

## **CHAPTER V**

### **CONCLUSION AND SUGGESTIONS**

#### **Conclusion**

The initial purpose of this research is to create an ontology framework as a guidance in developing a satisfactory BIM model for construction cost management. This is because a standalone BIM model wouldn't be enough to provide information requirements for construction cost management.

In the ontology development phase, the main purpose of ontology framework is determined. Later, the required informations could be determined according to the NRM standards. This framework covers how a building component is broken down into its composing items and how it should be quantified. The ontology framework is used as an approach to develop and analyze BIM model for cost management purpose. Moving to the development and analysis phase of BIM model, a case study of actual project is carried out to simulate the development process of BIM model according to the ontology framework. According to the ontology framework, a BIM model that able to satisfy every information required for cost management is developed. Finally, a complete and structured data for construction cost management purpose could be retrieved from the BIM model.

This research has a big chance to be developed further for BIM based project delivery. A comprehensive approach upon developing BIM model and managing the informations retrieved could definitely help engineers to fully utilized BIM model as a baseline for project cost management. Subjectivity and ambiguity upon assessing a project could be reduced when a solid guideline for BIM based cost management is established.

#### **Suggestions**

Due to the time and manpower limitation, the author could only carry this research up to concrete frame superstructure of the building. So far, the BIM model has been able to provide satisfactory information required for this building section however a further research analyzing broader scope of the building should be validated in the future.

## **Future Research**

This research is a preliminary research for master thesis research. A further development regarding to the ontology framework created in Protégé software and BIM model in Autodesk Revit could be expanded further.

As the current research analysis is done in manual method, an automation to directly retrieve the information data from BIM model is expected to be done. The ontology framework in Protégé is created under “OWL” format in a Semantic Web Language (SWRL), this format provides the capability of cross platform integration between softwares to create an automated information retrieval in this particular field.

In the future, a more comprehensive method to automate information retrieval from BIM model and directly integrate it into the ontology framework could be done. A programming module specifically developed to analyze BIM model called Dynamo can be used to avoid the excessive effort upon managing the amount of informations retrieved. Semantic Web Language (SWRL) are able to be integrated directly with BIM model through Dynamo with some Python programming language improvisation. All of this integration in the future will be able to create an interactive method in utilizing BIM model as construction cost management baseline.

## REFERENCES

- (1970, January 1). AACE International Recommended Practice No. 18R 97 .
- Abanda, F., Tah, T., Pettang, C., & Manjia, M. (2011). An Ontology-Driven Building Construction Labour Cost estimation in Cameroon.
- Azhar, S. (2011). Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges for the AEC Industry. Leadership Manage. in Eng.
- Berners-Lee, T., & Swick, R. (2006). Semantic Web Development.
- Chitkara, K. K. (2005). Construction Project Management. Tata McGraw-Hill Education.
- El-Diraby, T. A., Lima, C., & Feis, B. (2005). Domain Taxonomy for Construction Concepts: Toward a Formal Ontology for Construction Knowledge. *J. Comput. Civ. Eng.* , 19(4), 394-406.
- Feng, C. W., Chen, Y. J., & Yu, H. Y. (2017). Employing Ontology and BIM to Facilitate the Information for Subcontractors Payment Requests and Ledger Generation.
- French, S. S., Fischer, M., Kunx, J., Ishii, K., & Paulson, B. (2003). A Feature Ontology to Support Construction Cost Estimating. *AIEDAM* , 17(2), 133-154.
- Government, U. S. (2009). GAO cost estimating and assessment guide. [Washington, DC].
- Gruber, T. R., & Olsen, G. R. (1994). An Ontology for Engineering Mathematics, 258-269.
- Guarino, N., & Musen, M. (2015). Applied ontology: The next decade begins. *AO*, 10(1), 1-4.
- Gómez-Pérez, A. (2006). *Ontological Engineering*. Springer Science & Business Media.
- Hergunsel, M. F. (2011, May 1). Benefits of Building Information Modeling for Construction Managers and BIM Based Scheduling.
- Karshenas, S., & Niknam, M. (2013). *Ontology-Based Building Information Modeling*.
- Li, Y. (2018). Research on Construction Projects Cost Management, 394, 032057.
- Liu, X., Li, Z., & Jiang, S. (2016). Ontology-Based Representation and Reasoning in Building Construction Cost Estimation in China. *Future Internet* , 8(3), 39.
- Liu, X., Li, Z., & Jiang, S. (2016). Ontology-Based Representation and Reasoning in Building Construction Cost Estimation in China. *Future Internet*, 8(3), 39.

1. Liu, Z., & Ma, Z. (2015). Establishing Formalized Representation of Standards for Construction Cost Estimation by using Ontology Learning. *Procedia Engineering*, 123, 291-299.
2. Liu, Z., & Ma, Z. (2015). Establishing Formalized Representation of Standards for Construction Cost Estimation by using Ontology Learning. *Procedia Engineering*, 123, 291-299.
3. Perera, A., & Imriyas, K. (2004). An integrated construction project cost information system using MS Access™ and MS Project™. *Construction Management and Economics*, 22(2), 203-211.
4. Sangram, M. P., Desai, D. B., & Gupta, A. K. (2015). Earned Value Analysis In Construction Industry, (*International Journal of Informative & Futuristic Research*).
5. Smith, P. (2016). Project Cost Management with 5D BIM. *Procedia - Social and Behavioral Sciences*, 226.
6. Sunil, K., Pathirage, C., & Underwood, J. (2015). The Importance of Integrating Cost Management with Building Information Modeling (BIM).
7. Wang, H. H., Weng, S. W., Gansonre, A. A., & Wang, W. C. (2014). Developing an Ontology-Based Representation Framework for Establishing Cost Analysis Knowledge Base for Construction Work Items.
8. Wang, H. H., Weng, S. W., Gansonre, A. A., & Wang, W. C. (2014). Developing an Ontology-Based Representation Framework for Establishing Cost Analysis Knowledge Base for Construction Work Items.
9. Yismalet, A. G., & Patel, D. (2018). A Critical Literature Review On Improving Project Cost Management Practice and Profitability of Domestic Constructors.











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