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IS Teaching and Research at The National University of Singapore

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Introduction

The National University of Singapore started with the nucleus of a Computer Science department in 1981 in the Faculty of Science. As a part of the national effort to develop a strong program of education in IT, the department was upgraded to become the Department of Information Systems and Computer Science (DISCS) in 1983. Graduate level teaching and research started in 1986. Serious research in Information Systems (IS) and CS started around 1986 when a pool of young people educated and trained in these areas became available.

The Department presently has more than 1,500 undergraduate students and 150 graduate students, and 75 academic staff. It offers 70 undergraduate courses and 50 graduate level courses.

IS Teaching in DISCS

DISCS aims to produce basic and higher degree graduates who meet the demands of the information technology (IT) industry. To this end, it aims to equip DISCS graduates with marketable knowledge that integrates problem solving skills, technical IT and business knowledge. In addition, they will have a conceptual foundation that enables them to:

- adapt to emerging technology and develop themselves into future leaders of the IT industry; and
- proceed to further studies locally or in reputable universities overseas.

Higher degree graduates will be equipped with advanced knowledge in IT and its management, as well as a strong foundation for careers in R&D.

For the Bachelor degree, a candidate must read at least 28 modules (over 6 semesters) consisting of:

6 Essential modules at Level 100

6 Essential modules at Level 200

2-4 Project modules at Level 300

5 Area of Focus modules

4 or more Enrichment modules, and

An appropriate number of Elective modules to make up a total of 28 modules

At about their second year of study, each candidate chooses an area of focus and takes at least five modules from the chosen area. The area of focus provides the candidate with a focused programme of study that is targeted towards specific segments of the IT industry. It also allows good candidates to specialize early in their chosen areas. There are six areas of focus in the ISCS programme representing a broad classification of the various academic disciplines and job segments in the fast growing field of IT. Two of these areas of focus are classified as IS. These are:

- Business Modeling Focus: *encompassing sub-disciplines related to decision sciences, focusing on business modeling, intelligent business systems, model management, statistical inference and mathematical programming.*

- IT in Business Focus: *encompassing sub-disciplines related to IT management, focusing on IT planning and management, innovative applications of IT in the various industries and business functional areas.*

The department offers five graduate level programs: (1) B.Sc. (Honors), (2) Diploma in Information Technology, (3) M.Sc. by coursework and dissertation, (4) M.Sc. by Research, and (5) the Ph.D. degree.

- **BSc.(Honors):** This is a continuation of the three year undergraduate program to a fourth year. In order to be eligible for admission to the Honors program, a student must have maintained a B average grade in the third yeas of the undergraduate program. The duration of the Honors program is one year.

- **Diploma in information technology:** This program provides an opportunity for working professionals to upgrade their knowledge through part-time studies in IT Persons seeking admission to this program generally have a Bachelor's degree in computer related areas or an Honors degree in other areas with sufficient experience in computer related work.

- **MSc. by coursework and dissertation:** This is another part-time graduate program for professional upgrading. Applicants will have an Honors degree or equivalent in Computer Science or Information Systems. Typically, students are IT professionals with several years of experience.

- **MSc. by research:** This program is based entirely on research and is suited to students who plan to continue for the degree of Doctor of Philosophy. Normally, applicants have an Honors degree or equivalent with outstanding academic record.

- **Ph.D.:** The Department has a small number of Ph.D. students. Candidates are required to work on a substantial research problem and submit a thesis containing original contribution to knowledge.

IS Research in DISCS

Research in Information Systems in DISCS started around 1986. Most of the IS research in DISCS is empirical in nature. It consists of collection and analysis of data and interpretation of the results on the research problem in real or contrived settings. The research efforts used the sample survey strategy, the laboratory experiment strategy and case study strategy.

The key resources needed for doing good research are: (1) research students, (2) research funds, and (3) research time. In DISCS some of these resources are readily available and some others are in short supply.

- **Research students:** Students with some capability for doing research become available at the Honors year. They can put in an equivalent of four months full-time effort to a research project. Those who do MSc. by coursework and dissertation are more suited to do research on real-life problems and can put in an equivalent of six months full-time effort. Students who do M.Sc. by research are normally research scholars, teaching assistants, or research assistants in the Department. They are expected to put in an equivalent of 18 months of full-time effort into their research. At the Ph.D. Level, research is a serious full-time commitment which extends over several years.

- **Research funds:** There are several sources of funds for research in Singapore. The University supports good research projects through research grants. The other sources of research funds are Singapore National Science and Technology Board, and a consortium of industries. The procedures for applying for research grants to the University and National Science and Technology Board are similar to the procedures of the National Science Foundation in the USA. The research grants offer funding for equipment, consumables, and employment of research assistants.

- **Research time:** The main official role of DISCS and senior academic staff is still perceived to be teaching but they are expected to do research and publish in refereed international conferences and journals in order to get tenure and promotions. Unlike in the USA, research grants do not fund buying of teaching time. This limits the time senior academics can devote to research.

- **Research expertise:** DISCS is short of research expertise in IS. Out of the 75 academic staff, a majority is computer science oriented. It has about fifteen staff members that have IS or management science orientation.

Although DISCS is short of research students, and research time for doing research in IS, some progress has been recorded since 1986. The research can be classified into two categories: ongoing research projects with dedicated research resources and occasional research exercises with no continuing research efforts or research resources. The major and ongoing research projects are Application of IT in Small Businesses, Interorganizational Systems, Government Policy and Diffusion of IT in Asia-Pacific Countries, and Group Support Systems.

DISCS completed more than 50 occasional research projects since 1986. These projects have covered a wide variety of research areas. Some examples are Decision Support Systems, Information Systems Planning, Performance Evaluation and Capacity Planning, Occupational Stress, financial modelling, application of neural network, application of game theory and computer security. A good number of these projects have the potential to develop into ongoing funded research projects.

Discussion

From the above review, it can be seen that our research activities cover a wide area. This discussion will focus on some factors which offer comparative advantages or act as constraints for doing IS research in a small country likes Singapore with limited human resources and in a predominantly Computer Science environment.

- **Curriculum and courses:** As an academic discipline, IS is inter-disciplinary and eclectic in nature. It draws and synthesizes concepts, knowledge, and research techniques from diverse reference disciplines which include CS, management science, economics, cognitive psychology, organizational behavior, accounting, sociology, and so on. In order to do good research in IS, researchers need to develop a sound background in a few of these reference disciplines. The courses currently offered by DISCS have a strong technology orientation and the present regulations allows DISCS students to take only four enrichment modules from outside the department to cover the reference disciplines and receive credit. Therefore, our IS research students have to learn the necessary reference disciplines on their own. The really good and motivated students are equal to this challenge, but this discourages a large number of students who like to do IS.

- **CS Environment:** The consolidation of IS and CS into one department creates both opportunities and problems. One major advantages of such arrangement is the possible integration of knowledge from both IS and CS. Therefore IS researchers in DISCS are well placed to do research and development work with a greater technical orientation. Another advantage involves the

development of teaching content that is more application oriented in the case of CS and more theory and technology based in the case of IS.

However, this integration has created some constraints and problems, whether real or perceived. The real constraint is the fact that DISCS students are expected to understand both IS and CS materials. In reality, they sometime understand neither thoroughly. Regarding perceived problems, although the Department has an excellent record of supporting and funding IS research so far, young persons considering an academic career have misgivings about choosing IS. These arise from perceptions such as: IS is a watered down version of CS and therefore an inferior academic discipline; IS research does not receive the same level of recognition as CS research; IS is a support discipline rather than a core discipline, and so on. The encouraging aspect is that a small number of good students who studies CS for the undergraduate degree have chosen to do IS research at graduate level.

- **Relevance and rigor:** A good part of our research activities uses the survey research strategy and requires support from organizations. While the organizations have been willing to co-operate in our research, they expect our research to address issues of current relevance to them which may not always offer scope for academically rigorous research. Therefore, a large number of our occasional projects tend to address issues and problems of current relevance.

- **Research Students:** DISCS is short of research students in all disciplines. Although the salary differential in Singapore between jobs in the university and in industry is not very big, young people in Singapore do not yet attach high "prestige value" to academic careers.

Future Directions

The IS research efforts in DISCS research can be considered reasonably successful judging by the number of internationally refereed publications. Most of the research to date has been empirical in nature and adopted survey and laboratory experiment research strategies. DISCS is now in the process of developing expertise in case study research, modeling and simulation, and conceptual research. Some potential areas for new research are financial modeling, application of neural networks, application of game theory, information economics, EDP audit, and system security and privacy.

References

References available upon request from the first two authors (weikk@iscs.nus.sg, yapcs@iscs.nus.sg).