

# Research Statement

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## Background

With rapid technological changes, simple intuitive but powerful tools plus unprecedented access to information are now anytime anywhere in the palms of individual consumers and business users. As it takes time for the world to properly assimilate technology, the gap between what are available and how they are used is getting larger, not smaller. Two major classic obstacles are getting harder to breach: 1) paradigm changes in work habits and 2) knowing what to address rather than how best to solve them.

## Research Areas

- Exploratory modeling for strategic, tactical and operational decision-support  
The spreadsheet is common in today's office but its power and flexibility are under-appreciated. Research audits have found spreadsheet users' over self-confidence as the main cause for high percentage errors in deployed spreadsheets. Used mainly for numerical computations, spreadsheets are really best suited for finding out about unknowns. My research exploits spreadsheet features to assist executives in diagnosing concerns on their own, thus expediting actionable resolutions. It steers spreadsheets away from being mistreated as disposable software to turn them into systematically-deployed organizational assets. They can be valuable institutional knowledge depositories, powerful decision-support tools and workable information systems prototypes. Business Process modeling and System Dynamics are similarly excellent for user-led collective discovery of what are ill-understood about processes, organizations or industry structure. The three methodologies span the hierarchical management levels of strategic design, tactical planning and operational control. Further translational research will make such commonly available technologies more useable as self-service exploratory tools.
- Conceptual design of complex manufacturing and service delivery systems  
Operations process research is in either finding optimal solutions to high-level monolithic concept models (as in operations design and management) or evaluating detailed process workflow maps (as in information systems requirement specifications). My interests, bridging the two separate domains, are in looking at proper framing and decomposition of large real-world operations problems: hierarchical modeling of sub-problems with overlapping time horizons, linking constraints, feedback mechanisms, and incremental re-planning. The research is to find and justify good efficient heuristics and non-conventional approaches such as market-based coordination and combinatorial auction mechanisms, and incorporate them into actual operations and IT systems. Areas addressed include capacity and technology planning; supply and demand matching; perishable, seasonal and

substitutable products management; and complex, large-scale, time-sensitive flexible coordination. These are applied in global shipping, container terminal, third- and fourth-party logistics, supply chain, manufacturing, and general service operations.

- Applications of IT in manufacturing, supply chain, logistics and general services  
Every year, the Information industry rolls out novel technological concepts and new systems offerings. New terms are invented and old ones rehashed. Many business users are confused and wonder if the new bottles being sold really contain new wines: Is ASP (application service provisioning) the same as cloud computing? With due respect, technologies are better understood now than before by technologists and the business community, and many promises are now more than mere promises. Still, there are a lot of vapourware out there. In this research focus, I want to understand what evolving information and communications technology offer and evaluate realistically what work and do not when they are applied to manufacturing, distribution, health-care, hospitality, and other general or public services. The research is to discover where technology can be appropriately applied and how best to use available information to reduce cost and improve service performance. Increasingly, the challenges go beyond operational and tactical improvements. Technology can be leveraged to create new business value propositions and innovative synergistic concepts. Examples include cross-docking, vendor-managed inventory, non-asset-owning fourth-party logistics, and direct-sales businesses.

### **Selected Publications and Outputs**

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<http://www.mysmu.edu/faculty/tyleong/ExploratoryModeling.htm>

Leong TY 2012. Wonderful World. Resource website.  
<http://www.mysmu.edu/faculty/tyleong/WonderfulWorld.htm>

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Leong TY & NL Ma 2011. "Inkjet Printer Pricing," *INFORMS Trans. on Education* 11(3):132-137.

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- Leong TY & MLF Cheong 2008. "Teaching Business Modeling using Spreadsheets," *INFORMS Transactions on Education* 9(1):20-34.
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- Zhao ZY, TY Leong, SS Ge & HC Lau 2007. "Bidirectional Flow Shop Scheduling with Multi-Machine Capacity and Critical Operations Sequencing," *IEEE Multi-Conference on Systems and Control*, October, Singapore.