DIGITIZING LEAN CONSTRUCTION WITH BUILDING INFORMATION MODELING

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Introduction

- Conventional construction management approaches are rather static and rigid (top-down communication and a silo-oriented, linear mechanistic mindset), neglecting the fact that construction processes are stochastic with many unknown variables.

- The underlying assumptions are that:
  - Activities, tasks and dependencies can be defined in isolation
  - Site workers and subcontractors share the same understanding of what needs to be done
  - Required information is provided
  - The desired outcome can be achieved on time if the plan / schedule is followed

- However this does not happen in practice.

- Given this background, LCM and BIM have been accepted by the industry as the most promising methodological approaches to improving project reliability and performance.
Literature review

- Building Information Modeling has been used for Lean Construction Management Methods to enable a better understanding of the object and the related interfaces.

- Lean Construction Management Methods, in turn, has been used for Building Information Modeling as a simpler way of communicating product information to project participants.

- Lean Construction Management and Building Information Modeling do not depend on each other, however a synthesis of both is very promising.

- The common feature of recent studies is that – even though they are linked in a certain way to each other – there is still no true interaction.

- There is still demand for an integrative platform to improve ongoing exchange of project, product and resource information.
Aim and objectives

- Improve collaborative work across trades, technologies and locations

- Harmonize analogue and digital work processes

- Enabling the systematic compiling, preparation, analysis and assessment of product, project and process information (preparation for big data and machine learning)

- Ongoing evaluation of live data, forecasting

- Future: Automatic project support through the provision of solution proposals using artificial intelligence
Proposed framework
Overall process analysis and process planning
BIM integration – product and process structure

„HB_102_ARCH_Sprinkler_Rohinstallation“
BIM integration – linking objects and activities

Activity ID

Object ID
Production controlling: kanban card generation
Production control – kanban board
Production control – progress update

- Design with C3D
- Scanning
- Visualization of progress
- Foto from site

Lean- & logistic: kanban cards

Progress:
- 100 %
- ca. 90 %
- ca. 45 %

- Visual and transparent
- Easy and reliable progress tracking
Conclusion

- One of the main current challenges is the uniform structuring and automated linking of execution-related data sets down to individual elements of a BIM model to facilitate collaborative project execution.

- It has been demonstrated that a platform that facilitates the exchange of information related to products, processes and resources is a key success factor for the integration of LCM and BIM into projects.

- A successful alignment of LCM and BIM, as well as systematic evaluation of collected data, contributes decisively to an improvement of the general project management

- So far, several technological concepts have been developed and tested. These include:
  - Automated printing of construction assignments (kanban cards)
  - Digital pull planning workshops
  - Use of BIM-based quantity take-offs for accurate resource planning and reliable assessment of project performance based on live data (mobile app and QR coding technologies)