Investigating the Use of Software Negotiation for Adaptive Revenue Management

L.H.L.M. Wimalasena

08/10007

Faculty of Information Technology

University of Moratuwa

September 2010

Investigating the Use of Software Negotiation for Adaptive Revenue Management

L.H.L.M. Wimalasena

08/10007

Dissertation submitted to the Faculty of Information Technology, University of Moratuwa, Sri Lanka for the partial fulfillment of the requirements of the Degree of M.Sc. in Artificial Intelligence

September 2010

Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organization.

L.H.L.M. Wimalasena

Name of Student Signature of Student

Date

Supervised by

Prof. Asoka S. Karunananda

Name of Supervisor(s) Signature of Supervisor(s)

Date

Dedication

This Thesis is dedicated to my beloved wife

Ranga Subhashi

for her great support and caring throughout the period.

Acknowledgements

This thesis would have been far from completion, if his support and guidance was not there throughout the research. I'm heartily thanking my supervisor Prof. Asoka S. Karunananda who is the Dean of Faculty of Information Technology of University of Moratuwa, for being my supervisor and guiding me patiently in all the times.

I would also like to thank my dear colleagues, in providing invaluable assistance and support during the hard and tough times of the research while they were also going through the same. Shihan Merino Silva specially remembered for being there to discuss and help on technical matters from the beginning.

Last but not least I would like to thank the researchers who have done their research work related to Revenue Management and various Artificial Intelligence approaches for revenue management.

Abstract

Enterprises today, specially performing online sales face huge challenge to respond to very dynamic market changes and to manage their revenues. This is due to the complex nature of the businesses and huge amounts of data being required to process to make generate correct forecasts. Complexity further increases when it comes to travel and tourism industry where mainly the hotel and flight prices face great competition and demand fluctuation. From the literature it can be seen that this area of research has already been studied in different angles. Examples are agent oriented supply chain management, multi agent mediated internet market places, dynamic re-contracting and re-negotiation in online market places …etc. However, there is no readily available solution to address this complexity and manage revenues from Tour Operation point of view.

This thesis presents the work carried out to address the tour operator business complexity by building a multi agent technology based model. Inputs to the system are customer purchase requests for flight seats, relevant inventory with the seat allocation criteria. System outputs the decision if to accept customer purchase request at the requested prices, autonomously adjust listed prices which can be above or below the minimum price and most appropriate allocation of the inventory which generates the optimal revenue. In transforming input to the output, agents act autonomously trying to negotiate the best price for the customer and optimal inventory allocation. Features of the system are adaptive negotiation, adaptive price adjustments and generating forecasts for customer bid price and patterns. Design of the system consists of few types of agents. Namely, Global Manager, Local Manager, Sales, Customer, Inventory, Demand forecasting, Competitor price monitoring and Pricing agents. Ontology has been defined in two levels. One is to store global travel ontology and the other to store local Ontology for the tour operator. MADKit has been used to implement the agent model and to wrap existing services. Evaluation has been performed based four cases defined with agent features in each. Results from the evaluation clearly shows, if the supplier closely analyzes and adapts to the market behavior in terms of negotiation, price adjustments and forecasting, he can earn considerable more revenue out of the same market.

Contents

List of Figures

List of Tables