IMPROVING THE LEARNING OF DESIGN MANAGEMENT OPERATIONS BY EXPLOITING PRODUCTION’S FEEDBACK: DESIGN SCIENCE APPROACH

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Research background – a need for efficient learning

- To increase productivity in construction, organizations and especially design management operations should exploit the knowledge created in previous projects, and particularly the knowledge created in the production phase, more effectively.

- Even though the *identification, collection, analysis, storage* and *reuse* of tacit and explicit knowledge from projects has been recognized as a pertinent part of the learning of design operations, the nature of the project-based industry sets barriers for development.

- The lack of proactive, double-loop learning from an actor's own mistakes is one of the fundamental reasons for poor productivity development.
Desired double-loop learning through a design-construction feedback loop (Henderson et al. 2013)
Research background – a need for participatory research

- The reactive touch to learning reflects the inefficient implementation of new learning processes, which have been criticized for their inefficiency to drive change.

- Research on project-based organizations has centred only on visible problems at hand and asking what should be done, instead of focusing on how to concretely solve the problems Eriksson (2013).

- To overcome this inefficiency in management research, researchers should take a more active role in designing the solutions instead of only observing from a distance.
Research aim

- Therefore, there is a certain need for designing but also for concretely implementing more effective learning processes into the construction design operations.
- The goal of this study is to develop a concrete construction design learning process by an experimentative design research approach while answering the following research question:

  How can the learning of design management operations in a construction company be improved through feedback acquired from production?
Research strategy – Design Science Research (DSR)

- Reciprocal collaboration between the case company’s design management operations
An organizational knowledge management strategy can be based on the balance between two different approaches that should be appropriately balanced through the learning process:

- **Personalization**, a human-based view, emphasizes the meaning of tacit knowledge and is usually present in small and agile organizations.

- **Codification**, a technology-based view, describes an approach where knowledge is managed through systems and documents and the knowledge is mainly explicit.
Diagnosis – learning in PBOs

- The most effective knowledge creation takes place within the group level. For project-based organizations, group-level learning can be enhanced by implementing so-called project-based communities of practice.

- In these communities, experts working within the same area of interest share their knowledge created in the projects, while analyzing the knowledge and simultaneously sharing it with the organization.

- In an optimal setting, project-based communities of practice operate freely but at the same time, within a structure that enables continuous filtering and analysis of the created knowledge.

- For effective implementation of the communities of practice, the culture of learning from failure was recognized as one of the most contributing factors, in both literature and in the expert interviews.
Diagnosis – the preliminary learning model

- The vocabulary and process components applied should be clearly determined and presented while connecting the strategic and operations-level actions.

- **The balance between personalization and codification** should be ensured in every process step.

- The process should be accessible, easy-to-use and lightweight. Also, the collection and storage of information and knowledge should be as automated and standardized as possible.

- The project-based communities of practice should enable a space for **effective learning from failures and root causes**. The community should be supported by an experienced process owner and facilitator.
Diagnosis – the preliminary learning model
Testing and development of the model with a case

The design process of acoustic and fireproofing connection details in drywalls separating apartments

Potential cost of design error: 10’000-15’000e per wall

(1) Collection of the information
(2) Analysis: The community of practice
(3) Storage of the analyzed knowledge

Analysis and further development of the learning process
Testing and development of the model

- Process fluency:
  - The process should be as streamlined as possible to minimize the time spent by the participants
  - Standardized to easily and effectively implement it for another company’s internal communities.
  - Should be accessible even during constant rush created by projects

- The process was further developed to be optimally streamlined and more easily adopted by determining clearer instructions and process steps.
  - Instructions were created for preparation, facilitation and knowledge storage
  - Improved A3 document templates were created
Discussion & Conclusions

- The implemented learning process enables more efficient construction-design learning process
- Balance between stages of learning & between codification and personalization
- Revelation of root causes
- Easy-to-use process, high value with low effort
Discussion & Conclusions

● Additionally, the learning process is a potential enabler for tackling wider barriers for productivity development:
  ● Missing the common language of knowledge management (Mäki 2008)
  ● Ignoring the deeper root causes (Dave and Koskela 2009),
  ● Lack of learning from errors (Cannon & Edmondson 2005), and
  ● Forgetting to ask "how" (Eriksson et al. 2013)

● The proposed learning process attempts to educate the organization to address these barriers in an organized manner.

● The process could enable cumulative learning while individuals and implemented communities of practice would internalize the culture of the continuous learning in their daily work.
Avenues for future research

- More tight feedback loop through exploitation of digital monitoring and automation: “situation room”-approach

- Integration of client, users, contractors and designers into the process
Thank you!