Implementing BIM to Streamline a Design, Manufacture and Fitting Workflow.

Machado, M, Underwood, J and Fleming, AJ

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INTRODUCTION

- Sacks et al. (2010), stated the interactions between Building Information Modelling (BIM) and Lean, arguing that to achieve the full improvements in construction projects both concepts of BIM and Lean should be adopted together.
- BIM implementation demands changes in existing process and procedures for design and construction, representing a technological change, but also a process change. Technology should fit organizational structure and reinforce business process, making the company leaner.
- In the UK, the Government Construction Strategy (2011) mandates the use of BIM in all centrally procured projects by 2016, reinforcing the need of supply chain integration in order to accomplish reliability and better value for money, encouraging the use of offsite construction.
- In addition, there is a vision of the use of Building Information Modelling (BIM) to allow design to feed direct into machines, connecting design and manufacture, and discarding unnecessary intermediaries (Cabinet Office & BIS, 2011).
- BIM adoption and awareness is growing in the UK construction sector. There is an influence of the "push-pull" Government Strategy for BIM, and a "feeling" of BIM being a new standard for project information, which is transforming the construction industry landscapes.

METHODOLOGY

- The research adopts a case study methodology, including focus groups and interviews, on a BIM implementation for Design for Manufacture and Assembly (DFMA) at Links, a design, manufacture and fitted company based in the UK.
- The project is a Knowledge Transfer Partnership (KTP) between the University of Salford and Links. KTP is a program partly funded by Innovate UK, which aims to support business wanting to increment their performance and competitiveness with innovative solutions by accessing universities knowledge and expertise.
- The project objective is to implement BIM within Links ensuring that the company has the expertise needed to operate in a BIM environment from design to manufacture and installation, integrating these three company areas.
- The project begun in February 2014 and has 30 months duration, divided in 5 stages, as illustrate in Figure 1:

1. Benchmarking: Establish and consolidate best practice knowledge in BIM
2. Diagnosis: Detailed review and analysis of the organization’s current situation
3. Action Planning: Develop BIM-based collaborative strategy; the current stage on May 2015
4. Taking Action: Pilot implementation of BIM-based collaborative strategy for DFMA
5. Evaluate: Project review, evaluation, and dissemination

RESULTS

CURRENT PROCESS

Figure 2 represents the Design process including interfaces with Customer and Manufacturer.
- Design Preparation – Ideas for the space sketched by hand.
- Design Concept – 2D layouts and elevations using (dwg), specification sheet (doc), and 3D visualizations (CGIs) on 3DMax.
- Once the client approves design, design outputs are sent to manufacturer sister company.
- The manufacturer develop detail furniture drawings (dwg) and send to Links for approval.
- After drawings sign off, 3D models (CADs) with all manufacture information are developed.
- 3D models are next input into CNC Machines for production.
- Information is shared in pdf, non-editable files.

IMPROVEMENT GAIN ANALYSES

- During a set of interviews and workshops, Links staff shared their vision for improving each process, as well as, details of how to measure their performance.
- Table 1 summarise the issues founded, relating each one with Lean defined wastes, and suggestions for improvement.
- The analyses highlighted the information duplication on design-to-manufacture process: copying the same information in multiple file formats, not interoperable, with a lack of the “single version of the truth” in design projects. Duplication of information is considered a waste; moreover, duplication can cause errors and excess of inventory.

MEASUREMENTS

- On the BIM Strategy Plan, a set of KPIs are proposed applying the Balanced Score Card methodology, that covers 4 areas of every organization: Customer, Internal Process, Financial and Learning and Growth (Kaplan & Norton, 1996). More than measuring the processes these are KPIs to control that the company is moving towards its strategic objectives. Furthermore, systemic measurements could stimulate a continuous improvement process.
- To get a comparison of the results of BIM implementation, a baseline project is going to be measured. Next, KPIs are going to be captured on a BIM Pilot Project.
- Table 2 describe KPIs, its objectives and the proposed metrics.