Chapter 5

Conclusion and Future Directions

5.1 Conclusion

Ready mixed concrete delivery models are implemented to investigate transportation productivity, which depend on variant variables including concrete volume, delivery distance, batching time, travelling time, waiting time, pouring time and returning time. Hybrid artificial neural network–regression and hybrid multiple regression–artificial neural network models were developed to predict the ready mixed concrete transportation productivity using actual collected data from the case company in greater Bangkok, Thailand. 843 trips of transportation delivery were observed from October to December 2012.The actual values and predicted transportation productivity values were compared in order to measure the performance accuracy of the both models. The predicted values of hybrid artificial neural network - regression model were found closely to the actual values more than another proposed model. Moreover, the values of RMSE and MAPE of hybrid artificial neural network - regression model is lower than hybrid multiple regression-artificial neural network model. The following conclusions are drawn from this study:

Hybrid artificial neural network-regression model is better alternative approach for developing ready mixed concrete transportation productivity model than hybrid multiple regression-artificial neural network model. The findings suggest that due to the unstable or changing patterns in the data, using hybrid model can reduce such uncertainty. However, by fitting multiple regression model first to the data, the over fitting problem is more strongly than fitting with ANN first. The reason for this could be explained that ANN model is more suitable for non-linear relationship than multiple regression model, so it can be capable of accuracy for uncertainty data. Therefore, fitting ANN first to the data could provide accurate estimates of the productivity of transportation delivery process.

5.2 Directions for future research

Continued work could be undertaken to compare other ANN architectures; for instance, Elman recurrent neural network. Additionally, it can be studied the effect of the training set on the model performance (Graham et al., 2006). Furthermore, the ready mixed concrete transportation productivity model can be considered other techniques in order to compare performance; for example, fuzzy logic, genetic algorithm and so on. Future studies may also replicate this study by looking at other independent variables which may affect transportation delivery.