Technologically Enhancing the Supply Chain of a Hybrid Modular Builder

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INTRODUCTION

There is a constant urge to create ground breaking concepts in the architecture, engineering and construction (AEC) sector. This is where collaboratively integrating a range of technologies in an attempt to modernise a traditional hybrid modular builder becomes significant. There have been individual attempts to overcome the negativities currently in the construction industry, however, there has yet to be a complete holistic approach to it.

PROBLEM

1. The construction industry is in a constant decline of productivity
2. It is consistently dubbed one of the most dangerous industries to work in
3. It is a slow adopter of technology

AIM

1. Address the benefits of integrating singular technologies
2. Study the collaboration between the different technologies
3. Develop an unprecedented conceptual implementation plan

TECHNOLOGY EMPHASIS

1. Design for Deconstruction (DfD)
2. Lean Manufacturing
3. Building Information Modelling (BIM)
4. 3D Scanning
5. Internet of Things (IoT)

METHODOLOGY

Inspiration → Background Research → Justification → Analysis

- Established Standard Design
- Potential Improvement in Supply Chain
- Identified Gap in Previous Research

- Interaced with Experts
- Curating a Range of Technologies
- Researching each Technology Individually

- Crosschecked Previous Implementation Case Studies
- Conducted Interviews with Academics, Practioners & Business Owners

- Created a Conceptual Collaborative Integration Model
- Proposed the Model for Professional Validation

ANALYSIS

The base supply chain seen in black in the figures below is the improvement from traditional building by adopting hybrid modular construction. The exploitation of the technologies is conducted in the short, intermediate and long term. Each implementation or collaboration is accompanied with several benefits, signified in red in the figures below.

Short-term

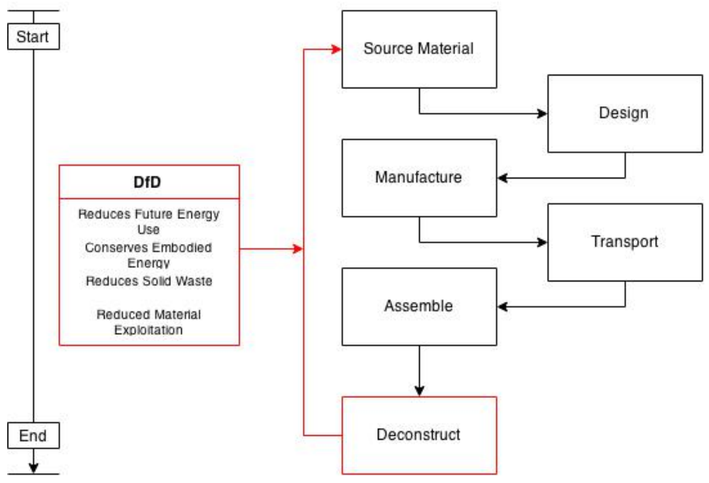

Figure 1: The Benefit of Incorporating DfD Across the Supply Chain

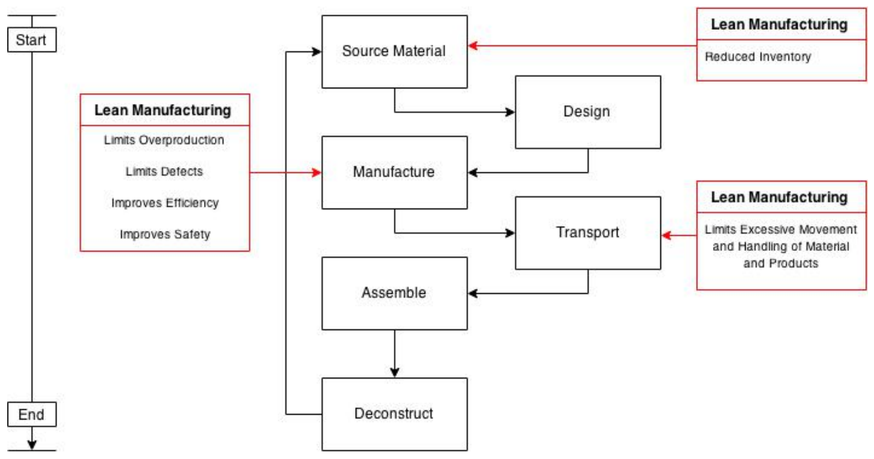

Figure 2: The Benefit of Implementing Lean Across the Supply Chain

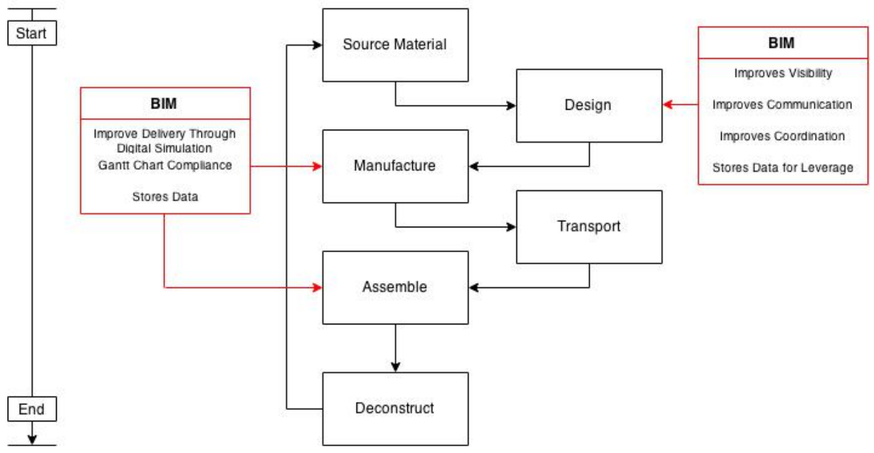

Figure 3: The Benefit of Implementing BIM Across the Supply Chain

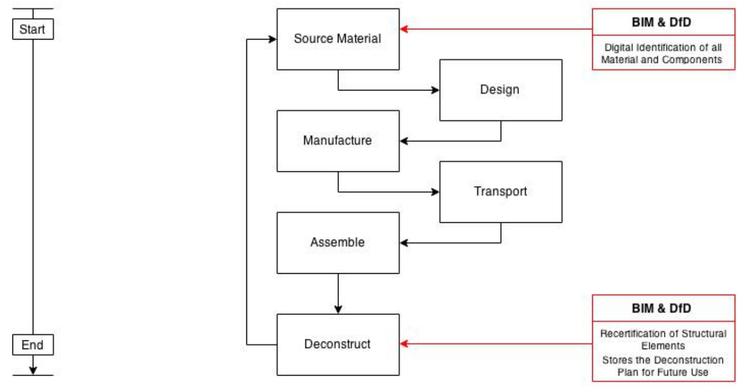

Figure 4: The Impact of Integrating BIM & DfD

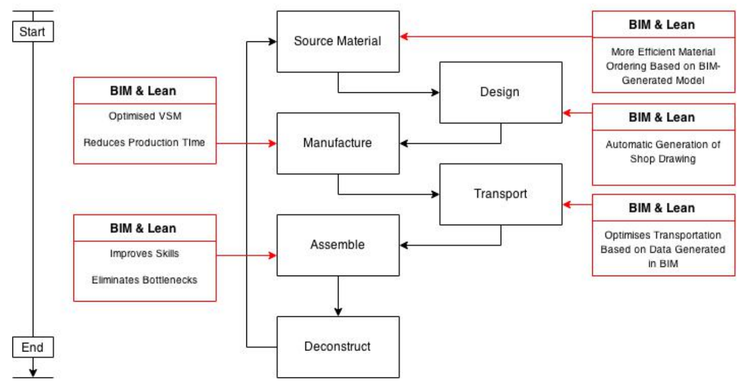

Figure 5: The Impact of Integrating BIM & Lean

Intermediate-term

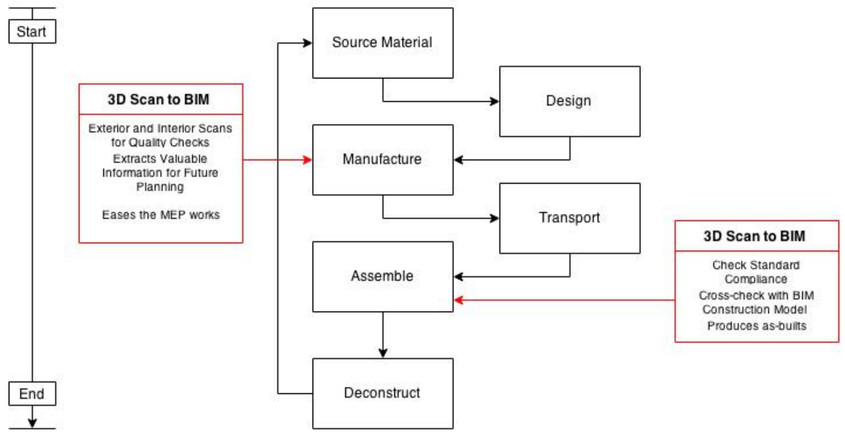

Figure 6: The Impact of Scan-to-BIM

Long-term

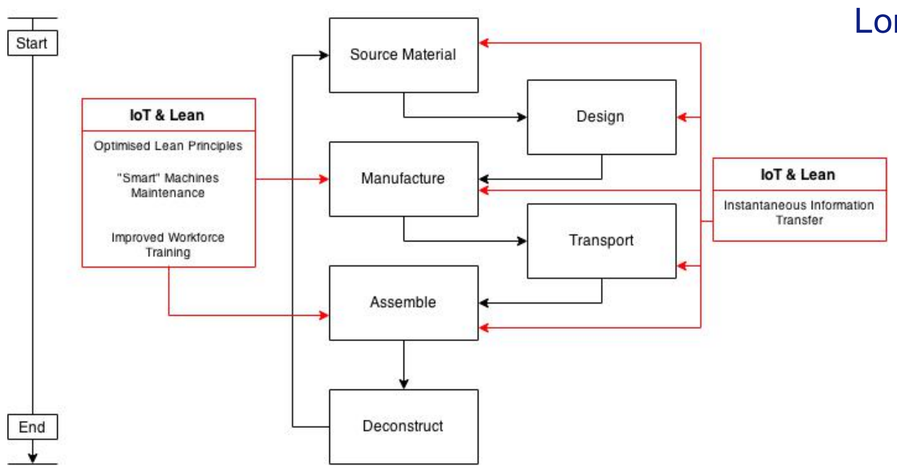

Figure 7: The Impact of Integrating IoT & Lean

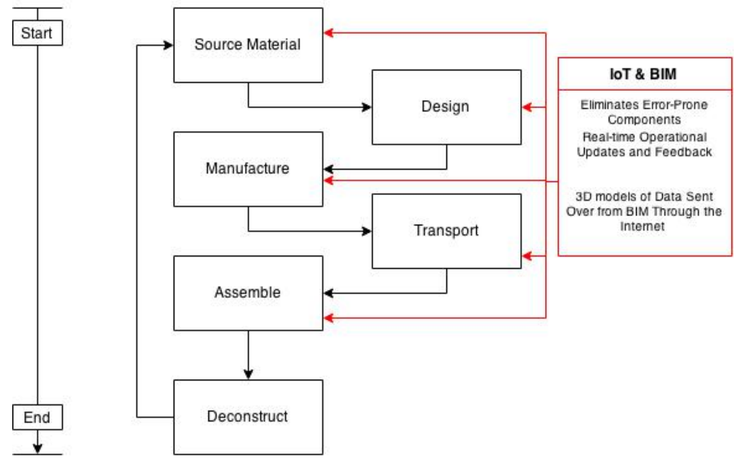

Figure 8: The Impact of Integrating IoT & Lean

CONCLUSION

The conceptual model developed is the first of its kind. The individual technologies are available and have been implemented thus proving their feasibility and positive impact. Their collaboration have yet to be studied which led to new concepts being hypothesised through my research. In turn, the benefits to the industry are substantial. However, it will take time, research and commitment to technologically develop the traditional supply chain. The potential use of the outcome will be mainly incorporated in companies aiming to enhance their current technologies and take a step closer to future construction techniques.

ACKNOWLEDGEMENT

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