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Essential Spreadsheet Modeling Course for Business Students

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'Management Science' can be an even better if not the best business course if students first take 'CAT.'

By Thin Yin Leong and Michelle L.F. Cheong

Ask any student at the Singapore Management University (SMU) to name one of the most practical and useful courses offered by the university. The answer would inevitably include CAT. CAT stands for the "Computer as an Analysis Tool" course. Originally based on a course of the same title offered by the Wharton Business School, the focus of CAT was shifted to provide business students the essential practical skills and necessary "real-world" exposure to better use personal computers for resolving business problems. The course is basically centered on using the Excel spreadsheet to work on ambiguous ill-defined problems.

So what's new? Management professors have been using spreadsheets as the main computing tool to support their teaching of business management, statistics and management science courses for many years. Though some modeling skills can be learned through these courses, they are often a secondary concern to the main domain content. Powell [1] argued that modeling skills should be taught before teaching management science. We agree and further assert that it should be a totally separate course, with special emphasis on modeling and analysis skills, to get our students better prepared for the real world. Grossman's article on "The Spreadsheet Analytic Value Chain" [2] states the five essential steps business students must take to effectively employ analytical techniques in the real world. This further supports that spreadsheets modeling and analysis are essential skills, be it for solving OR/MS problems or just the daily mundane decision-making.

Learning the art of modeling constitutes more than exposure to models and computing solutions. The latter has evidently been the primary approach so far. Modeling is really about dealing with open-ended questions, navigating around assumption and trying to make some sense of the situation. It must explore unspoken possibilities and overcome dead-ends. Whereas models try to find the answers, modeling deals with asking the right questions. Without good modeling skills, students are unable to develop simple new models or even adapt old ones to real-world circumstances. Clarifying modeling, Powell [1] proposed a hierarchy of modeling skills: basic quantitative reasoning, informal modeling (e.g. identifying critical assumptions), formal modeling (like Excel skills), understanding models from other disciplines, end-user modeling, understand and work with large-scale models.

The black-box and the influence diagrams are used to help students develop business models. In sketching the black-box model, student learns to differentiate between controllable and uncontrollable for input data, and between performance measures and intermediate variables for output results, a skill we found not necessarily intuitive to them. The influence diagram shows students how to relate the various variables to each other, and the process of evolving the required business model — especially relevant in a group setting — without being bogged down too prematurely on the specifics of the functional relationships. Helping students use these two basic diagrams opens up the path for them to move on to other more sophisticated artifacts like

the data flow diagram, graphical user-interface (GUI) design, storybook and even UML's use case diagram.

Like practically all other courses in SMU, we conduct the CAT course in a studio-like environment, with about 40 students in each class. A textbook [3] has recently been published to support the delivery of the course. To impart modeling and analysis skills, we go through class exercises that are developed based on real business problems. We intuitively construct the models in the exercises "live" before the students, role-modeling a systematic process, thereby demonstrating for our students what we want them to do in "consulting" mode. Every student, attending the classes with their own laptop, works along to reproduce the entire model and where possible on their own.

Over many such exercises, we explore a variety of modeling issues and constructs, and indirectly develop the needed Excel skills. Each exercise brings in a different business challenge and perspective, and at the same time demonstrates to the student the appropriate use of selected Excel features and functions. Students feel challenged and enjoy each class, whether or not they already have strong Excel spreadsheet skills. (Those having strong technical skills seem to lack modeling ability to effectively use them).

Some of the concerns covered in our exercises include estimating price-demand relationship, revising a product pricing table under competitive pressure, appreciating time value of money (without having taken a financial accounting course), importing data and looking up specific dependent values from given tables, and simulating time-varying and stochastic variations in demand or return rates. We teach students to do trade-off analysis, "what-if" analysis and sensitivity analysis. They also learn to "analyze" data in lists, using Excel's Sort, Filter and Pivot functionalities. There are also some simple computation of summary statistics and plotting the notional histogram.

In addition to the usual assignments and mid-term test, our students work in project teams to produce prototype Excel-based systems for real organizations, after completing modeling and analysis of their challenges. To date, a few hundred projects have been completed by our students. The projects covered organizations in civic clubs and social welfare, education, entertainment, food and beverage, health care and medical, manufacturing and logistics, public services, sports and recreation, transportation, and tourism and hospitality sectors.

The CAT course is very popular among students and university administrators alike. It is offered by the School of Information Systems, but it supports our whole management university campus. All schools, except the School of Accountancy, require their entire student population to take the course. More than 80 percent of accountancy students find the course useful enough to voluntarily opt for it.

Management science as a course has been losing favor in many business schools. We believe the problem lies in business executives and managers not been able to relate it to the work. With the many years of experience behind us, we assert that management science can be a better if not the best course [4] if students first take the CAT "business modeling with spreadsheet" course. Taking management science later offers students more opportunities to practice the base modeling skills developed in CAT and take them to the next level. The same holds true for other

courses, like financial analysis and marketing research, which by the way are using more spreadsheets, but not intensively enough for the lack of spreadsheet modeling skills.

Can business schools afford to have another "management science" course, when many are dropping their main management science course? With more business students finding it hard to deal with quantitative courses directly using mathematics and the commercial world demanding stronger analysis and better spreadsheet skills, perhaps the response should be, "Can we afford not to?"

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