

# CHANGE MANAGEMENT

**The BIM  
Manager's  
Handbook**

**Dominik  
Holzer**

ePart

**2**



# **THE BIM MANAGER'S HANDBOOK: GUIDANCE FOR PROFESSIONALS IN ARCHITECTURE, ENGINEERING, AND CONSTRUCTION**

**CHANGE MANAGEMENT**

**EPART 2**

Dominik Holzer

**WILEY**

Copyright © 2015 John Wiley & Sons Ltd

*Registered office*

John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

For details of our global editorial offices, for customer services, and for information about how to apply for permission to reuse the copyright material in this book please see our website at [www.wiley.com](http://www.wiley.com).

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, except as permitted by the UK Copyright, Designs and Patents Act 1988, without the prior permission of the publisher.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at <http://booksupport.wiley.com>. For more information about Wiley products, visit [www.wiley.com](http://www.wiley.com).

Designations used by companies to distinguish their products are often claimed as trademarks. All brand names and product names used in this book are trade names, service marks, trademarks, or registered trademarks of their respective owners. The publisher is not associated with any product or vendor mentioned in this book.

**Limit of Liability/Disclaimer of Warranty:** While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. It is sold on the understanding that the publisher is not engaged in rendering professional services and neither the publisher nor the author shall be liable for damages arising herefrom. If professional advice or other expert assistance is required, the services of a competent professional should be sought.

ISBN 978-1-119-09229-2 (epdf); ISBN 978-1-118-98779-7 (epub); ISBN 978-1-119-09230-8 (Wiley Online Library)

Executive Commissioning Editor: Helen Castle

Senior Production Manager: Kerstin Nasdeo

Assistant Editor: Calver Lezama

Cover design and page design: Artmedia

Layouts: Aptara

Front cover image: © Morphosis Architects

# CHANGE MANAGEMENT

When thinking about BIM we immediately refer to technology as the key factor for BIM Managers to consider. On an organizational level though, it is not technology skills alone that make a competent BIM Manager, but her or his ability to guide and manage change effectively. The change-facilitator role of BIM Managers is immensely important and this Part 2 will point out how they get it right.

Imagine the following scenario: Sitting in a room with a group of BIM Managers who are discussing their respective roles. Peers from different professional backgrounds engage in informal chit-chat about their day-to-day duties and they might point out some new development they have been following. Without a doubt, at some point the discussion will converge toward the difficulties they face within their organization explaining what it is they do, why so much money is spent on technology, about the overheads they are responsible for, and how hard it is for them to get the BIM message across to upper management and team leaders. In the past, this has been the classic BIM Manager's dilemma: positioning and justifying what they do within their organizations. In some instances this issue still persists. It is not a problem related to the BIM Manager as such, but an issue that reflects on the implications of introducing innovation and change to an industry that is

more often than not set in its traditional ways. The problem is that BIM Managers tend to overlook that by managing BIM, they are actually tasked with managing change.

Part 1 of this publication, *Best Practice BIM*, established a set of criteria that assist BIM Managers in benchmarking BIM implementation as it occurs in practice. Part 2 follows from a key argument introduced in Part 1: Proper Change Management is a critical factor for the successful and sustained proliferation of BIM into any organization. Change Management as discussed here is an essential process within any organization undergoing substantial transformation in a short period of time. Its purpose is to minimize resistance to change within the organization and assist those affected in coping with the personal impact of change.

Part 2 first discusses the effects of technology on an organization in terms of innovation and change. Requirements for Change Management will be presented as integral to the wider ramifications of facilitating change when implementing BIM. It then proceeds to raise and discuss the main cultural issues associated with Change Management and suggests specific actions that help smooth the often “bumpy ride” that BIM Managers encounter in their role as facilitators of change. Based on accounts from top practitioners, a number of approaches will be explained that help BIM Managers to overcome change resistance by their colleagues. Finally, this part will offer tips and tricks that form useful instruments for BIM Managers to complement their Change Management efforts.

The advice given here will allow BIM Managers to apply a structured approach in communicating the effects of change to other stakeholders. It will assist BIM Managers in developing and benchmarking BIM implementation strategies and communication regimes. The information provided in this section will not only benefit those who are in the early stages of introducing BIM to an organization; it will offer useful insights to those who are well advanced on the path of implementing BIM within their organization in order to master supporting its continuous evolution.

# Technology as a Driver for Innovation and Change

Over the past 20 to 30 years the work environment in architecture, engineering, and construction practices has become ever more information-rich, allowing for novel approaches to conceiving and delivering the projects we undertake. Speaking about BIM at the 2005 AIA Convention in Las Vegas, Thom Mayne, head of the renown U.S. architecture firm Morphosis, predicted: “You need to prepare yourself for a profession that you’re not going to recognize a decade from now, that the next generation is going to occupy.” Mayne adds to this by highlighting the potential of the use of information and communication technology to enrich design and construction processes: “There exists a new medium, a continuity, a flow of thinking, a design methodology which is more cohesive from the first generative idea, through construction, coordinating millions of bits of discrete data.”<sup>1</sup>

New technology and associated tools possess a transformative character that impacts on the entire supply chain and the business models of how major stakeholders interact on construction projects. Digital Innovation promotes organizational change in design practice as well as across construction and procurement.<sup>2</sup> The management of information and communication technology (ICT) has therefore become an ever more relevant aspect of contemporary practice. Some argue that there is a direct relationship between the progressing specialization in the construction industry, the increased application of technology, and the complexity of contemporary construction projects.<sup>3</sup>

Since the introduction of CAD to mainstream practice, management of ICT was predominantly handled by an organization’s Information Technology (IT) expert or department. A separation between IT and design/engineering activities within an organization was the norm and the IT department remained in a supporting role. The IT expert would set up and maintain an organization’s hardware and network infrastructure, the software environment for communication and design/engineering/documentation. The increasing application of BIM comes with a new distribution of responsibilities: The veracity inherent in the changes triggered by BIM stem from the disruptive nature associated with its core concept. BIM addresses whole-of-life of building projects. Its use opens up channels for communicating and exchanging building information across a group of stakeholders who previously adhered to a predominantly one-directional process of passing on information throughout the supply chain. Apart from a few exceptions, these stakeholders focused on their own piece of the puzzle without much thought to integrating lifecycle considerations into their planning.

The technology surrounding BIM is changing that view. Increased interoperability facilitates increased potential for exchanging information across a broader group of stakeholders. In the second decade of this century we increasingly analyze and respond to how to work our way backwards through the supply chain from Operation and Maintenance (O&M), to Construction, Engineering, Design, Feasibility, and Building Component Manufacturing (eventually closing the loop with the operational side). On a project level, information inherent in these processes requires management and the modeling and coordination processes require strong guidance from those who provide the most direct interface between the technology and organizational culture. This change in process signifies a major cultural shift in the way humans interact on projects both across organizations as well as within their own team. On a multidisciplinary project level such interaction increasingly gets regulated by BIM Execution Plans and other guidelines. One key challenge emerges if conflicts surface due to tensions

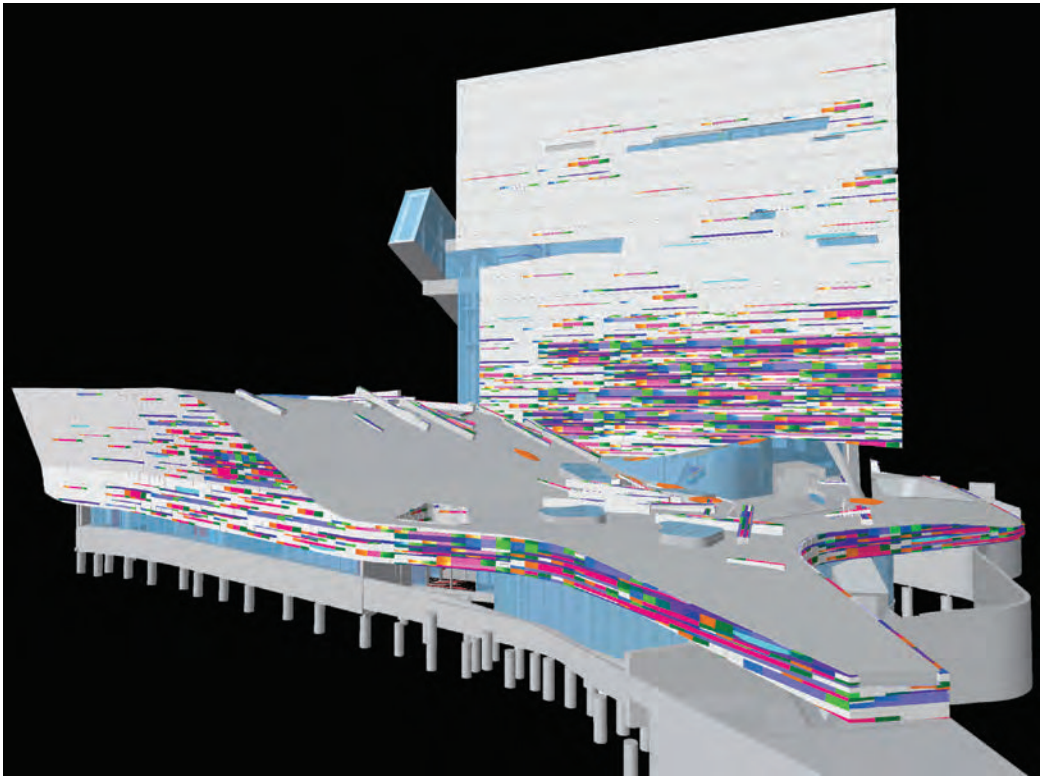
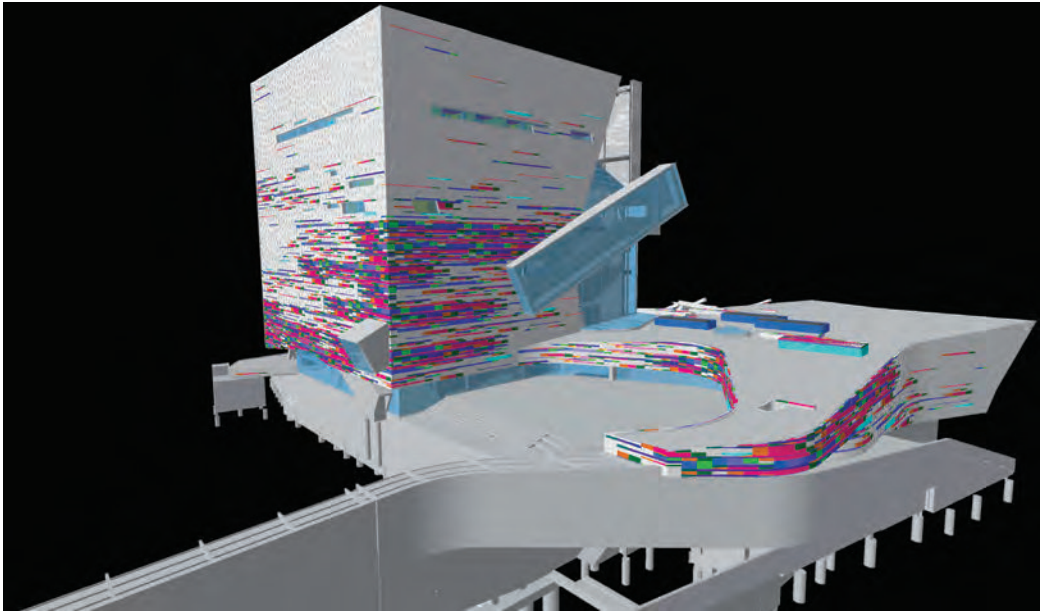


Figure 2–1 BIM applied on the precast concrete facade at the Perot Museum of Nature and Science by Morphosis Architects.

© Morphosis Architects



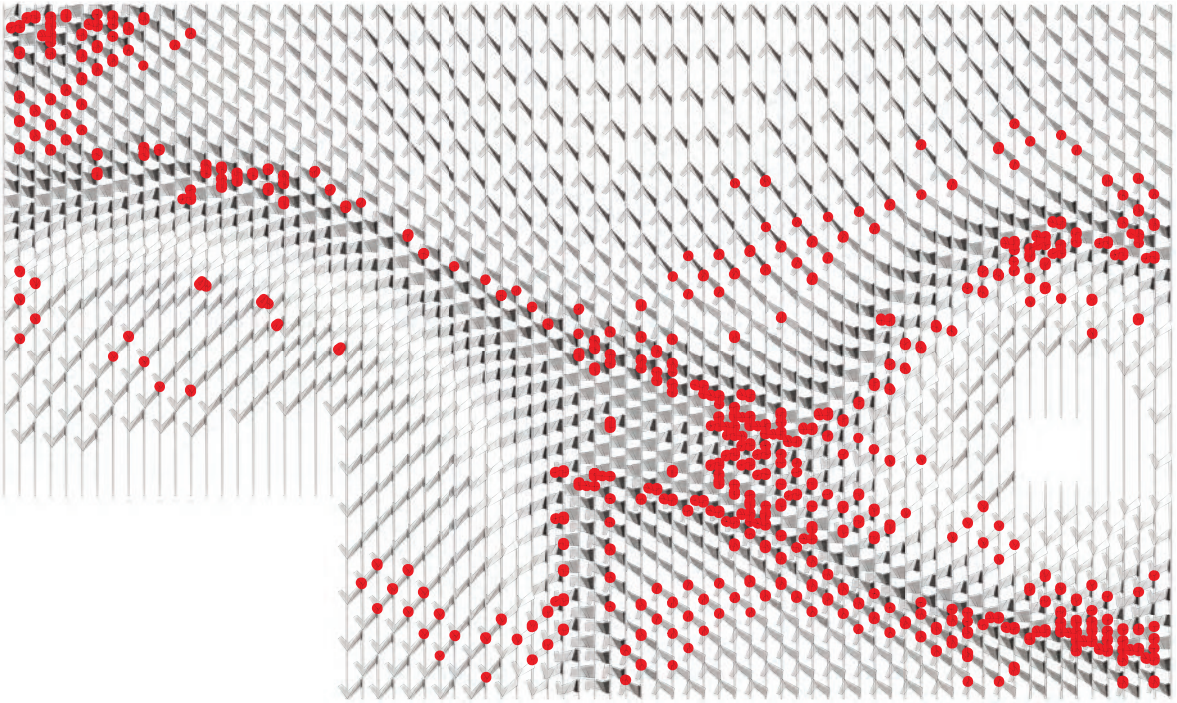


Figure 2–2 Emerson Los Angeles project by Morphosis: A geometric model that contains/embodies a large amount of information including constructability, costing, fabrication, and design.

© Morphosis Architects

between the team’s goals and the legal framework by which they are bound. Within individual organizations tensions arise due to varying levels of engagement of staff with technology, the associated range of skills, and varying levels of resistance to accommodating change to well-established workflows. In addition, an organization’s leadership is not always aware of the impact BIM has on its business.

## The Cultural Dimension of Change . . . and Its Management

Organizational change requires a change in culture. Social Science describes organizational culture as: “the constellation of values, beliefs, assumptions, and expectations that underlie and organize the organization’s behaviour as a group.”<sup>4</sup> Cultural change therefore has a profound impact not only on an organization as a whole, but also on its individual members as it is asking them to alter their perception and behavior.

# The Social and Organizational Context to Change

“An organization doesn’t change until the individuals within it change.”<sup>5</sup>

In the construction industry, there exists a tendency to approach a project with the same methods that have worked in the past; successful delivery often depends on preestablished “formulas” and workflows that have proven to be efficient and effective for those involved. Due to the traditionally poor knowledge-capture in the construction industry, many of these formulas sit within individual project leaders’ heads.

The advent of BIM scrutinizes this approach. The introduction of high-end technology for information sharing requires a re-think of established workflows. BIM implies a more structured and less individual-centric approach to knowledge-capture. Project team constellations need to be revised in order to help manage the increased data connectivity across a project team. Project leaders are likely to be challenged by the increase in information management required to share models efficiently among various participating stakeholders.

What needs to happen to empower those who are well set in their traditional ways to open up toward new approaches? How can one structure a process of engagement that leads to sustained organizational change?

In his publication *Critical Success Factors of Change Management*,<sup>6</sup> Tim Fritzenschaft suggests three major phases associated with Change Management: Change agents first need to *prepare and create readiness for change*; before *executing change*; and subsequently *consolidating* it.

The first phase requires a clear definition of the objective and an analysis and understanding of the current situation or environment to be changed. It is pivotal to create a shared awareness among affected stakeholders about the problems that lead up to the need for change in the first place. In addition, change facilitators should have the ability to communicate well to those affected what the upcoming changes will encompass. What effect are they going to have on them personally? Creating a shared understanding about the areas of change required both, in terms of buy-in from upper management as well as operators in the trenches, will soothe the disruptive nature associated with change.

Fritzenschaft describes the second phase as the crucial point where change agents determine competences and responsibilities that lead to change. This is the phase where employees get involved in executing the change. At this point, it is crucial to identify key organizational roles related to the facilitation of change. It is also the period where most resources (time, money, and manpower) are required. This is the time of dialogue and engagement. Whereas the audit undertaken in the first phase results in awareness about what needs to happen and how to achieve it, phase two encompasses a period of transformation. This phase has a major impact on the cognitive landscape of those affected.

Any organizational change is only as effective as the means to uphold and sustain its effects. Therefore, the final phase, according to Fritzenschaft, is all about consolidation of what has been achieved. It is the period where results get communicated and progress gets monitored continuously.

# BIM Managers: Facilitators of Change

BIM Managers play a decisive role as change facilitators. Change facilitators assist key stakeholders within an organization by mentoring them on their path to deal with change. They empower them to engage with a changing context that affects their professional and personal life. Their involvement is to determine a vision and a program for implementing the three phases as described above. First, BIM Managers need to base their work on a strong awareness of the situations they encounter within their organization and beyond. They are the ones who understand the broader industry context when it comes to technology uptake and its reconciliation with existing practices.

During the process of facilitating change, BIM Managers train, mentor, and build communities in order to align traditional workflows with new approaches that respond to the strategic BIM and technology direction identified earlier. This is the period where those affected are likely to be taken out of their comfort zone, the period where BIM Managers empower them to cope with and embrace change that affects them.

In order to consolidate their efforts, the BIM Manager needs to monitor the adherence of staff to particular workflows, standards, and other BIM-related processes that were introduced in the second phase. There exists a tangible danger for those who are new to adopting BIM to fall back into old habits once problems arise. It should be the declared goal of any BIM Manager to assist an organization to get to a point where the benefits of using BIM outweigh its upfront investment. Depending on the quality of the BIM Manager and his or her associates, this point happens sooner or later. A well-developed strategy will also assist the practice to decrease their effort levels in delivering projects altogether.

Change Management in the context of BIM is by nature an ongoing process. There is clearly a major upfront learning curve to master: Those at the start of embracing BIM are confronted with a large number of major

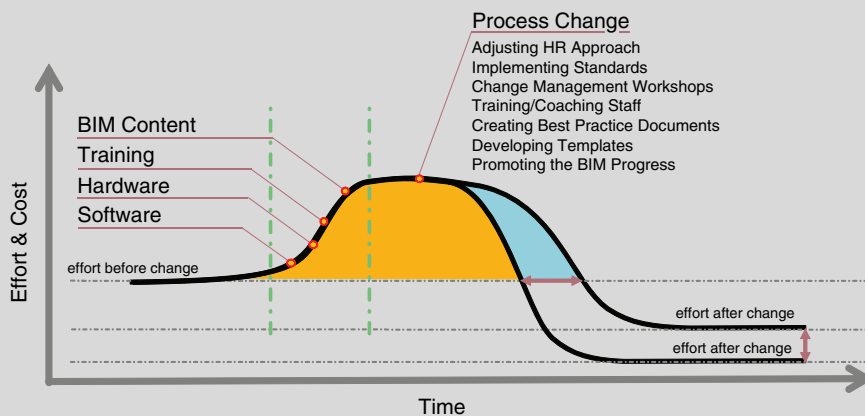


Figure 2-3 Change Management graph, reducing the effort of project delivery.

© Dominik Holzer/AEC Connect

changes to traditional workflows. At the same time, even those with a proven track record of successful implementation across their organizations (and with a number of reference projects to show for it) still highlight that they are on a path of discovery. BIM keeps evolving and it does so across a widespread range of building lifecycle-related topics. If architects and engineers were first to apply BIM to facilitate design, engineering, and documentation, contractors started soon thereafter to accommodate it for construction coordination and management. As time progresses, more and more clients/developers/project managers/and manufacturers are getting involved. Inherent to a rise in information sharing capability across an expanding group of stakeholders comes an increase in complexity and the need for Change Management. The gradual expansion of the BIM constituency has occurred over the past five to ten years and it is still ongoing. Hand in hand with the expansion of stakeholders is the availability of technology that allows them to interact via BIM. BIM Managers therefore deal with a moving target when helping to facilitate an organization's response to the implementation of BIM.

## Interfacing with Your Organization's Leadership and Management

BIM as a process is highly disruptive to traditional practices applied across the construction industry. In addition, BIM continues to evolve at a rapid pace. Those new to its implementation often struggle when taking their first steps; those already proficient in its use need to ensure they keep up with the rapid changes as part of its development. In that sense, BIM has a major impact on business aspects of a large proportion of stakeholders across the AEC industry. Still, there appears to be a disconnect between those who manage and lead an organization and those who actively engage with BIM. It is the BIM Manager's role to bridge this gap. The reasons for this disconnect are manifold, but one of the key factors is that organizational change associated with BIM usually occurs tangentially: It neither emerges directly via bottom-up demand from staff (except possibly in a select few cases), nor does it typically result from a top-down directive. Instead BIM is often introduced by a technology specialist within consulting or contracting firms, or simply by an enthusiast who is passionately pushing for change. One other reason for an organization's leadership skepticism toward BIM is the fact that the associated lifecycle thinking at times stands at odds with the immediate business interests of an organization. Leaders tend to focus on internal benefits rather than what is good for the project. With the absence of a revised scheme for redistributing fees, leaders see the risk of their organizations taking on more work than they are paid for.

### BIM's Push and Pull

When using BIM we do not just apply new software to replicate processes we used to engage in less efficiently in CAD. When using BIM, we drastically alter established workflows, relationships, and deliverables. We thereby impact a wide range of stakeholders across the construction industry and beyond. The kind of change required, and the extent to which change is needed to facilitate BIM, is often unknown to upper management. Due to their lack of awareness about BIM, they struggle to decide on what to change, which direction to take, or how to

achieve the change process. The lack of client pressure or mandates by authorities results in the predicament that BIM-related organizational change gets driven from within the organization (push) rather than presenting a clearly defined target to work toward (pull). At the same time, managers tend to be highly alert to changes triggered by outside factors such as e-market demand, policies, or other business-related circumstances.

Richard Saxon predicts a change in market behavior with more pull from the client side: "BIM is a supply-side phenomenon, offering changed performance to the market as 'Push.' What will determine how it changes the industry will be the customer 'Pull,' the services actually sought by the market."

The internal push for BIM remains problematic if upper management does not realize that its implementation is in essence a management-related task. Management often mistakes it as a technical challenge that is best resolved by IT staff, CAD experts, or junior staff members with a technology edge. Even if overarching policies, or even mandates, exist (there are increasing numbers of those emerging globally) they are more likely than not going to be read and understood by the BIM Managers and not by upper management. The consequences are problematic.

## Decision Makers Who Do Not Understand BIM

Within those organizations that are new to the adoption of BIM, upper management's relationship with BIM Managers is at times rather reactive instead of proactively engaging. In these instances, it is common that the communication flow between a firm's decision makers, project leaders, and BIM Managers and authors is not well structured; it remains a one-way street. The purpose of BIM and its goals get communicated insufficiently, with little or no benchmarks for implementation and strategy for change. BIM's effects on business remain unexplored. Such shortcomings result in miscommunication between stakeholders and misunderstanding of the impact of BIM on projects. It can lead to annoyance by project leaders who do not seem to get what they want and it simultaneously can lead to frustration among BIM Managers who feel misunderstood or disrespected. Along with the lack of understanding of BIM itself, the role of the BIM Manager as an agent for change is, at times, little understood or supported by upper management.

Based on feedback from expert BIM Managers globally, the lack of engagement from upper management and/or the client represents the primary obstacle BIM Managers need to overcome. The most knowledgeable BIM Manager who is surrounded by the most competent team will still struggle and likely fail to establish best practice BIM if upper management does not understand it in the first place. Such lack of engagement is reflected in a number of typical examples:

- Obscured views about what BIM is
- Mistaking BIM for 3D CAD
- A mere focus on software and technology
- A lack of understanding of how BIM impacts HR or staffing on projects
- Recruiting staff that lack the required BIM skills

- A misjudgment about the benefits and particularities of a BIM delivery process
- Ambiguity about the BIM Manager's position within an organization

**HOW TO OVERCOME THIS ISSUE:**

Understand the reasons behind the lack of engagement by upper management.

Learn how upper management makes decisions—What is their source of information? Who do they trust and why?

Engage the key decision makers in a discourse about BIM—avoid being technical. Put yourself in their shoes.

Ensure BIM becomes an integral part of business conversations; run regular information sessions with upper management.

## Lacking Support from the Top

Management's lack of understanding of BIM results in a bigger problem: the lack of adequate support they provide!

BIM Managers are often left with insufficient authority to facilitate change and to set up BIM in a sustained manner. Still, it is the BIM Managers who get blamed for the lack of progress if change does not happen or if it does not occur quickly enough. This problem highlights a crucial quality BIM Managers need to possess when they guide an organization's transition to BIM. They need to be able to make and communicate a compelling business case for BIM to their leaders.

Making a business case is highly relevant in order to receive adequate resources and time allocations for the management process of BIM. Resources in this sense refer to (training and coaching of) staff, but also to a dedicated budget for BIM-related purchases (software/hardware, BIM library objects, etc.). Time allocations refer to both the BIM Manager's time away from pure project work (e.g., in order to focus on BIM standards development) as well as an understanding that staff in general need to be given time for ongoing training, mentoring, or other forms of engagement with BIM. Gustav Fagerström is a Design Technology Specialist who gathered his experience working across several different fields and prominent firms such as Buro Happold, UN Studio, and KPF. He describes this issue as follows: "Oftentimes there is time to either do the work your clients are directly paying you for, or to develop non-project-specific best practices and tools, but not both."

**HOW TO OVERCOME THIS ISSUE:**

Learn to gain trust by upper management.

Prove the value you add as a specialist within your organization.

Demonstrate that BIM is not an overhead by a platform for innovation.

Be clear about your BIM-related responsibilities and accountabilities and those of others.

Highlight what it is you are doing and what support you require to do your job well.

Make (a) business case(s) for the change you wish to enable.

Set up and articulate a BIM and Design Technology related annual budget.

## Becoming a Manager

Issues related to a lack of support from the top are a double-edged sword. While BIM Managers agree that the lack of support from upper management is a problem, this problem could be seen in a different light: Any professional who puts “Manager” in his or her title should better be able to deliver on that promise.<sup>8</sup> The point made here is that BIM Managers can—to a degree—be blamed for their peculiar situation: Their technical (or BIM software) knowledge is not always matched by equivalent leadership skills required to act in a management role. BIM Managers need to know how to manage process and change, and not just software. The BIM Manager Certification courses mentioned in Part 1 are a pathway into more structured skill development for BIM Managers, but there is more:

Upper management laments the lack of communication skills of BIM Managers who struggle to articulate their specific needs. Independent of the level of authority provided to BIM Managers within an organization, they are still accountable to enable upper management to make informed decisions about BIM.

### **HOW TO OVERCOME THIS ISSUE:**

Improve your communication skills—You are more likely getting support if you can clearly articulate what you need.

Attend Management seminars that focus on business aspects of your work.

Aim for gaining an “industry-accepted” BIM Manager Certification.

Establish benchmarks and referring timelines or budgets against which they can be measured.

Apply management techniques to your own workflow; introduce BIM key performance indicators (KPIs).

Work together with upper management on business plans and budgets that relate to your work.

## Learning to Lobby

Years of experience in a 700+ staff design firm have taught Toby Maple, global Design Technologies Leader at HASSELL, a thing or two when it comes to facilitating change. According to Maple, in order to win over the skeptics, a BIM topic is best not tabled impromptu at an executive meeting; it is better to strategically increase management’s understanding and seek common alignment from the relevant players beforehand. Toby explains:



“Management’s understanding of BIM and BIM processes are probably not to the same technical level as the BIM Manager. One key tactic for getting multiple parties aligned, understanding and supporting you is to have nontechnical discussions with them one-on-one—before you go into the room where you seek an outcome. If you can arm them with a good understanding of what the issues are beforehand, you certainly increase your chances of reaching a consensus. People don’t want to look ill-informed and not able to make a decision in a meeting!”

“In terms of the actual process of providing decision support: You need to be able to articulate to management the value of improving on the current situation, as well as to highlight the negatives to adoption; you need to define the business imperatives to make certain decisions, because of cost, resourcing, or maintenance of different applications. Once people realize that your request is not simply a passionate or emotional plea, that the issues you raise affect the business financially, that realization can result in a Eureka moment for management. These people often become your greatest advocates.”

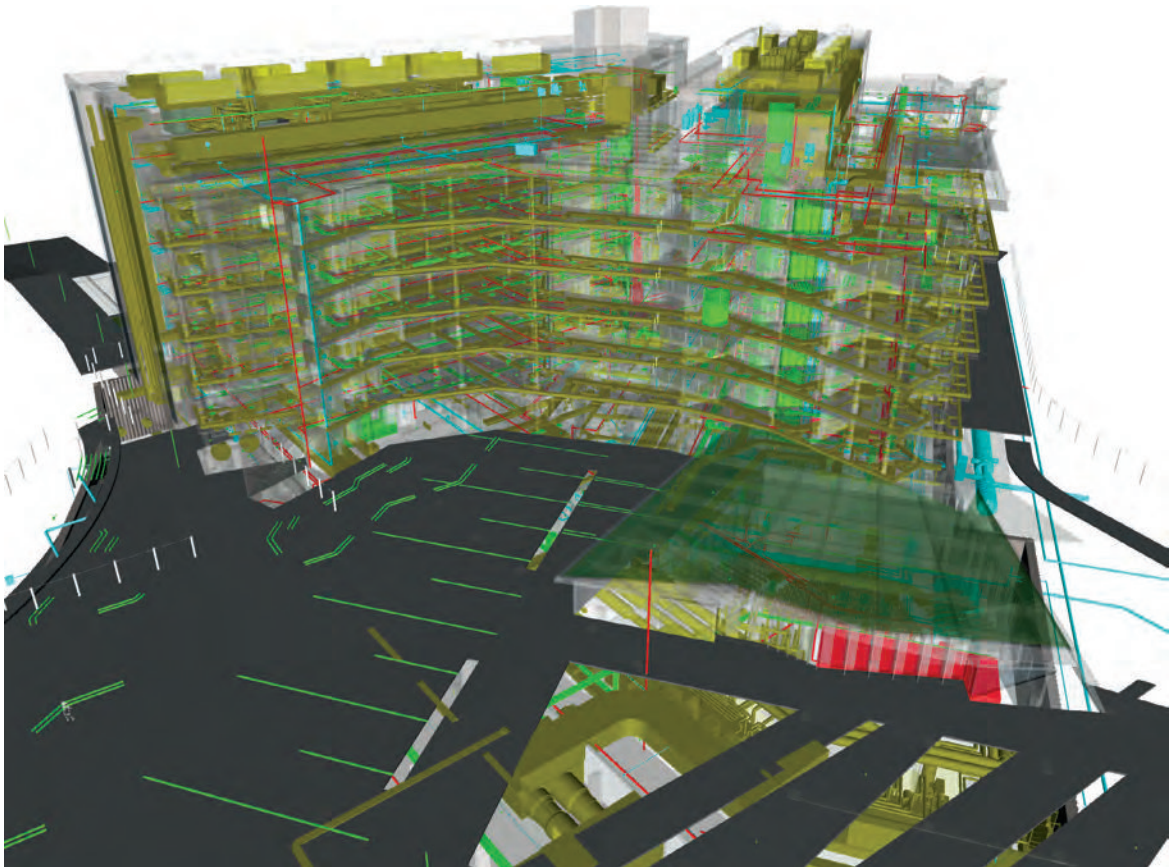


Figure 2–4 Federated Revit Models in Navisworks for coordination reviews by HASSELL.  
© HASSELL



An organization's leadership is well advised to adopt a strategic approach to implementing BIM that tackles Change Management on a business and cultural level. The BIM Manager is the key advocate to allow this change to unfold, supported by upper management and in strong reference to the goals and objectives by key staff such as project leaders and practice innovators.

## The Inside Man

Following Toby Maple's suggestions for engaging management strategically, another instrument to break the ice between BIM management and an organization's leadership is to have an individual from within the leadership group acting as the BIM liaison—a senior staff member who not only enjoys the trust of upper management, but who also has a technical edge. He or she can help facilitate dialogue and engagement between the more technically inclined BIM proponents and the directorial/principal level. The advantage for BIM managers is to have a strong partner to go to who is in regular contact with decision makers in a firm. The disadvantage is the BIM Manager's dependency on that liaison which, to a degree, may stymie the BIM Manager from gaining direct access and respect from the leaders. The reliance on a liaison may also turn out to be problematic if that person is drawn away by other commitments and BIM- or technology-related issues remain unresolved over an extended period of time.

Ultimately, it should be the BIM Manager's goal to have the ear of upper management directly and to aspire to becoming part of that management group. Current examples in practice hint at the increased significance organizations place on the BIM Manager's role. A career pathway toward Design Technology Leader, or even Practice Director is a plausible development.

## Selling Value Back to the Business

Strategic BIM Manager and Associate Director at HDR Rice Daubney, Stephan Langella is one of a lucky few. When discussions about people's roles came up within his organization, Langella's boss delivered a clear message to his peers: The BIM team is not an overhead; instead, the employment of someone like Stephan Langella is a strategic investment into the future of the business. Langella accounts:

"You have to stop the culture where you accept the business referring to you as an overhead. You need to claim your position as a strategic investment. The problem is that some within a business believe that utilization equals profit; and that is not true. In order to demonstrate your value you need to show tangible outputs that others can engage with. You need to sell your value back to the business! The smart BIM Manager needs to know how to do that. Smart BIM Managers need to articulate business cases; they need to have a business focus. Otherwise you may get pushed into a corner. If all you have left to do is 3D documentation and fire-fighting, you have lost control! We keep implementing the following strategy on our organization: Every single project has a person assigned to it who is responsible for BIM. That person doesn't necessarily have to be a capable BIM person, that person has to be a capable manager."

As Langella's example highlights, BIM Managers often struggle to provide proof of their value to their organization. How far does the investment into BIM pay off? What is its business case (from project to project)? How can

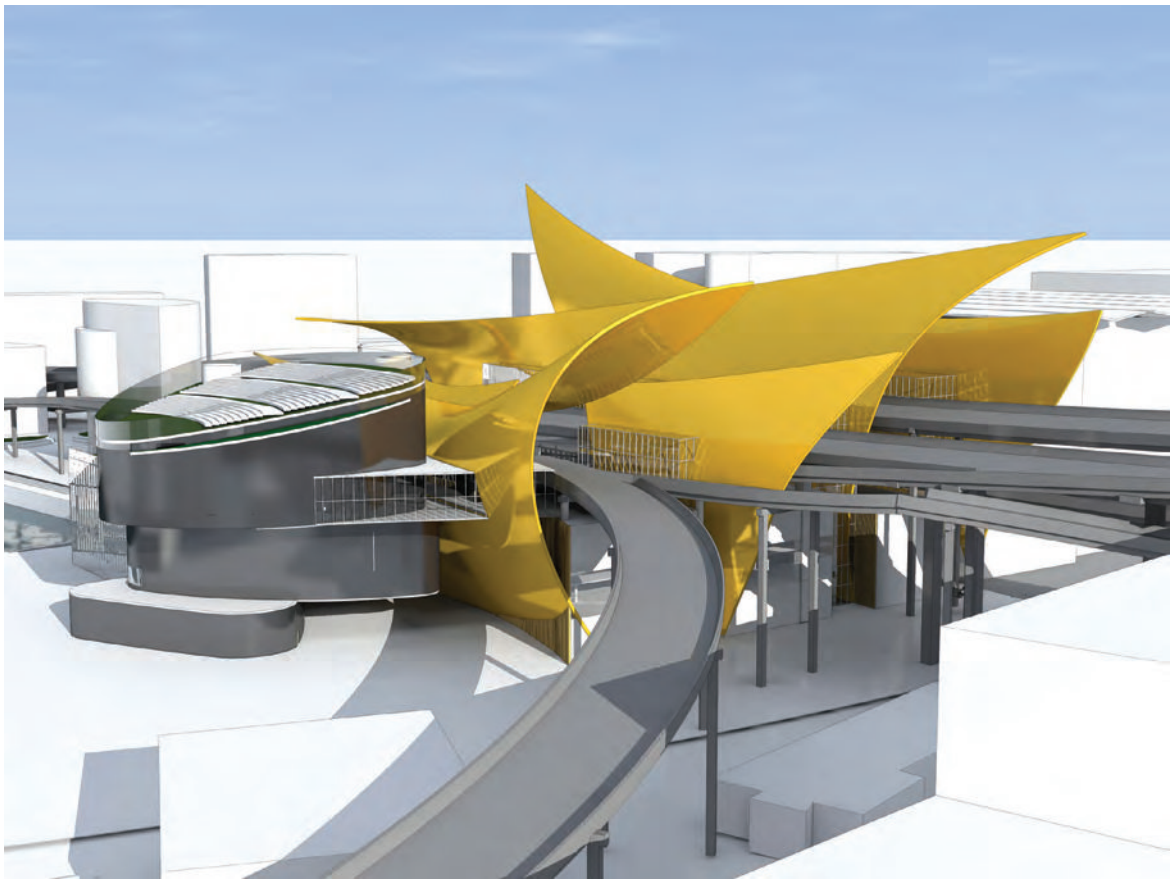


Figure 2–5 Best Use of BIM for Design, Drama, and Excitement at Build Sydney Live 2013, BIM Coordination Workshop result by HDR Rice Daubney.

© HDR | Rice Daubney and Obayashi Corporation

one measure successes or challenges of BIM and validate performance on projects or across an entire organization? How can the Return on Investment of BIM be maximized?

By nature, BIM proponents argue for an increase in output quality of documentation, construction planning, the construction process both onsite and offsite, and higher-quality data at handover and commissioning. The effort applied to achieving higher-quality output differs from stakeholder to stakeholder as roles and responsibilities can shift between traditional and BIM-style approaches. Finally, fees are mostly still determined by clients and project managers based on outdated traditional methods of delivery. They seldom reflect the nature of upfront planning and coordination associated with BIM and they rarely take into account the potential of BIM to facilitate downstream savings for clients. All of the above arguments need to be taken into consideration by BIM Managers when defining their business cases and the associated Return on Investment (ROI).

While there exist simplified formulas<sup>9</sup> or even “online tools”<sup>10</sup> to measure BIM ROI, the prerequisites for achieving efficiency gains from BIM are often more multifaceted. These benefits depend on a large number of factors and they differ throughout the various trades, markets, and maturity levels of BIM uptake. They also depend on third-party requirements such as BIM mandates or specific BIM-related policies. Implementation costs for software, hardware, training, or content (creation) can represent a significant hurdle that prevents some from going for BIM in the first place. Those who do are still left with a steep learning curve and ongoing costs for implementation (and in particular for managing change). Design Technology expert Gustav Fagerström shares his personal views on the pros and cons of the project-related utilization options:

“It is a key conundrum for the management of Design Technology within any AEC organization whether it is preferable to remain an overhead cost entity (more R&D headspace, less project integration, thereby potentially less easily demonstrable relevance to the practice bottom line and ROI), or an integrated project team entity (little to no headspace for R&D beyond specific project applications, integrated fully into the billable work of the organization and essential to delivering the product.) Either model has its own challenges in terms of quantifying and validating the associated upfront cost as well as the ROI.”

#### **HOW TO OVERCOME THIS ISSUE:**

Benchmark BIM-related expenses and activities and establish a clear set of KPIs against which they can be measured.

Report these KPIs regularly to upper management and discuss their implications.

Work with project team leaders on their delivery strategy; weave in your BIM knowledge to increase efficiencies.

Explain to upper management what you manage, and what you fail to achieve with BIM; provide the reasons behind both.

Establish an annual Design Technology and BIM budget from which to work; get it funded by upper management.

Involve upper management in decision making processes related to the financial aspect of BIM.

Shift upper management’s mindset away from seeing BIM as an overhead and toward an investment into the future of your organization.

## **Overcoming Change Resistance and Managing Expectations**

Director of Digital Practice, Josh Emig of Perkins+Will states, “While integrated delivery is growing, the majority of projects in our industry still use delivery methods that reinforce disciplinary silos, narrow self-interest, risk aversion, information hoarding, and a 2D mindset.”

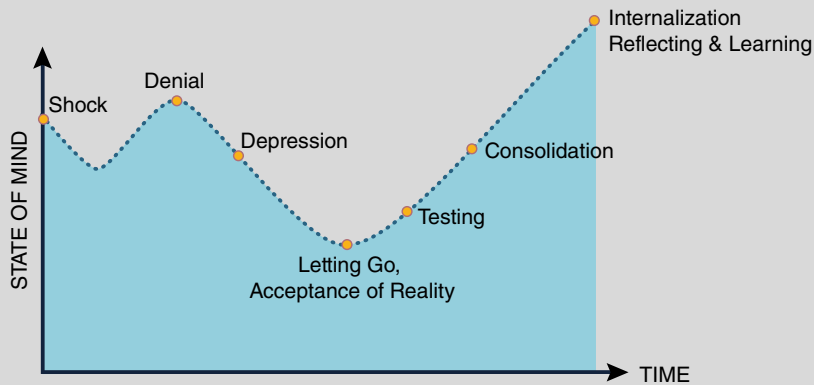


Figure 2-6 After J. Hayes, *The Theory and Practice of Change Management*, 2010.<sup>12</sup>

© Dominik Holzer/AEC Connect

So far we have looked at change management on an organizational level and how it is influenced by organizational and leadership culture. This section addresses change resistance as it occurs in groups and with individuals. The key impact on our behavior occurs on an emotional and attitudinal level.<sup>11</sup> Fear plays a role that feeds into resistance to change—fear of the unknown, fear related to financial loss, or fear of becoming redundant. Organizational Behavior Research tackles this issue by identifying several states of mind an individual undergoes when confronted with transition.

Winning over leadership when it comes to BIM is without doubt a crucial precondition to effect change within an organization. Yet, when it comes to addressing change resistance on an individual level, there is another group that requires attention: Middle Management, and in particular project team leaders.

## That BIM Thing Looks Amazing, Just Not on My Project!

According to BIM Manager Jan Leenknecht at Bjarke Ingels Group (BIG), “Everyone comes to a Copernican shift in documentation technology with their own approach, their own assets and fears. You get the whole range of responses—in times of challenge the real personality shines through.”

BIG’s Jan Leenknecht accentuates a primary concern of BIM Managers when facilitating change: Winning over the design teams and those running the projects with those teams. BIM Managers benefit greatly from the support they get from the top. At the same time it is actual BIM output and the end user comfort on a team level that reflects the success or the shortcomings of any BIM implementation effort most directly. Jan explores this further:

“In general, the best way to effect change (with the partners, design team members, and especially with project leaders) is to work through actual results rather than through “BIMspeak” or boilerplate BIM slide shows.

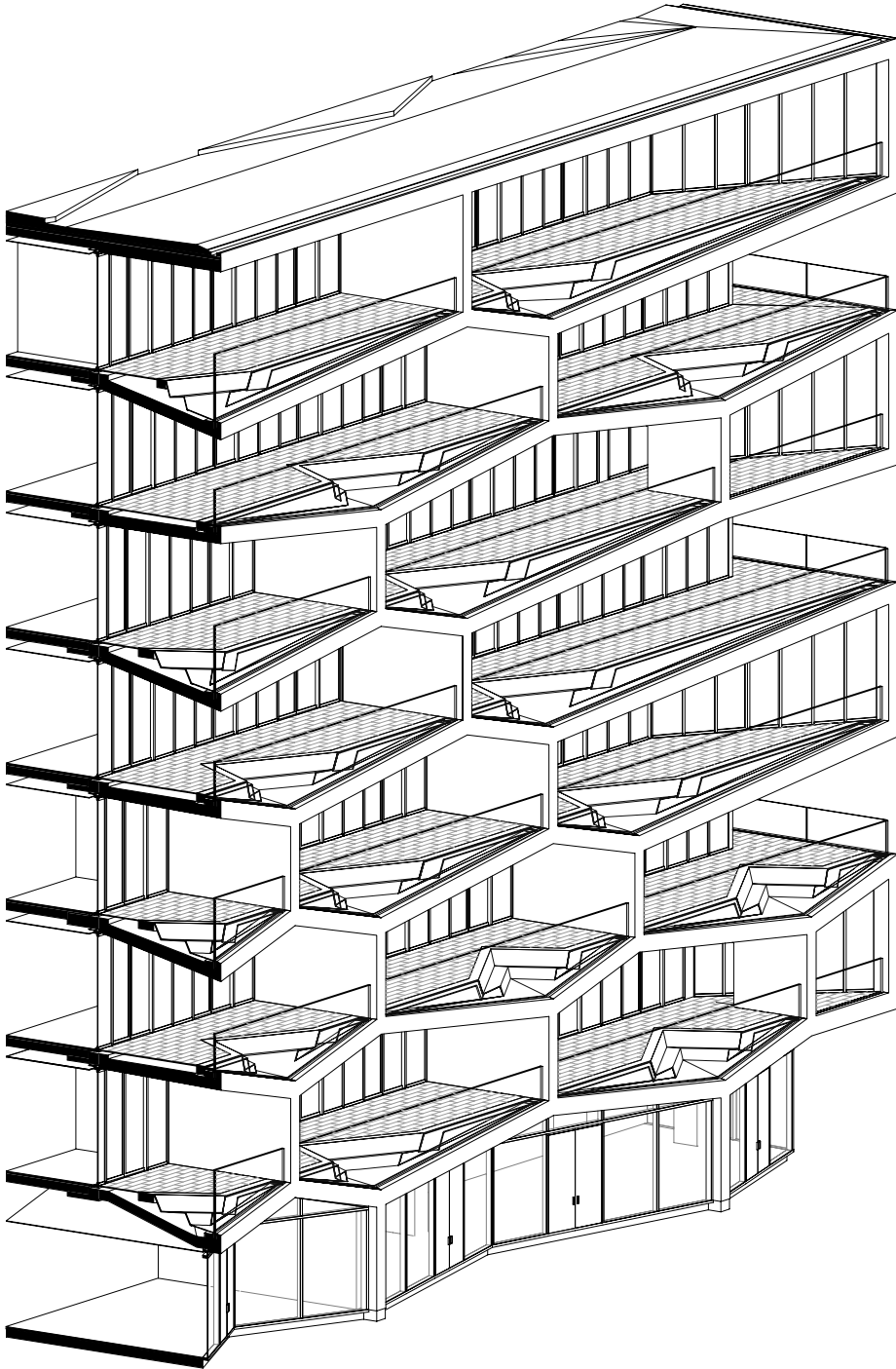


Figure 2-7 BHS Project by the Bjarke Ingels Group (BIG): Balconies.

© BIG



Figure 2–8 BHS Project by the Bjarke Ingels Group (BIG): Close-up Render.

© BIG

A sharp-looking finished drawing set or a well-performing interoperability workflow will win over more BIM skeptics than all the MacLeamy curves in the world.

Another way, [to gain the support of] the design teams, is to always prioritize end user comfort over BIM management comfort. Example: A Revit template with a long list of Worksets may look professional and ready for all possible scenarios from a BIM management point of view, but it will, in most cases, only add extra assigning work for the design teams. We start our projects with one Workset for all modeled elements (“Building”), and add more only when necessary. Most projects do perfectly fine with that one Workset through halfway of the Design Development stage.”

People resist change. They do so in a context where they see their well-established “formula for success” being jeopardized by approaches they aren’t familiar with and that they haven’t tested yet. Change resistance is a

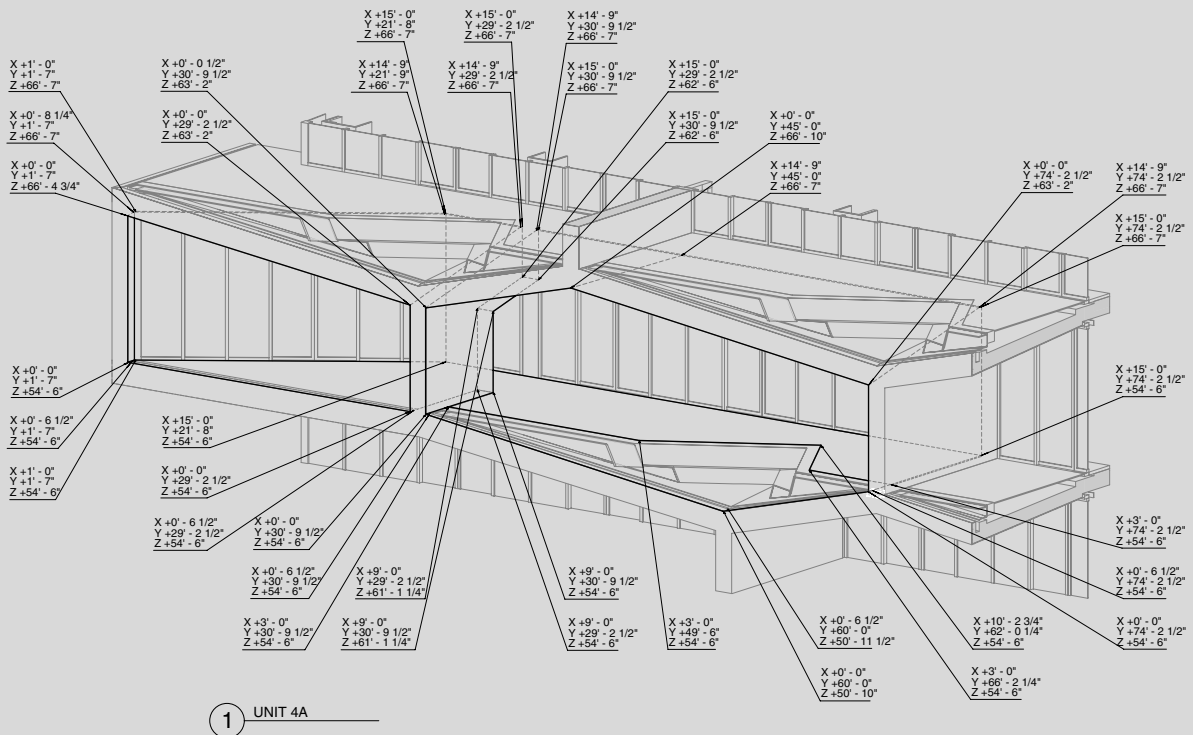


Figure 2-9 BHS Project by the Bjarke Ingels Group (BIG): Balconies Control Points.

© BIG

natural instinct to protect oneself from risk of failure. Knowledge acquisition in the construction industry is often based on empirical observation and exposure to processes as they unfold on precedence projects. The advancement of knowledge vocationally stands in stark contrast to the system-oriented approach taken in other industries, such as car manufacturing or aerospace.<sup>13</sup> The increased use of BIM as the predominant method of delivering projects jeopardizes previously existing success formulas applied by middle management who usually occupy team-leader roles.

HASSELL's Toby Maple shares an insight related to this topic:

"On a project level, if we consider a BIM skeptic principal or team leader, it is crucial to get good people around them, who have delivered projects before successfully using BIM; they value the opinion of their peers. As Design Technologies Leader they don't necessarily value my opinion from a project delivery standpoint, even though I have been implementing BIM for over ten years. They will trust their fellow staff whom they've worked with before. They will be more comfortable asking them questions such as: How can I achieve 3D coordination? How can I integrate my markup's into the model? HASSELL is luckily now in a position where we have a network



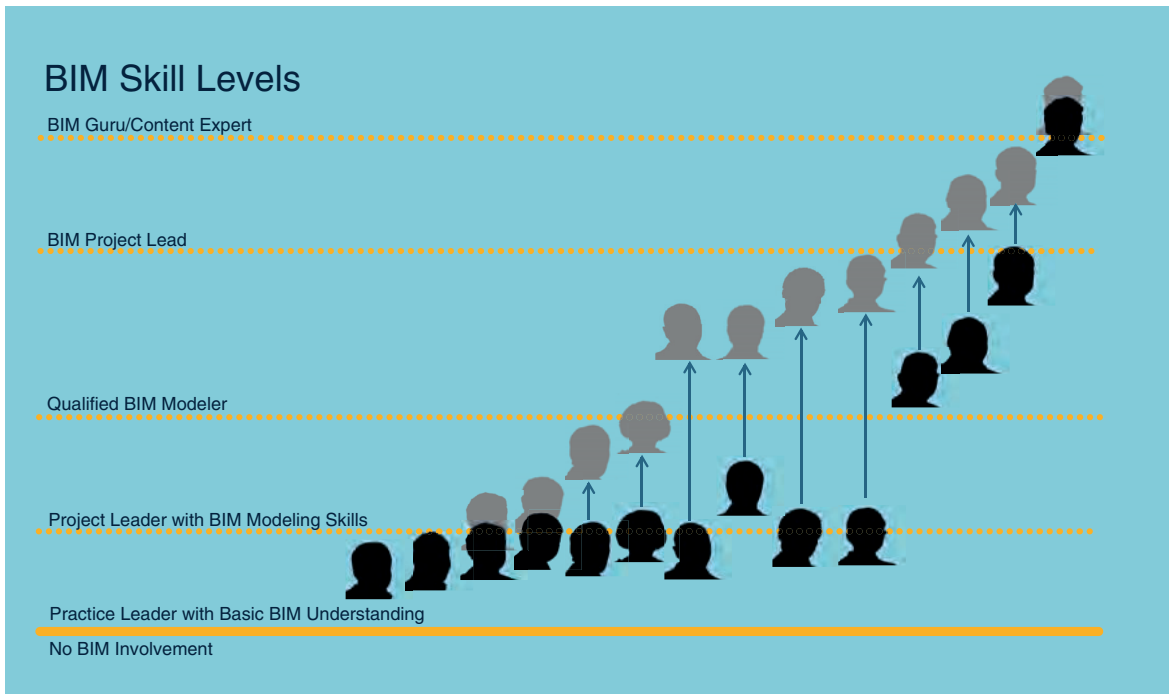


Figure 2–10 BIM skill level development on an individual level.

© Dominik Holzer/AEC Connect

of BIM support personnel for staff. We have been fortunate to have delivered profitable BIM projects very early on which gave us enough success stories for BIM to become infectious—from then on people started engaging with BIM processes on their projects and asking: *How can I use BIM to do my job more effectively?*”

Support for BIM not only takes into consideration individuals’ personalities, but it should also take into account the desired level of change for each individual. As an example, when looking at existing and desired skills across an organization, the BIM Manager should map out different levels of BIM-related knowledge to then determine each staff member’s desired pathway for change.

The mentality of those who do not adapt to the changing circumstances in the workplace needs to shift in order for them to get rid of old habits. BIM Managers need to take on a coaching role; easing the burden of transition for those who struggle and empower them to become part of the BIM implementation process. Well-formulated people skills are a prerequisite for BIM Managers who provide support to others whose focus lies less on technology than other aspects of their work. In the context of cultural change, the ability to go beyond the kind of silo thinking prevailing across the construction industry is a pivotal asset for BIM Managers. Where others often only see their part of the equation, BIM Managers need to provide vision and guidance that cuts across professional boundaries, thereby embracing the whole-of-life dimension of BIM.



#### HOW TO OVERCOME THIS ISSUE:

Overcoming change resistance requires acknowledging that it exists in the first place.

Proper BIM management requires an in-depth understanding of change management.

Communicate the cultural relevance of BIM to your organization on a number of levels:

- A solid and ongoing dialogue about technology and BIM, and business goals with upper management
- Regular information sessions with project leaders, understanding their point of view and their deliverables
- Regular and frequent mentoring/monitoring with those who author or coordinate information based on BIM

Facilitate a transparent discourse about the advantages and challenges associated with project delivery using BIM.

Realistically judge each individual staff member's pathway for applying BIM and complement it with related training and mentoring.

Change management has a vast array of issues associated with it; Part 2 of this series is dedicated entirely to this topic.

## Bridging the "Us vs. Them" Schism

"... the extreme positions of technophobia and technophilia provide a useful dichotomy that animates and propels design thinking."<sup>14</sup>

We have all come across labels such as "the BIM guys" or the "Tech People." There exists a cultural schism associated to the implementation of BIM that is deeply rooted in the history of technological advance in practice.

The use of high-end technology in professional practice has progressed since the advent of personal computing in the 1980s and from the mid-1990s onward it was greatly amplified by the added connectivity facilitated through the World Wide Web. Nowadays, the application of high-end technology has become pervasive in the developed world both in our private lives as well as for our work; the boundaries between specialist and common operator are progressively blurring.

Within organizations the progressive introduction of technology has, at times, led to an "us vs. them" mentality. There are those who see the use of technology less as an opportunity than as a threat to their professional integrity; a distraction to the core of their professional activities. As a result, those who engage with technology can easily get pigeonholed as "tech people" (or "techies") with an associated career path that keeps them separate from others. This stigmatization may at times be the typical context for a BIM Manager's career. Such a stigma may be welcomed by some who want to specialize and who see this as a distinction on their professional pathway. Others may struggle accepting that BIM helps their careers.

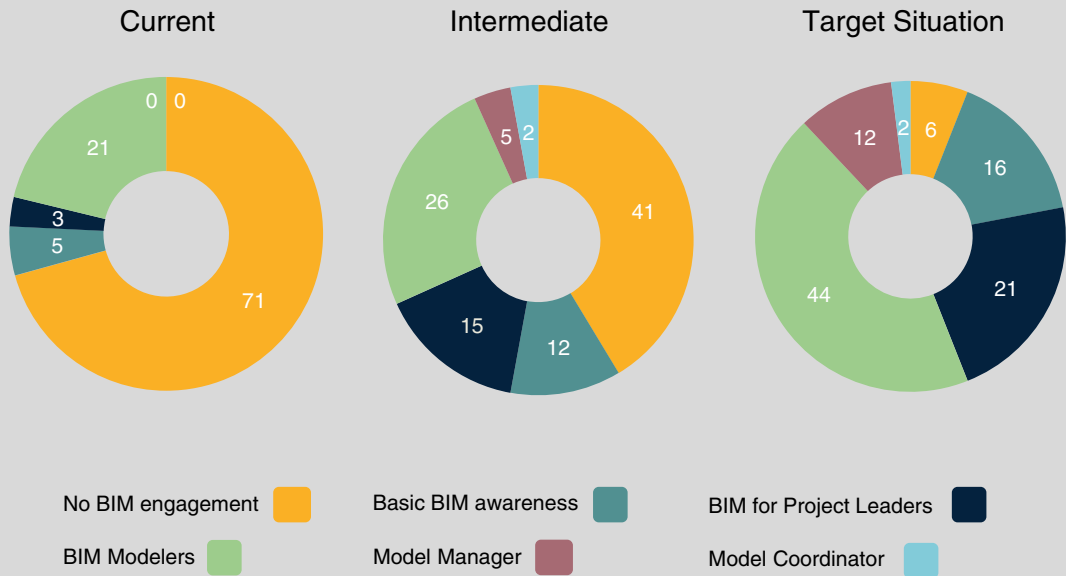


Figure 2–11 Strategic BIM skill roadmap considering individual strengths and organizational goals.

© Dominik Holzer/AEC Connect

As an example, there are designers who do not wish to develop their BIM skills as they fear the label of “Model Manager” or “BIM Architect.” Engineers may be critical about adopting BIM as it pulls them stronger into design documentation and delivery—a role that for many instead sits with specialist drafters and detailers. Contractors may prefer to do things in the way they have done them in the past. The use of BIM suggests disrupting their established principles, which in return is perceived by contractors as a substantial risk. Those propagating BIM management within contracting firms therefore continuously fight to demonstrate that the added benefits of BIM outweigh the risks.

The type of tensions mentioned above can lead to organizational friction and inertia. Colleagues may—at first—be interested in technology, change, and the promise of more efficient work methods. When it comes to aligning their known ways of working with BIM processes they may struggle to accommodate such change. Techno-skepticism and Technophobia among certain staff may be the result and lines get drawn between technology protagonists and those who wish to have little to do with it.

#### HOW TO OVERCOME THIS ISSUE:

Emphasize to those colleagues who are mainly concerned with activities that do not have technology at their core that you understand their point of view.

Address the origins of techno-skeptic or even technophobic sentiments among colleagues; in some cases their anxieties stem from a lack of understanding, in other cases they are based on ignorance and the perception of risk, or a misinterpreted stigma associated with technology.

Coach others to engage with technology and break down the schism between a tech and a nontech mentality.

Structure your training and mentoring strategically around particular circumstances of staff.

## Developing a Network

“Change in a large, diversified, geographically distributed firm requires strong networks for both initial and long-term success,” says Josh Emig, of Perkins+Will.

No BIM Manager works in isolation. As in any other organizational setting, BIM Managers constantly interact with their peers to advance their desired goals. BIM Managers engage regularly with the executive level and they interact with project teams on a day-to-day basis. Depending on the size of any organization and its geographical distribution, BIM Managers should keep an eye on building up partnerships and networks across their organization that help them to effectively expand their sphere of influence. One of the worst occurrences in larger organizations is the segregation into local clusters of interest where synergies get lost and uncoordinated approaches to BIM flourish. Josh Emig, Director of Digital Practice at the design firm Perkins+Will, shares his experience:

“Perkins+Will is a design firm of 1,600 people, working in ten or so market sectors, across 25 offices, globally. Individual office size ranges from 30 people to over 200 people. The growth of Perkins+Will over the last 15 years has been an equal split of organic growth and acquisitions. Each acquisition joins the firm with its own culture, personalities, and ways of working. Lastly, Perkins+Will has a distributed corporate structure, which is to say that there is no central Perkins+Will headquarters. Our corporate leadership is distributed across five cities in North America, while our board membership represents an even broader set of localities globally.

Several years ago, when we went about rethinking our technology efforts, our design technology organizational structure consisted of two groups: a corporate group, focusing primarily on the implementation and support of design software, and local project-based ‘design technology leaders.’ This structure was actually in place for good reason: It allowed for central coordination, as well as project-based champions, for initial BIM implementation and support that began in 2006. Over time, however, as the firm grew and BIM adoption became more mature, this structure began to show weakness.”

“While the firm did not suffer for talent, the corporate group had become disconnected from projects, project leadership, and office leadership, and project technology leaders who, while effective on projects, were similarly disconnected from broader efforts at the firm-wide scale. What was needed were more and stronger connections between office networks and the firm-wide network.

Figure 2–12 High performance buildings, like Perkins+Will's Atlanta office at 1315 Peachtree St. in Atlanta, require diverse skill sets and technology perspectives to execute successfully. Strong, diverse internal social and organizational networks are a key component of building successful teams.

© Raftermen Photography



Figure 2–13 Perkins+Will major, multi-office project BIM planning incorporates perspectives from various domains in network: overall project manager, firm-wide BIM leader, office BIM managers, and project BIM managers representing several Perkins+Will and consultant offices.

© Perkins+Will/Josh Emig

Through simple organizational shifts, we created technology leadership positions in each office—effectively a local technology leader who reports to office leadership, coordinates the efforts of the project based technologists, and forms a network tie to our smaller, corporate design technology group, now called ‘Digital Practice.’ These office-based technology leaders are also key communicators of technology capability, strategy, and risk management to our project leadership, which is perhaps the most critical constituency in any change program. Lastly, they are often the best ‘ears’ in the firm because they are privy to project details that are invisible to the corporate team because they are ‘flying too high’ and invisible to project teams because they are ‘in the weeds.’

In each of these domains, people are engaged with efforts of the others—project-based technologists often work on firm-wide knowledge and resource development efforts. Corporate Digital Practice team members engage on project work. Office design technology leaders work in the three domains simultaneously. Most importantly, the communications of these three domains overlap continuously through various standing calls, through project efforts (both internal resource development and external, client-facing projects), as well as through friendship and ‘peer support.’”

## Tips and Tricks

This concluding section of Part 2 offers some in-depth support for running BIM audits and for setting up in-house BIM Workshops. These instruments provide BIM Managers with a better understanding of their organizational context and they help to raise the BIM knowledge level of key decision makers.

## The Design Technology and BIM Audit

There are a number of ways for BIM Managers to address cultural and skill issues related to Change Management. An audit is a great starting point to bridge the gap between an organization’s aspirations related to technology use, and more specifically BIM, and successful implementation. The audit can either occur in-house, or it can be extended to include key collaborators of that organization. The purpose behind the audit is twofold.

First, it will offer the BIM Manager a stock take of the organization’s BIM capacity (summary of skills) as well as revealing the aspirations of staff from the leadership level all the way to the operators on the floor. The BIM Manager can then identify gaps between the current BIM knowledge level and the desired BIM maturity within the organization. Identifying those gaps will assist the BIM Manager in developing a roadmap for future implementation.

Second, the BIM audit is about empowerment. The fact that the audit takes place is in itself a message to staff that their views are valued. In addition, communicating findings from the audit to those involved (and even those not yet involved) will engage them with the topic. The insights provided by the audit will allow the BIM Manager to engage leadership with confidence about staff sentiment and the current skill level among them. It cuts out a good proportion of “second guessing” by the BIM Manager and it helps to fine-tune the development of future pathways for implementation.

One cannot assume that staff will have the answers when it comes to the right implementation strategy. Ultimately the BIM Manager is the key person tasked with developing a vision and direction for the change that is required. Still, responses from those affected most by BIM in their day-to-day work are invaluable when it comes to Change Management and BIM implementation.

## Set Up and Run a Design Technology/BIM Audit:

The audit itself should consist of three major parts.

The first part is about gathering people’s individual feedback during semi-structured, face-to-face interviews with selected staff. Here the BIM Manager asks employees about their experiences and their expectations of using BIM. Transcripts or even recordings are useful aids to help the interviewer remember what gets said. In case the interviewing BIM Manager uses any method to record what is said, he or she must ensure that no office policies or other work-right-related clauses are violated. Also, anonymity of the interviewees needs to be

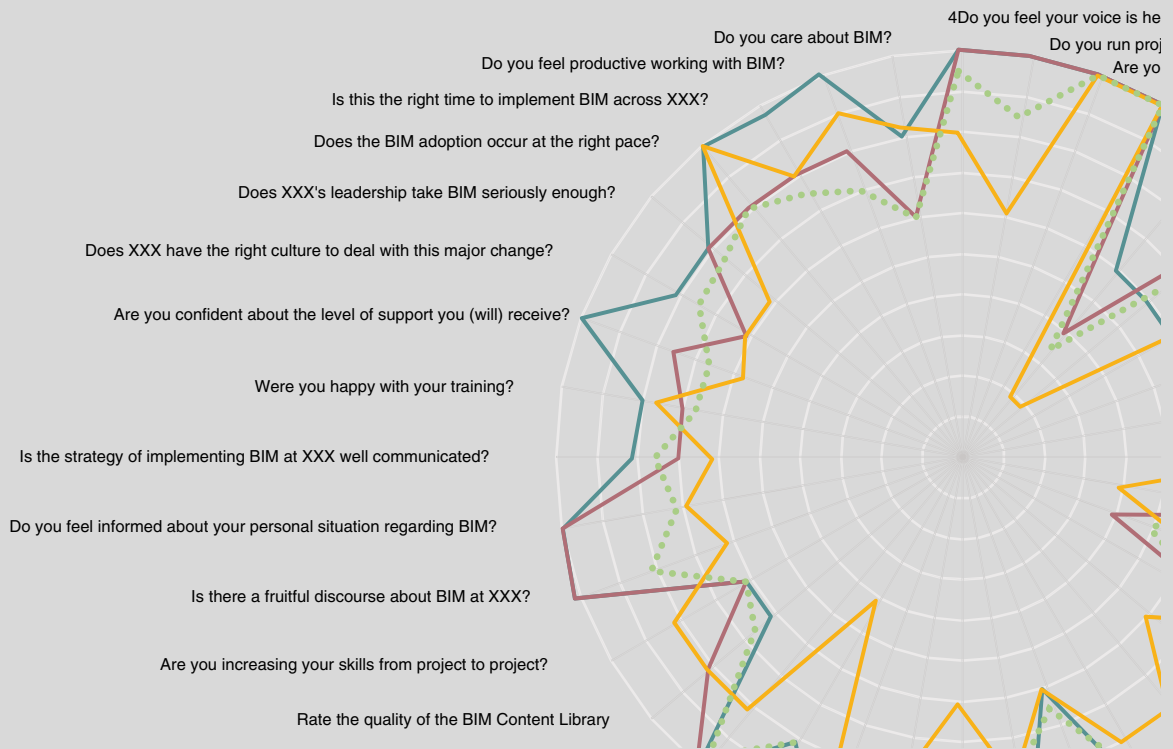


Figure 2–14 BIM Audit Example—Comparison Matrix.

© Dominik Holzer/AEC Connect

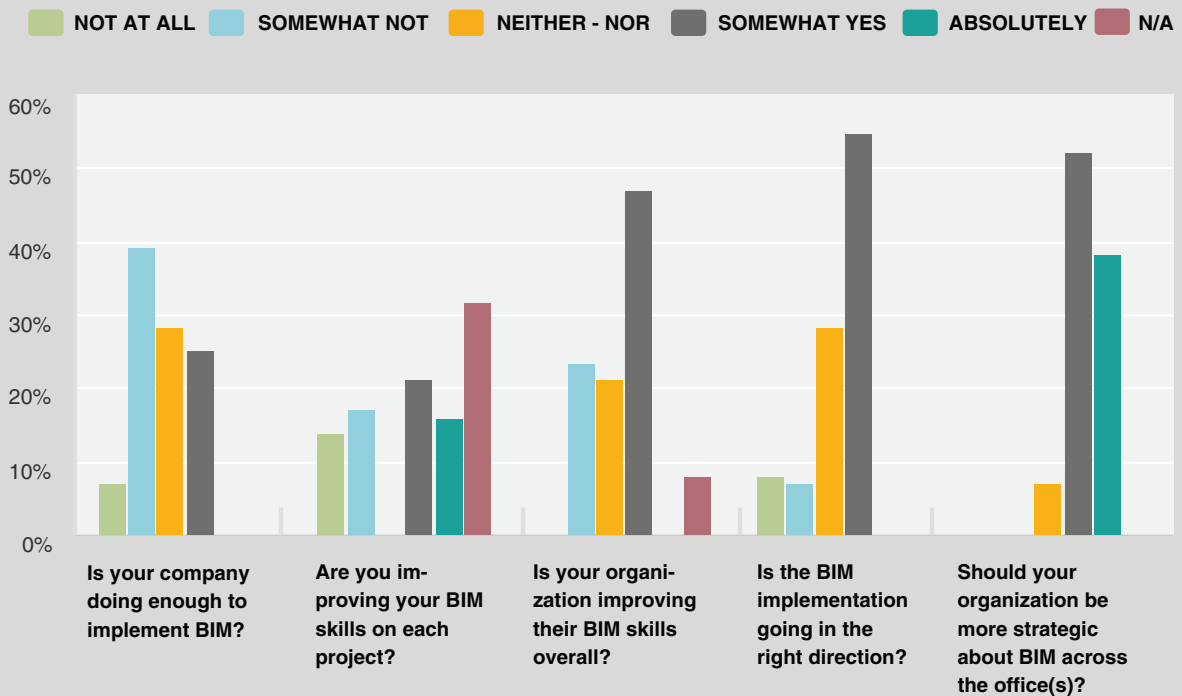


Figure 2-15 BIM Audit—An example of a skill-improvement response.  
 © Dominik Holzer/AEC Connect

guaranteed in order to establish trust between the interviewer and the interviewee. In some cases, an organization may prefer to invite an external party to conduct the interviews.

Complementing the interviewing process, the BIM Manager can find out more via a questionnaire that asks respondents to quantify certain aspects related to BIM and technology. This second part of the audit will allow the BIM Manager to graphically represent responses on charts. Such charts are highly useful in order to communicate findings to an organization’s leaders and others.

The third major part of a BIM audit is to work in groups to run collaborative brainstorming sessions where employees are able to voice their views and develop out-of-the-box ideas related to BIM. These sessions are usually highly interactive and they may already include a component where staff gets exposed to some of the feedback gathered during the audit. Raising consciousness, increasing understanding, and making individual staff aware that their concerns and ideas are noted by others lead to social interaction and empowerment.<sup>15</sup> The group dynamic emerging from any audit should be expanded and developed into regular BIM user sessions.

# What Should Be Asked During the Audit?

A BIM audit should obviously help determine the current skill level of staff when it comes to delivering projects using BIM. In addition, the audit should engage staff on a personal level in order to determine the mood on the floor and broader aspirations. The BIM Manager should organize the questions in a manner that includes more general questions upfront, to then become more specific toward the end. Ideally, questions should cater to those already confident in the use of BIM as well as to those not engaged yet. Further, questions should query the level of confidence interviewees have in the BIM approach taken by their organization. How well are they informed about what is going on? Do they feel involved in the uptake/implementation of BIM? It proves useful to ask participants during the audit about their expectations and if those are matched by what they have experienced in terms of BIM exposure.

## **SOME QUESTIONS MAY INCLUDE:**

How can/could it support your daily (design) practice?

What are the obstacles to using BIM in an efficient way? Is there anything holding you back?

Why should you engage with BIM at your organization? Why wouldn't you?

What would you put in your miracle toolbox; what would make your work so much easier?

Describe the way you exchange BIM data with your consultants from design to construction.

How easily do you adapt to unfamiliar technology?

What training would you require most for working in a BIM environment?

To what extent does BIM affect the documents and data output capability within your organization?

Has progress been made with its implementation?

What would you like to achieve through BIM?

How often do you get asked by external design parties to provide information in BIM?

As much as in-house audits offer a rich view into an organization's technology uptake, BIM Managers should also consider including external organizations in such activities. It can be invaluable to the positioning of an organization's BIM strategy to have a good understanding about the BIM experience of their most immediate collaborators.

Due to obvious business constraints, external BIM audits usually cannot be conducted with the same level of detail as internal ones. External audits can nevertheless reveal important aspects to be considered as part of an organization's internal Change Management process. They paint a more detailed picture of the market in which an organization is operating. Such knowledge can help with the alignment between internal work processes and external factors that are crucial for the successful delivery of projects using BIM across multiple organizations.



Table 2.1 BIM Audit—Typical example of an audit questionnaire.

QUESTIONS							
<b>General</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Do you care about BIM?						
	Do you feel productive working in BIM?						
	Is BIM "the right way" for delivering projects?						
	Is this the right time to implement BIM across XYZ?						
	Does the adopting happen at the right pace?						
<b>Level of Confidence</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Are you confident XYZ's leadership takes BIM seriously enough?						
	Does XYZ have the right culture to deal with this major change?						
	Are you confident with your ability to migrate from CAD to BIM software?						
	Are you confident about the level of support you receive?						
<b>Being Informed</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Were you happy with your BIM training?						
	Do you feel informed about the steps XYZ is taking (to implement BIM)?						
	Do you feel well informed about XYZ's internal BIM support?						
	Is the strategy of implementing BIM at XYZ well communicated?						
<b>Feeling Involved</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Do you feel involved in the BIM process on your project?						
	Do you feel part of XYZ's BIM progress?						
	Do you feel your voice is heard when it comes to BIM?						
	Is there a fruitful discourse about BIM at XYZ?						
<b>Matching Expectations</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Does BIM at XYZ meet your expectations?						
	Are you happy with your own learning curve?						
	Do you think starting BIM was worth while?						
	Do you enjoy working with BIM?						
<b>Output Quality</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Has BIM had an impact on the quality of your documentation output?						
	Do you run projects better when using BIM?						
	Does using BIM make your life easier?						
	Does BIM allow you to increase the quality of your design?						
<b>Progress</b>		absolutely	somewhat yes	neither - nor	somewhat not	not at all	NA
	Is XYZ doing enough to implement BIM?						
	Are you improving your BIM skills on each project?						
	Is XYZ improving their BIM skills overall?						
	Is XYZ's BIM implementation going in the right direction?						

© Dominik Holzer/AEC Connect

For the above reasons, it is useful to find out how far advanced collaborators are with the setup of their in-house strategy. How well established are their workflow protocols? Do they implement well-formulated standards? Do they work toward accepted industry frameworks and guidelines? Would they like to approach certain aspects of collaboration differently, given the opportunities BIM provides? How do they approach document and data management in the context of BIM? What value add do they perceive within the context of BIM? How would

they usually split BIM element authorship across various stages of design, engineering, documentation, and delivery?

A greater awareness of these factors allows BIM Managers to reduce second guessing when it comes to the establishment of collaboration workflows. It further allows the BIM Manager to communicate preferences to decision makers within an organization when it comes to the selection process for collaboration during tender.

The BIM audit does not merely assist the BIM Manager in understanding the cultural Change Management within an organization. The audit can be seen as a stepping stone toward the development and/or adjustment of BIM standards, BIM content creation framework, and ultimately also the setup of cross-disciplinary BIM Execution Plans.

## Change Management Workshops and Seminars

With the audit as a first step, more support is required to assist an organization with Change Management. Learning the use of new software itself is seen by some as the key move toward adopting BIM. This classic misconception originates in the belief that BIM is some sort of 3D CAD and all that is needed is therefore an understanding of generating, manipulating, and checking/coordinating 3D models. As seen in Part 1 of this publication, Best Practice BIM draws a very different picture:

Adopting BIM successfully requires a sound understanding of information management across the project supply chain. Next to a different approach to project setup, BIM necessitates changes to established workflows within an organization and beyond. Further, BIM offers a range of opportunities for data association and integration with processes that can be entirely new to an organization (and the expanded project team). There is no “typical” BIM workflow; it strongly depends on what information requirements are predominant on a project-by-project basis. Such an approach may be alien to organizations who traditionally were used to delivering more ad-hoc outcomes under a lot of time pressure and with only limited consideration about data integration and management.

Bearing in mind the opportunities mentioned above, organizations usually still depend on 2D document delivery to fulfill their contractual obligation. Typical plan/section/elevation output that traditionally stemmed from the drafting process in CAD increasingly gets generated in semiautomated processes using BIM. Manipulation of 2D output is often no longer directly possible for project architects, project engineers, or project/design managers. Accessing design in order to update 2D document output does not occur as directly in BIM as it used to in CAD. The interconnectedness of information inherent to BIM makes it difficult to accommodate local or ad-hoc changes to document output. The entire setup of graphic standards for the visual feel of document output is best determined upfront and not at the end of the process toward finalizing documents for submission.

For those who are not (yet) familiar with this typical BIM workflow, access to crucial documentation output is suddenly kept at arm’s length. As a result, there exists the danger of disempowerment and even frustration among those who traditionally used to run projects with hands-on control about the output. If they apply a traditional (CAD) mindset to running projects, BIM will not yield the promised increase in efficiencies. On the

contrary, the use of BIM is likely to delay progress among the project team, or—at times—the team may even revert back to using CAD in order to meet urgent project deadlines. In engineering practice, BIM is changing the role distribution between the drafters and the engineers. Depending on local (and market) circumstances, it is not uncommon for there to exist a clear split between the duties of a draftsman (for document creation) and those of an engineer (for design simulation, analysis, and validation). When using BIM, there is a chance that engineers are increasingly becoming involved in the documentation process, as it now more easily ties into various analysis processes. As a result, some see the role of the draftsman in danger when considering the future development of BIM among engineers.

The BIM Manager needs to address these concerns and help educate key project staff about the intricacies associated with various BIM workflows. Managing expectations among staff is a fundamental aspect of Change Management. The BIM Manager thereby helps those new to the BIM workflow to understand the major differences to traditional approaches of project delivery. The Change Management seminars should neither focus much on the act of documenting a project in BIM nor to the software used to do so. They should cover other related topics such as the project context, project initiation, project progress, and the handover of information to downstream parties.

PROJECT CONTEXT	BIM Manager Tasks
Interpreting BIM clauses in project briefs	Make project leaders aware of the typical BIM deliverables in project briefs to ensure they avoid signing off on services that may sit outside your organization's typical scope.
Understanding the impact of contract procurement	Highlight how various contract procurement models impact on the team's ability to share data via BIM.
Understanding legal obligations associated with BIM delivery	Advise the project leader on how to consider these topics as part of the project setup.
The relevance of national guidelines or key BIM requirements of select clients	Inform staff about the most relevant national BIM requirements (as per mandates of public sector government bodies). Project teams ought to understand the key implications such mandates or requirements may have on their deliverables.
Individual staff's BIM skill levels and development thereof	Get an overview about the range of BIM skill levels on the floor. Envisage the desired skill levels across the organization and identify how to educate individual staff toward their desired knowledge level.
The relevance of in-house BIM Standards	Highlight the need for such standards and explain to staff how they affect their day-to-day BIM delivery processes.

PROJECT STARTUP	BIM Manager Tasks
Project startup and work throughout the consecutive stages in BIM	Assist project teams in determining the most appropriate moment for them to start using BIM on a project. Help to map out a roadmap for the use of BIM throughout the remaining project stages.
Explain the concept behind digital tool ecologies and interoperability	Be aware of the most appropriate path to connect different tools for design, documentation, visualization, analysis, and so forth. Assist project teams in defining related tool ecologies, file transfer, and data-handover processes.

<b>PROJECT STARTUP</b>	<b>BIM Manager Tasks</b>
Discuss project team selection in relation to BIM	Consider the skill sets required to use BIM successfully, and assist project leaders in selecting staff with complementary skill sets in order to get the right mix for their team on any given project.
Assemble the right team	Explain the importance of finding optimal in-house team constellations to facilitate a BIM workflow on a project. At times, specialists who work across projects may be required in order to provide additional support to the core team.
The distribution of modeling responsibilities	Assist in these matters and work with project leaders in order to agree on the desired workflow of the team.

<b>PROJECT PROGRESS</b>	<b>BIM Manager Tasks</b>
Explain BIM content creation requirements and BIM library management	Set up and/or maintain a well-organized BIM library; communicate guidelines to BIM authors on how to manage library content between their project and the organization's centralized library.
In-house data management and exchange	Highlight the opportunities and responsibilities related to data exchange from and to BIM; demonstrate how to interface BIM data with external applications in order to make the process explicit to BIM authors and project leaders alike.
Manage the workflow and communicate issues among project teams (in-house)	Depending on the size and business of an organization, the BIM Manager is often responsible for coordinating the efforts by individual Model Managers and/or other team members. Reports about major issues on projects should be communicated to the BIM Manager and discussed in a group on a weekly basis. Such feedback assists the BIM Manager and the others in adjusting their workflow.
Link BIM and engineering analysis tools	Help to determine the workflow between engineering analysis and documentation. The interfacing capability between 3D models used for these at times distinct activities is increasing. Some basic performance checks can even be facilitated via BIM tools in the lead-up to documentation.
Opportunities for construction planning using BIM (4D BIM)	Highlight any potential benefits of linking geometric data to delivery schedules, timelines, or even Gantt charts. 4D BIM gets increasingly used by contractors in order to manage the progress onsite. Head contractors as well as subcontractors should be aware of the 4D BIM workflow and they should adjust their software infrastructure to allow them to engage in these processes.
BIM and cost planning interface (5D BIM)	Point out opportunities for quantity extraction and cost planning using BIM. Smart associations between geometric model and cost data can result in a better integration of information and validation of cost trends on a project.
More and more BIM services are moving from BIM authoring and coordination within offices to the actual coordination of construction onsite.	Explain the opportunities inherent to field BIM and provide examples of its successful implementation to your colleagues. In some cases an organization's leadership may not even be aware of the potential BIM brings to the table in reorganizing the construction site.

MULTIDISCIPLINARY COLLABORATION	BIM Manager Tasks
Assist with the management of BIM workflows in multidisciplinary teams	Explain to staff how BIM can be applied across multidisciplinary project teams. What are the opportunities as well as the typical pitfalls? Explain who should run the BIM coordination and how these sessions get structured.
The purpose and nature of BIM Execution Plans	Explain the logic behind BIM Execution Plans. Those documents are becoming essential guidelines for project teams to orchestrate their coordination efforts. It is therefore pivotal that staff understand their purpose and their effective application on projects.
Share BIM data with third parties	Convey the key criteria to staff for sharing BIM information with third parties from a technical, procedural, and also from a contractual perspective.
Dynamics during multidisciplinary BIM Coordination Sessions	Suggest Best Practice approaches and inform staff about workarounds in order to maximize synergies found in the collaborative process.

The entries above merely represent a snapshot of potential topics to be discussed during the Change Management seminars and workshops. Their content will depend on the core business of the BIM Manager's organization and his or her level of BIM maturity. In the end, it is up to the BIM Manager to determine the most appropriate discussion points to be covered during the seminars.

One other aspect to consider is the grouping of staff into various levels. Change Management workshops should ideally target specific constituencies within an organization, ranging from those modeling or coordinating in BIM, to those supervising the project delivery process, and ultimately also to the key decision makers (leaders) of the organization.

As illustrated in this part of the publication, Change Management is a highly relevant and multifaceted process every BIM Manager should be familiar with. Learning how to manage change and being able to engage collaborators in a mentoring role is as relevant as the technical knowledge BIM Managers need to possess. This technical knowledge is the subject of Part 3 of this publication. In Part 3, Design Technology will be looked at from a number of angles with particular focus on the interface between organizational infrastructures and innovation driven by high-end technology.

#### Endnotes

1. T. Mayne, "Change or Perish," *AIA Report on Integrated Practice*, November 1, 2005. <http://www.aia.org/aiaucmp/groups/aia/documents/document/aia076762.pdf>
2. R.E. Johnson and E.S. Laepple, *Digital Innovation and Organizational Change in Design Practice*, Connecting Crossroads of Digital Discourse, ACADIA 2003 Conference Proceedings, Indianapolis, 2003, pp. 179–183.
3. C. Gray and W. Hughes, *Building Design Management*, Oxford: Butterworth-Heinemann, 2001, p. 12.
4. T.P. Holland, "Organizations: Context for social services delivery," In *Encyclopaedia of Social Work*, Vol. 2, Washington, D.C.: NASW Press, 1995, p. 1789.
5. G.E. Hall and S.M. Hord, *Implementing Change: Patterns, Principles, and Potholes*, 2d ed., Pearson, 2005, p. 7. <http://www.pearsonhighered.com/educator/product/Implementing-Change-Patterns-Principles-and-Potholes/9780205467211.page>

6. T. Fritzenschaft, *Critical Success Factors of Change Management*, Wiesbaden: Springer Gabler 2014, p. 62.
7. R. Saxon, *Growth through BIM*, Construction Industry Council (CIC), UK, 2013, p. 27.
8. Management is the "effective and efficient attainment of organizational goals through planning, organizing, leading, and controlling organizational resources", R. Daft and D. Marcic, *Understanding Management*, Cengage Learning, 5th ed., 2005, p. 7. [http://www.cengage.com/search/productOverview.do?jsessionid=A60BDF746F97FC611B7E1EF4B4C11479?N=16+4294951002&Ntk=P\\_EPI&Ntt=311069048761652123620592753316187724&Ntx=mode%2Bmatchallpartial](http://www.cengage.com/search/productOverview.do?jsessionid=A60BDF746F97FC611B7E1EF4B4C11479?N=16+4294951002&Ntk=P_EPI&Ntt=311069048761652123620592753316187724&Ntx=mode%2Bmatchallpartial)
9. "BIM's Return on Investment," Autodesk, 2007, [http://images.autodesk.com/emea\\_s\\_main/files/gb\\_revit\\_bim\\_roi\\_jan07.pdf](http://images.autodesk.com/emea_s_main/files/gb_revit_bim_roi_jan07.pdf)
10. RTVTools online ROI calculator, <http://www.rtvtools.com/roi-calculator/>
11. T. Fritzenschaft, *ibid*, p. 37.
12. J. Hayes, *The Theory and Practice of Change Management*, 3d ed., Basingstoke; New York: Palgrave Macmillan, 2010, p. 151.
13. P. Mêda and H. Sousa, "Towards Software Integration in the Construction Industry—ERP and ICIS Case Study," Proceedings of the CIB W78 2012:29th International Conference—Beirut, Lebanon, 2012, pp. 304ff.
14. L.R. Bachman, *Integrated Buildings: The Systems Basis of Architecture*, New York: Wiley, 2002, p. 26.
15. K. Kirst-Ashman, *Human Behavior, Communities, Organizations, and Groups in the Macro Social Environment: An Empowerment Approach*, 2d ed., Belmont, CA: Brooks-Cole, 2008, p. 71.

# **WILEY END USER LICENSE AGREEMENT**

Go to [www.wiley.com/go/eula](http://www.wiley.com/go/eula) to access Wiley's ebook  
EULA.