DECISION SUPPORT SYSTEM FOR MODULAR HOUSES

JOSEPH CHUEN-HUEI HUANG
College of Architecture, Illinois Institute of Technology
3360 S. State St., Chicago, IL 60616, USA
huanchu1@iit.edu

1. Introduction

Presently, only a small percentage of people in the world typically hire an architect to design and build a home which is tailored to their preference. Besides the architect's fee, clients also need to wait an interminable time for design and construction. Factory-made prefabricated housing systems tried to solve this problem previously. However, most pioneers failed to address the issues of variability and individual needs (Kieran & Timberlake, 2004). Plants closed because they produced more than the market demand, and prefabricated housing provided less flexibility than the traditional stick-built housing.

The advanced digital technology makes it possible to communicate design ideas and concepts to others more effectively. The project delivery process leads itself to customization, embodying principles of lean production (Pine, 1993), flexible computer-integrated design interaction with clients, and reduced cycle times; all effecting rapid response between consumers and producers.

2. Proposed Method and Prototype

In order to achieve the objective of consumer participative design process of modular houses, the prototype model combines the results of two parts: data collection of client's requirement and prefabricated modular system with design configurations. The web-based consumer driven interface can simulate the interaction between client's needs and the adoptable systems.

The current advisory system starts with a dynamic questionnaire – a series of questions to address the client's household profile, lifestyle, basic site context information, space requirements, design style and the budget of home construction. The advisory system will base on the customer's input to find the most suitable design options from its database. Once the customer selects the matched model from suggested design options, it moves to the customization phase. The online configuration tool provides the functionality to change or add some design elements based on user's preference. It contains four categories: space planning, construction, appearance, and appliance. Space planning is the most important component of these categories. Each individual room is treated as a replaceable "block", and can be exchanged by different layout of the same space type or even

trade-off with different usage. There are some restrictions assigned to these room blocks to control the associated wall types which have to be compatible with their neighbors when those rooms have been rearranged.
A prototype interface which can guide customers to make a clear decision has been constructed. The upper portion of interface is the decision tree navigation window and the lower part is for input-output dialogue window. The dialogue window includes questionnaire and design suggestion. This prototype also has a professional mode for architects to open a digital design model with Revit Building application by the linkage of a highlighted item within the dynamic tree structure.

3. Conclusion

Utilizing an interactive questionnaire to gather information from clients is an alternative to replace the limited face-to-face first meeting time between architects and clients. The current prototype works for the early stage of schematic design phase as a rational recommendation. The future direction will be focused on the output format for manufacturing and bi-directional linkage between the advisory system and Building Information Modeling applications as a seamless collaboration of the project delivery process.

Acknowledgements

Special thanks to Prof. Robert Krawczyk, Prof. George Schipporeit and Prof. Robert Babbin from College of Architecture in Illinois Institute of Technology.

References

Kieran, S. and Timberlake, J.: 2004, *Refabricating Architecture: How Manufacturing Methodologies are Poised to Transform Building Construction*, McGraw-Hill Companies, Inc, New York.

Pine, B. J.: 1993, *Mass Customization: The New Frontier in Business Competition*, Harvard Business School Press, Boston.