

HOW BIM-LEAN INTEGRATION ENHANCES THE INFORMATION MANAGEMENT PROCESS IN THE CONSTRUCTION DESIGN

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INTRODUCTION

The construction industry faces significant challenges due to insufficient processes. Design phase is a key process of construction project lifecycle in which many problems and challenges occur. Most of the issues within the design process are mainly due to poor information management process. Therefore, it is important to adopt new innovative technologies and processes to improve information management (IM). Over the last decade, the number of projects implementing innovative and technological processes such as Building Information Modelling (BIM) and Lean has been increased. However, rather applying BIM and Lean independently, integration of BIM features with lean principles would bring more benefits to the design process in terms of improving IM.

- **Research Aim;** the aim of this paper is to study the potential benefits of integrating BIM and Lean to improve information management in terms of reducing construction design problems associated with information management challenges.
- **Research Methodology;** the underlying research is conceptual by nature, and is underpinned by literature review.

BACKGROUND

- The root causes of major construction industry problems could be identified in the design phase of construction process due to poor information management.
- Construction design problems including lack of communication and coordination, insufficient documentation, unbalanced sharing of resources, poor or missing input information, unreliable decision making, and design changes would consequently result in generating waste, such as rework, waiting and over processing, etc.. in the design process and later on construction site.
- To overcome many of the construction design problems there is a need of effective IM as it ensures that the information value is identified and achieved to its complete level.
- In order to enhance information management there is a need of implementing effective approaches such as Lean construction and BIM.

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FINDINGS

- Four IM challenges, including systems or tools, information, people and policy and strategy, have been identified which would result in major construction design problems.
- The IM challenges and their relation to the construction design problems are discovered.
- Due to a strong synergy between BIM and Lean, the integration of these two approaches would enhance IM through different beneficial features that they provide.
- Table 1 demonstrates the benefits of integrating BIM and Lean approaches to improve IM in terms of reducing construction design problems that are related to IM challenges.
- Table 1 shows four different types of linkages between IM challenges (numbers 1-4) in line with integrated BIM and Lean, and construction design problems (items a-f).

Table 1: Interaction of BIM and Lean to Enhance Information Management.

Interaction of BIM and LEAN		Information Management Challenges / Construction Design Problems																							
Lean Principles	BIM functionalities	1. Systems or Tools						2. Information						3. People						4. Policy and Strategy					
		a	b	c	d	e	f	a	b	c	d	e	f	a	b	c	d	e	f	a	b	c	d	e	f
Reduce Variability	Visualisation	Indirect						Indirect	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Indirect	Indirect	N/A	Direct	N/A	
Reduce cycle time		Indirect						Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Indirect	Indirect	N/A	Direct	N/A	
Increase flexibility				N/A	N/A	Direct	N/A																		
Use Visual Management	4D scheduling and construction sequence planning	Direct	Direct	N/A	Direct	N/A	Indirect	Direct	Direct	Direct	Direct	Direct	Direct	Indirect	Indirect	N/A	Direct	N/A	Direct	Indirect	Indirect	N/A	Direct	N/A	
Verify and Validate																									
Standardise																									
Reduce Variability	Collaboration and Communication	Direct	Indirect	N/A	Direct	N/A	Direct	Indirect	Direct	Direct	Direct	Direct	Direct	Indirect	Indirect	N/A	Direct	N/A	Direct	Indirect	Indirect	N/A	Direct	N/A	
Reduce cycle time																									
Increase flexibility																									
Use Visual Management	Clash Detection	Direct	Indirect	N/A	Direct	N/A	Direct	Direct	Indirect	Direct	Direct	Direct	Direct	Indirect	Indirect	N/A	Direct	N/A	Indirect	Indirect	Indirect	N/A	Indirect	N/A	
Verify and Validate																									
Standardise																									
a) Lack of communication and coordination		b) Insufficient documentation						c) Unbalanced sharing of resources																	
d) Poor or missing input information		e) Unreliable decision making						f) Design changes																	

SUMMARY

Some of the key challenges within the construction design have been highlighted in this paper such as lack of communication and coordination, poor or missing input information, design changes, and unreliable decision making. These problems will result in many challenges within the information management (IM) which would make the IM insufficient. This paper identified some of the key IM challenges within the design process which have been summarised into four main categories of systems or tools, information, people, and policy and strategy. These challenges have been linked to the construction design problems and it is believed by the authors that by improving those, the IM will be accordingly improved. BIM and Lean as two innovative and technological processes are believed to enhance IM. It is believed that the integration of BIM functionalities (such as visualisation and collaboration) with Lean principles (such as reduce variability, increase flexibility and use visual management) enable better IM improvement during the design process. Table 1 has been provided to show the relation between the integrated BIM and Lean and IM improvement. The interaction of BIM and Lean column in the table has been adopted from 'Interaction Matrix of Lean Principles and BIM Functionalities' (Sacks et al 2010). It can be concluded that the interaction of BIM and Lean would benefit IM in terms of reducing construction design problems that are associated with the IM problems.

