Chapter 1

Introduction

1.1 Statement and significant of the problems

Ready mixed concrete is a common building material used in the construction of commercial and industrial buildings, roadways, infrastructure and other structures. Ready mixed concrete is a perishable product which is a custom specified and availability of ingredients. Ready mixed concrete delivery has limitation due to capacity of plant batching and delivery time. At the same time, customer behavior constraints are variety such as demand fluctuation, placement size, quantity ordered of a specific mix, delivery location and timing, ordering, accuracy of quantity and so on (Tommelein and Li, 1999). Normally, ready mixed concrete industry is produced concrete at several plants, which have to deliver at customers' construction job sites using a mixer truck fleet in a timely with cost-effective management (Schmid et al., 2009). Based on operations of large size ready mixed concrete company located in Bangkok, Thailand, the variation of ready mixed concrete delivery is crucial. The delivery process is complicated, which has many consideration factors involved including amount of concrete volume, concrete batching time, traveling time, delivery distance, waiting time at job site, concrete pouring time and truck return time. So, it is necessary to manage organization's resources in order to minimize the total delivery time and maximize concrete delivery volume. As a result, the rate of delivery of ready mixed concrete is employed to measure transportation productivity (Graham et al., 2006).

In this research, two hybrid models based on artificial neural network and regression models are employed for modeling ready mixed concrete delivery i.e. (1) hybrid artificial neural network-regression model and (2) hybrid multiple regression-artificial neural network model. Then a performance accuracy of both hybrid models will be compared using root mean square error (RMSE) and mean absolute percentage error (MAPE).

This research differs from previous works in several aspects. The related work of ready mixed concrete delivery problem consider mainly on simulation, optimization, and heuristics techniques, while MR and ANN are applied to predict and model in many industries

except in ready mixed concrete delivery problem. In the light of these gaps, this research combines multiple regression (MR) and artificial neural network (ANN) for modeling ready mixed concrete delivery. The benefit of the estimate model will be useful for the management to plan an operation and its resources, thus avoiding shelf-life problem.

1.2 Objectives of the research

1.2.1 To propose 2 hybrid models i.e. (1) hybrid multiple regression-artificial neural network model and (2) hybrid artificial neural network-regression model for predicting productivity of transportation.

1.2.2 To compare the performance accuracy of 2 hybrid models using root mean square error (RMSE) and mean absolute percentage error (MAPE).

1.3 Scope of the study

1.3.1 Data is collected from one of the ready mixed concrete businesses in Thailand from October – December 2012.

1.3.2 Seven explanatory variables affecting transportation productivity are selected to validate the model.

1.3.3 Two hybrid models are compared to predict transportation productivity i.e. (1) hybrid multiple regression-artificial neural network model and (2) hybrid artificial neural network- regression model.

1.4 Benefit of the study

1.4.1 Hybrid model can be used to help business to predict productivity accurately.

1.4.2 The proposed hybrid models can be applied to other businesses.

1.5 Definition of the technical term

1.5.1 Ready mixed concrete is an essential material in contemporary construction and engineering projects. Ready mixed concrete is a mixture of four basic ingredients: sand, rock,

cement, as well as chemical compounds known as admixtures, which are mixed with water at a plant and transported directly to a construction site.

1.5.2 Hybrid model is a method to merge two methods in order to improve the prediction accuracy, which can be also referred as combined models or ensemble models and often used synonymously. Hybrid model can be implemented in three different ways, i.e. linear models, nonlinear models and both linear and nonlinear models.