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Purpose This research proposes an automated model for the design and manufacture of modular construction that applies both Building Information Modeling (BIM)¹ and lean concepts² on a modular construction manufacturing (MCM) process and gaining the benefit of both concepts³.

Method This integration involves transferring generated data from a BIM model to the manufacturing phase where 'Lean' is applied to the factory production line. Although translating and synchronizing data are essential to applying these concepts successfully, automation of the construction process has yet to be fully realized in the construction industry. Interoperability of the heterogeneous applications used in the domain of modular construction manufacturing can best be achieved by using generalized and standardized representations of the needed product and process data, thereby enabling faster and better management and decision-making. However, even though various solution approaches have been proposed in the last decades to integrate building information and lean principals, a general approach based on a standard BIM is still missing. In this research, the project components' schedule and quantity take-off list, which are required for applying 'Lean' to the production line, are categorized and extracted from the BIM model using IFC (Industry Foundation Classes) customized programming, and stored in a database placed in a data server. Then the Value Stream Map (VSM) is generated based on both existing database and defined lean criteria. **Results & Discussion** A simulation model is developed to evaluate the generated VSM. The proposed methodology is validated by a case study in Edmonton, Canada, called The Compassion House. The existing Compassion House is a 2-storey building with a basement and the new project is an extension for the existing building. The architectural design for the building included a modular construction capability, so the entire building was divided into modules. The application of an automated model on the design and manufacturing process of the case study illustrates the effectiveness of the proposed methodology in reducing waste, time, and, resource usage.

References

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Affiliation: University of Alberta, Edmonton, AB, Canada; *E:* mansoore@ualberta.ca

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