Research Statement

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Background
The background of my research involves 4 distinct areas:

a) **Data & Decision Analytics**
Many OM/OR problems often assume that the actual cause of the problem is known and the problem objective is well defined. Practitioners would know that real business problems do not present themselves clearly, often resulting in people solving the wrong problem. Thus, my proposed Data and Decision Analytics Framework aims to help the analyst to first identify the actual cause of business problems by collecting, preparing, and exploring data to gain business insights, before proposing what objectives and solutions can and should be done to solve the problems. Such a framework combines identification of the root causes by data analytics, and proposing solutions supported by decision analytics.

b) **Supply Chain Coordination**
Supply chain coordination encompasses research areas involving decision making at different levels of the supply chain. At the strategic level, the design of logistics network involves deciding where to locate hubs to consolidate supplies from multiple suppliers to be transported to multiple manufacturers, so as to minimize the total supply chain costs including fixed hub costs, transportation costs and inventory costs. At the tactical level, a centralized decision could involve coordinating the amount of supplies from different suppliers to different manufacturers, so as to minimize the overall supply chain costs. At the operational level, transportation decisions on different available routes across multiple time periods are made to coordinate shipping quantities from multiple suppliers to multiple manufacturers. My research work in this area cuts across all 3 different levels, depending on the problems faced and the data available for analysis.

c) **Spreadsheet Modeling**
The ability to model open, unstructured business problems into spreadsheet models for detail analysis has become increasingly important in the fast-changing business environment. Spreadsheet modeling has shown to support quick decision making and its use is rampant in the business world. Effective modeling comes from years of experience and exposure to myriad of business problems, plus using effective modeling and analysis techniques and tools. With an effective spreadsheet model, businesses can explore the
what-if questions and perform trade-off and sensitivity analysis. My research in this area involves effective use of the spreadsheets tool to solve operations related problems, such as nurse scheduling.

d) **Professional Programmes Design, Development and Delivery**
Designing, developing and delivering a professional programme involves identifying the knowledge gap in the industry, designing courses which will train the next generation of leaders in skills that are relevant, and ensuring the continuous growth of the programme, to benefit all stakeholders including the students, faculty members, our industry partners, and the Singapore economy. This massive task is coupled with many administrative items such as marketing and promotions, admissions, projects, internships and placement, and faculty search. This area involves also research in competing programmes and their curriculum, as well as new pedagogical methods for effective and scalable delivery, for example the blended learning education model. The desire to discover what works and what does not is critical to ensure that the programme grows in terms of curriculum quality and enrolment size.

**Research Areas**

a) **Data & Decision Analytics**
This research involves close collaboration with industry partners to obtain operations related problems and data to solve and obtain implementable results. The work completed include airport terminal resource allocation, airport check-in process optimization, demand forecasting and inventory pooling for luxury watches, order distribution process improvement for FMCG goods, and nurse scheduling for hospital intensive care unit. All the papers proposed solutions which were obtained from integrating data analytics approaches such as statistical distribution, statistical inference and regression analysis, with decision analytics solution methods including simulation, heuristic algorithm and optimization of mixed integer linear model.

b) **Supply Chain Coordination**
This research involves centralized decision making for supply chain coordination, using combinatorial auctions as a coordination mechanism. Leveraging on the tight links between combinatorial auction and Lagrangean Relaxation model, the Lagrangean multipliers are used as the dynamically adjusted parameter to balance supply and demand of supplied parts or shipping capacity, subjected to constraints. The proposed solution methodology is applied in freight consolidation & distribution (operational level), and supplies coordination (tactical level) problems. By harnessing the special characteristics of each problem, we aim to attain fast convergence for large problems, and thus the solutions are implementable in practice, as opposed to solution methods which take too long to solve for any practical
use. This methodology can be applied in many domain areas involving coordination of multiple decisions.

c) Spreadsheet Modeling
Effective modeling and analysis skills can be imparted to students and instructors alike. Good teaching notes on business problems were developed including analysis of demand and sales data and distribution, forecasting of growth trends, and price revision with quantity discounts using Excel Solver. A paper on emphasizing the importance of teaching spreadsheet modeling skills to students was prepared to create awareness and highlight the critical pedagogical insights. The textbook “Business Modeling with Spreadsheets: Problems, Principles, and Practice”, 3rd Edition, which covers a myriad of business problems was published and used as the textbook for several business modeling courses in SMU and UniSIM.

d) Professional Programmes Design, Development and Delivery
Apart from the 2 tracks in the MITB programme, several new initiatives have blossomed. In terms of CET, the MAS/iDA FS IT Lead Provider programme was successfully clinched and FIT Academy @ SMU was officially launched in October 2013. A new Graduate Diploma in Analytics programme is also in the process of getting approval and to be launched soon. In addition, agreements with 4 partner universities including Peking University, Xiamen University, Southwestern University of Finance and Economics and EBS Business School in Frankfurt, were signed to bring in quality students to the MITB programme. 2 MITB courses were converted to blended learning with another 4 MITB courses also underway, as part of the overall strategy to deliver the MITB International Programme. In each of these work, the questions of how to achieve synergies among all our education efforts, how to achieve scalability, and how to ensure sustainability and growth, have to be considered.

Selected Publications and Outputs


3. “Strategic Decision Support System using a Heuristic Algorithm for Practical Outlet Zones Allocation to Dealers in a Beer Supply Distribution Network”, by

4. "Effective use of Data and Decision Analytics to Improve Order Distribution in a Supply Chain", by Michelle CHEONG and Murphy CHOI, *Teradata University Network (TUN) Teaching Innovation Award Winner 2013*.


10. "Uncovering Insights through Data Analytics for an Airport Operation to Improve Profitability", by Nang Laik MA, Lee Fong, Michelle CHEONG, and Junyu CHOI, 07/2012, *SRII – Service Research and Innovation Institute*, 2012 San Jose, U.S.A


**Work-in-Progress**

1. “ATM Failure Forecasting and Field Service Optimization”, by Michelle LF CHEONG, Bharath CHANDRABABU, Ping Shung KOO, 2015.


Working Papers


