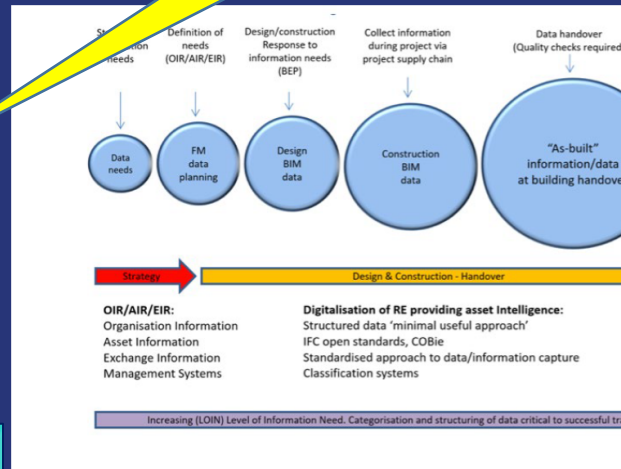
FM-BIM Mobilisation Framework: Critical Success Factors to Help Deliver Successful BIM Projects

CSF 10:

Ensuring successful transfer/ongoing management of information/data for the operational phase of assets

Over time an increasing number of buildings in organisations' portfolios will become digitalised and new buildings will be procured as standard using BIM. Organisations are increasingly likely to consider creating a digital representation of their existing RE portfolio, creating essentially a series of digital twins. This might include *'retro-BIM models'* and means FM teams will progressively receive increased amounts of digital information. This is illustrated in Figure 24 and shows how the amount of information/data increases during the BIM process and eventually will require a reduction process as the information needs to be transferred (or linked) into FM management systems. The information will be made up of **3D graphical models, alphanumeric data and documents** (PDFs, Jpegs, Excel sheets etc.) some of which may be held in external databases

BIM: existing buildings



BIM & EXISTING BUILDINGS
 Module Code: BE 1338
 Information Management
 Dr James Charlton
 Word Count: 3820
 Student No: 14025311

Logos for eBIM, NBS, bimacademy, and SCAN2BIM are visible at the bottom.

Figure 24

The *'EIR Template and guidance'* (Ashworth, 2017) can be used at the start of the BIM process and the *'BIM Data for FM Systems'* (Ashworth et al, 2019) can be used to help FM teams prepare for such projects. The guides are available from the [IWFM website](#).

BIM-2-CAFM Guide

GOOD PRACTICE GUIDE
BIM Data for FM Systems
 The facilities management (FM) guide to transferring data from BIM into CAFM and other FM management systems

iwfm
 Institute of Workplace and Facilities Management

ST 10.1: Data transfer

ST Ref	CSF Sub-Themes (ST)	Explanation	Ex	Deleted	Notated	do	/A
10.1	Planning the data transfer and quality checking process for BIM projects	<p>BIM information/data transfer should provide rich 3D models, PDF documents and alpha-numeric data. Having the end in mind is key to planning which systems require what data. A quality check process should be enforced to validate that what is required is being supplied (e.g. COBie data drops with automatic validation checks). Teams should consider linking documents e.g. O&M manuals to objects in BIM models to improve access for FM teams. Ongoing management to ensure BIM models/data remain relevant requires early answers to key issues i.e., which information is they</p>	<p>The targeted... must be clear... ensure system... using COBie/... can be found... 'Guidance' document... is an editable... must take time... or 'criteria' they... 'minimal useful'... 'COBie for FM'... can be used to... process' is essential... quality of data... COBie drops, visual check... to certain standards and model/data integrity checks. <i>Sarel and Jawadekar (2014)</i> wrote up, which readers may find useful. However a data quality check manual check still needs to be done manually. Information about COBie can be found in the standard 'BS 1192-4'.</p>				

Guidance on COBie for FM

Case study: COBie for FM

Doing COBie the Easy Way and Getting Real Benefits of BIM for FM



www.ecodomus.com

A Case Study of Using BIM and COBie for Facility Management

Sarel Lavy¹ and Salil Jawadekar²

¹PhD, Associate Professor, Department of Construction Science, Texas A&M University, College Station, TX 77843-3137; PH (979) 845-0632; FAX (979) 862-1572; email: slavy@arch.tamu.edu

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Abstract

This paper investigates the use of Building Information Modeling (BIM) and Construction Operations Building Information Exchange (COBie) for facility management on three projects where implementation concepts were used. Factors which affect these concepts are identified through a literature review. The study contains the following aspects of the implementation: responsibility for database formulation, characteristics of the database, technology, and effect on work order response times. A qualitative analysis was conducted to study the application of these concepts and to identify any problems encountered. Three case studies were conducted on projects where BIM and COBie were used for facility management. It was found that though the database generated by using these concepts is useful mainly for preventive maintenance, the data gathering and formulation process needs to be started earlier in the project. In order to make BIM more effective for facility management functions, such as space allocation, 3D mapping, building automation, etc., it would have been better to initiate BIM and COBie processes during early design and construction phases. The findings of this study can be used as a preliminary research upon which additional research on the implementation of BIM and COBie in facility management are further investigated and analyzed.

5. Further information and training



BIM for FM

8. Und 9. April 2021
15. Und 16. April 2021

Online kurs



Weitere Informationen
weiterbildung.ifm@zhaw.ch
Tel: +41 58 934 51 41

<https://www.zhaw.ch/de/lsfm/weiterbildung/detail/kurs/bim-for-fm>



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buildingSMART – FM Room



<https://bauen-digital.ch/de/rooms/#working-group-bimfm>

1. bSCH Building Room	ABC	CATEGORIES
bSCH Building Room		1. bSCH Building Room
Working Group - BIM / FM		1. bSCH Building Room
<p>The BIM / FM working group deals with the challenges of the perspective of investors, builders, operators and users and the resulting digital solution approaches in the context of BIM and building management. The focus of the work is on creating a comprehensive understanding, defining processes and analyzing standards, ecosystems and solutions. The aim of the working group is to consolidate existing knowledge, to compare national and international initiatives and to make an important contribution to the digitization of the real estate industry with relevant use cases. The working group started in Q3 / 2021 and is currently focusing on developing a market overview of productively implemented BIM / FM solutions. For this purpose, virtual site visits are organized, which are analyzed together in the working group in order to produce an appealing publication, resp. Create a BIM / FM market overview.</p>		
<p>Registration for the Working Groups Sign</p>		

https://docs.google.com/forms/d/e/1FAIpQLScK1kaXijWx3Hvoxof_ZacCmvBVD60YQ_15DwP6UizvFoNPrQ/viewform

buildingSMART – International activity and training



buildingSMART International

Activity Proposal

Project Name:

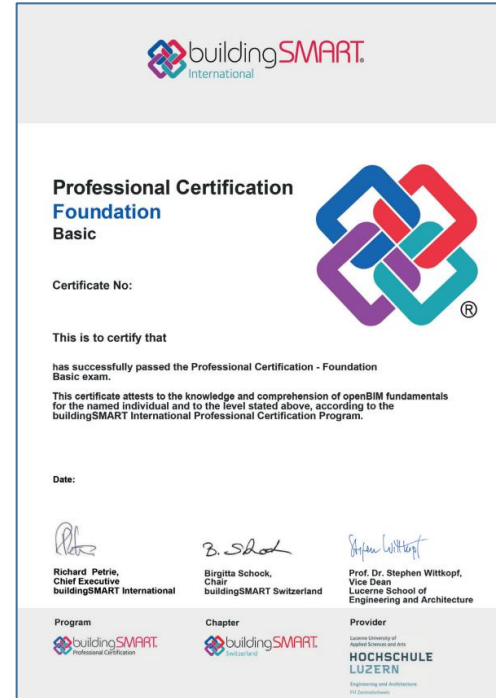
ISO41000 FMBIM Protocol, IDS and CDE

AKA “Facilities Management and openBIM”

5 DELIVERABLES

1. A BIM Protocol based on the ISO 41000 series representing the requirements of the facility management industry given the scope mentioned at 4.1, that will make handover/transfer and revision of data more accessible for FM.
2. An Information Delivery Specification based on the ISO 41000 series representing the requirements of the facility management industry given the scope mentioned at 4.1, that will make automation of handover/transfer and revision of data more accessible for FM.
3. An AECD/FM Common Data Environment model that will help increase real estate value by 2% bring down FM failure costs by 5% and simplify service processes.

Interested? Please email ashw@zhaw.ch



<https://education.buildingsmart.org>



Collaboration

(VIVA REAL Project Team, 2020)

<https://lnkd.in/dvCc-Xi>



Project Stockstrasse Neuenhof

Replacement new building in wood for three apartment buildings with a shared underground car park



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Questions

Look! is it a
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A plane?

No it's a
'BIM empowered'
facility manager!?



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