WAITING TIMES IN DESIGN PROCESS: A CASE STUDY

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BACKGROUND

This work focuses on design process from a managerial perspective, and it does not include an approach based on the creative process. Many problems were associated with design, for long identified in literature (Koskela et al. 1997). Lean design is a paradigm by which design process can be done more efficiently and achieving better quality results (Tilley 2005). Lean Design deals with managing the design process complexities, aiming to reduce waste and leverage activities that add value (Rischmoller et al. 2006). Reducing errors, cycle times, and part of activities without adding value, thus increasing productivity are aims of an improvement methodology proposed by Freire and Alarcón (2002). Value Stream Map (VSM) is a qualitative Lean technique used to analyse and design the flow of materials and information needed to deliver a product, service or design to a consumer, and comprises action mapping to bring a product from raw material to customer (Rother & Shook 2003).

METHODOLOGY

The objective of this research is to diagnose architectural design processes, taking into account lean design perspective. The research strategy herein was a single case study. The case study protocol designed for this work adopts lean construction tools. In step 1, a research presentation for authorization and commitment from the design team. In step 2, interviews were conducted with professionals who participated directly in developing design. In step 3, it was possible to construct a timeline and calculate the elapsed time between each document. In step 4, the current state VSM was design based on data collected in interviews with participants and on documents examining. In step 5, the future state VSM was proposed containing ideas and recommendations aimed at improving undesirable situations identified in current state.

RESEARCH FINDINGS

- **Cycle time analysis** demonstrates that Interface Coordination and Detailing are activities with the longest cycle time and exceed the average time. It also demonstrates a large amount of waiting time between activities product Conception and Definition. Two different types of waiting time were identified: (1) external wait, which occurs when Architects wait for information from other designers e.g. structure and / or MEP; (2) internal wait that occurs when Architects stop working it to complete activities from a different project (work prioritization within the architectural firm).

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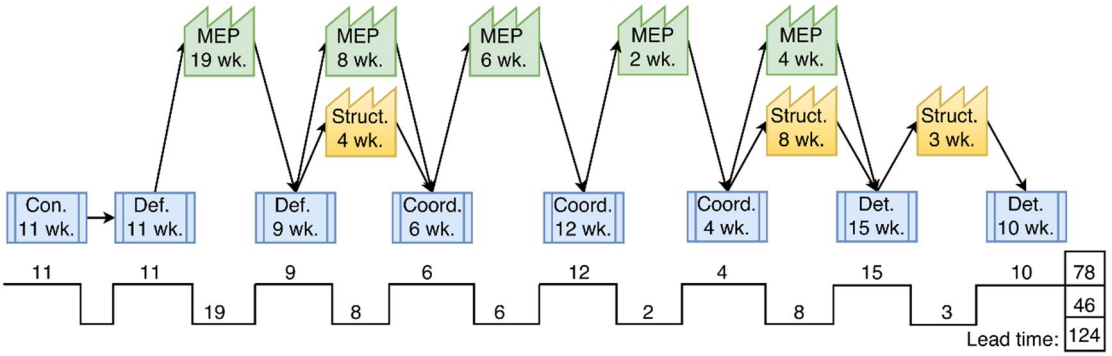
- **The current state value stream map** (Figure 2) identifies sequencing activities of architectural process and its interactions with different designs. Out of the total of 124 weeks of design process, 78 weeks were in architectural design and 46 weeks were in external wait, when the project waited for structure and MEP designers.



Descriptions: CON.: Product Conception; DEF.: Product Definition; COORD.: Interface Coordination; DET.: Detailing; MEP.: Mechanical, electrical and plumbing; Struct.: Structural; wk.: week

Figure 2 – Current state Value Stream Map of architectural design process

- **Proposed future state value map** focused on reducing waiting times (Figure 3). The new flow makes it possible to reduce process time from 124 to 66 weeks. External waiting time is reduced from 27 weeks, which is equivalent to a reduction of 41%. The proposed changes focus essentially on four aspects summarized below: (1) Elaboration of structure and MEP requirements to be used as input to Product Definition stage; (2) Establish a limit of two weeks for internal waits so that architecture office return to work on the design that is in internal wait ; (3) Standardize the sending of architectural design simultaneously to the structure and MEP companies; (4) Interface Coordination made with structure, MEP and architecture designs simultaneously in order to reduce number of process steps.

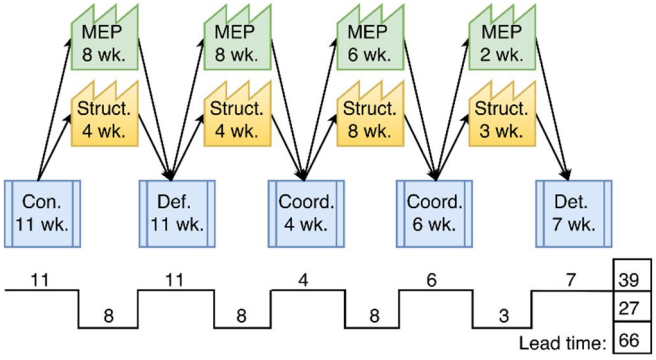


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Figure 3 – Proposed Future Value Stream Mapping for architectural design process

SUMMARY

- Mapping and analysing value stream are viable tools for improving design process. Designers can get improvements by applying these tools to their design processes.
- The main contributions of this work was the waiting times exposure in design process, proposing improvement opportunities for companies based on real problems identified, and structuring of methodology for application of lean diagnostic tools in context of architectural design offices.
- The findings from this case study provide important insights that allow recommendations to be made for future successful implementations.