

VALUE STREAM MAPPING - A CASE STUDY OF COLD-FORMED STEEL HOUSE FRAMING FOR OFFSITE MANUFACTURING SUPPLY CHAIN

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INTRODUCTION

Cold-Formed Steel (CFS), as emerging Offsite Manufacturing (OSM) building technology, helps in achieving affordable, sustainable and quality housing. The poor performance of Supply Chain Management (SCM) is a pivotal aspect for low uptake of CFS technology in the housing industry. Making OSM SCM lean helps in improving the performance.

OBJECTIVE

Application of value stream mapping (VSM) for OSM SCM that focusses on CFS house framing (i.e. following the design-to-order SC strategy).

VALUE STREAM MAPPING – A LEAN TOOL TO IMPROVE SUPPLY CHAIN PERFORMANCE

Value Stream Mapping (VSM) is a potential lean thinking tool for performance measurement and mapping. The current state maps processes and agents, and identifies wastes (non-value adding activities) and relevant problems in processes and interfaces, focusing on a single product SC. For the future, solutions and strategies are proposed that can improve overall performance. Empirical research, entailing case study approach is the relevant approach for VSM application. For performance indicator, Lead time helps to understand the complete SC from order to delivery of a particular project and comprises factors such as process time and queue time.

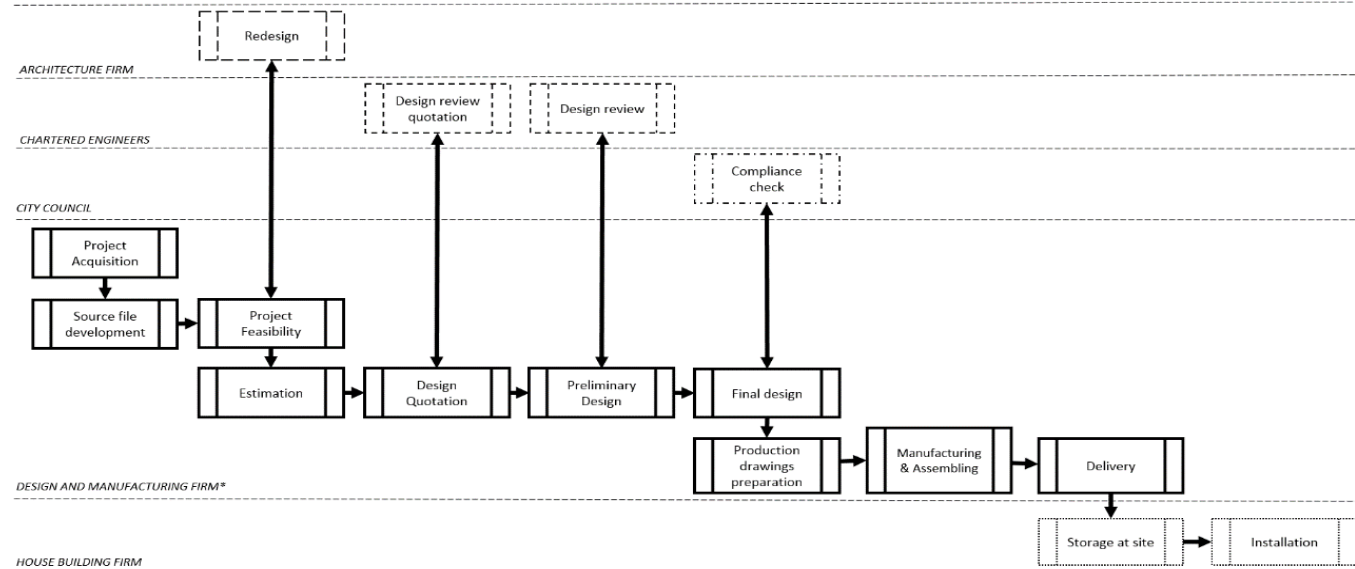
CASE STUDY OF COLD-FORMED STEEL HOUSE FRAMING

For VSM, there is a need to select a product or product family following criteria based on high volume by revenue, high volume by units produced, high defect rates, highest customer return rate, and visit the most processes. Detached houses with one or two floors are common, covering 75% building consents per year. CFS framing (i.e. roof trusses and wall panels) are one of the most common approaches in Offsite Manufacturing industry. Six private houses were selected for this case study.

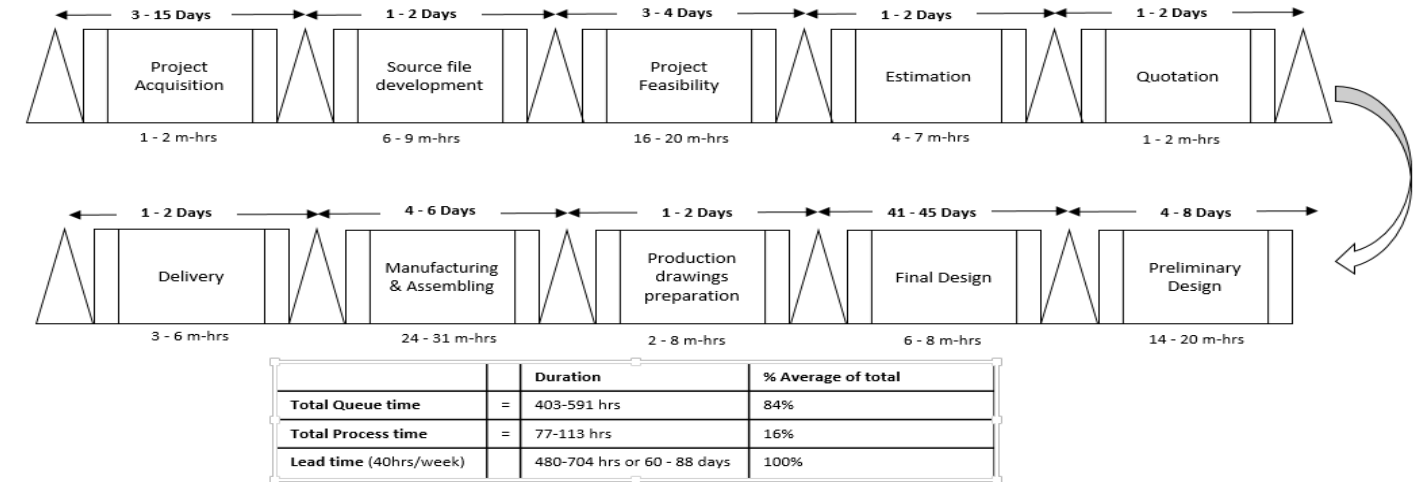
DATA COLLECTION

Data collection was completed through project and company documentation (including ERP). Also, interviews with five employees (with designations as commercial manager, business development manager, sales manager, design manager, factory manager and foreman) involved in the marketing, design, and manufacturing, having experience from 5 to 15 years in the CFS housing industry.

VALUE STREAM MACRO MAPPING



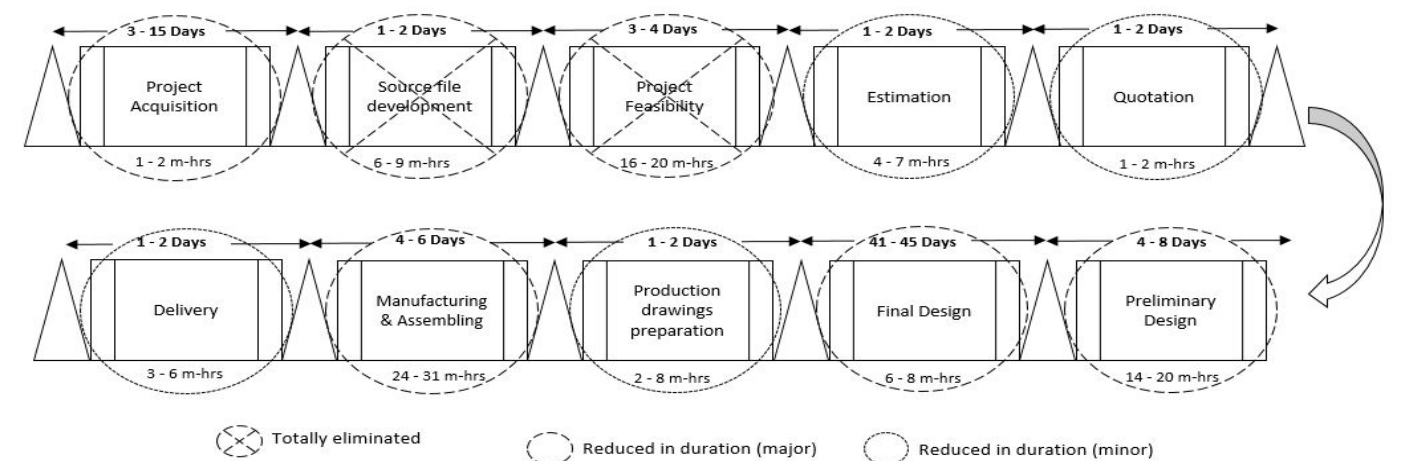
VALUE STREAM MAPPING – CURRENT STATE



COMMON WASTE IN OSM CFS SC

OVERPRODUCTION	Obtaining orders	UNDERUTILIZED PEOPLE	Less utilisation of potential employee; Third party review
TRANSPORTATION	Code check; Manoeuvring in factory	WAITING	Client decision making; delay in drawing approvals
INAPPROPRIATE PROCESSING	Source file development; OSM feasibility analysis	UNNECESSARY MOVEMENT	Poor factory layout
DEFECTS	Compliance issues; errors in the production file; manufacturing machine malfunction; a poor quality control system; unskilled operators, assemblers, and installers	UNNECESSARY INVENTORY	Low demand of framing; variation in CFS profiles leads; Site unpreparedness

VALUE STREAM MAPPING – FUTURE STATE



CONCLUSION

VSM is a robust and viable lean tool to map and measure the performance of OSM SCM. Ten processes were identified and also investigated further for non-value activities and steps in CFS housing. OSM SC disruptions have been classified in the context of eight waste categories. Integrated Building information modelling (BIM) and lean strategies were proposed to reduce disruptions. It is estimated that the lead time can be reduced to 10-15 days if the queue time and process time is reduced or eliminated, which helps in enhancing supply of housing stock.

FUTURE RESEARCH

Social and relief housing will be considered for further research. A lean OSM SCM performance model will be developed considering relevant indicators. Further, a theoretical and methodological BIM-lean integrated framework will be developed to improve the efficiency and effectiveness of OSM SCM.