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THE STATE OF THE ART OF MIS EDUCATION IN CHINA

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Abstract:

When comparing the present situations of the Management Information Systems (MIS) undergraduate program in Shanghai Jiao Tong University with several representative domestic MIS programs in other universities, the authors discover there exist three different types of training objectives in MIS education in China. We also conclude that the MIS education in the top 4 MIS undergraduate programs in the last 3 years presents similar features. Moreover, by scrutinizing the graduate employment status, several present problems in the MIS education in China are revealed, and solutions are proposed.

Keywords: Management Information Systems, undergraduate program, education, China

I. INTRODUCTION

Being established in the 1980s, the MIS discipline was initially launched by the department of computer science or the department of management science, with the education content and teaching method being mostly composed of the application of information technology in management.

In 1997, Ministry of Education of China started the adjusting and standardization of numerous and various undergraduate programs. Several problems had emerged by that time, including excessive specialization, limited contents coverage, poor overlapping and fusion, and students' limited innovation. In order to solve these problems, measures like combination and renaming of present programs have been adopted.

According to the "undergraduate program catalogues and program description for colleges and universities" released by Ministry of Education of China (1997), several programs, including Management Information Systems, Economic Information Management, Informatics, Scientific and Technologic Information, and Forestry Information Management, were integrated into a new information system major, named "Information Management and Information Systems". This regrouped information system major was renamed as "Information Management and Information Systems" based on taking all the above programs into consideration. Before the standardization and adjustment, the degree for MIS programs used to be bachelor of engineering or bachelor in science, and the degree for economic information management and forestry information management used to be bachelor of management or economy. While all of these programs were ramifications of MIS with Chinese characteristics, there are still considerable discrepancies between the programs launched in department of computer science and those in department of management science, especially in the objectives and curriculum. In the consideration of the combination of different scientific and engineering specializations in this major, the official name in China is "Information Management and Information Systems", while the name, "Management Information Systems", is widely used internationally and in some conditions in China (E.g. CNAIS represents China Association for Information Systems, an AIS branch in China).

The number of MIS undergraduate programs is the second largest in Chinese undergraduate management discipline. According to the report from the Chinese College and University Ranking

working team (Wu, S., Lv, J., and Guo, S. , 2008), the latest programs in the management discipline and their numbers are summarized and listed in Table 1.

Table 1: Ranking of Undergraduate Business Programs

Ranking	Undergraduate Program	Established Number
1	Marketing	400
2	Information management and information system	376
3	Business administration	356
4	Public management	339
5	Accounting	329
6	Financial management	240
7	Human resource management	239
8	Administration management	220
9	Engineering management	210
10	Logistics management	158
11	Industrial engineering	142
12	Labor and social security	109
13	Land resources management	65
14	Agriculture and forestry management	57
15	Management science	42
16	Archives science	30
17	Library science	30
18	Rural regional development	28

Table 1 shows that MIS is one of the most popular and prosperous majors in management discipline. Based on student admission statistics from most universities in China, MIS students have a much higher average score of the entrance exam than students in other majors. Furthermore, the statistics also show that the ratio of students who apply for MIS major to students actually admitted is one of the highest among all the majors. All these information implies that MIS is one of the most competitive major with excellent students. But unfortunately, according to the report (Wu, S., Lv, J., and Guo, S. , 2008), it is also one of the least standardized majors.

II. THE CULTIVATION GOALS AND PROFESSIONAL PROFICIENCY OF MIS PROGRAMS

According to the “undergraduate program catalogues and program description for colleges and universities” by Ministry of Education of China (1997), the cultivation goal of a MIS program is defined as follows: acquiring the basics of modern management theory, computer science technology and application ability; acquiring the knowledge in system engineering theory and the capability in system analysis, system design, and information management; being competent of technical work including the analysis, design, management, and estimate of information management and information system, in national administrative departments, commercial enterprises, financial institutions, scientific researching organizations.

When setting up the cultivation goals, curriculum, and syllabus for the MIS undergraduate program in Shanghai Jiao Tong University, related information from many famous domestic and foreign universities has been taken as references, in particular,

- Department of MIS, School of Business, The University of Texas at Austin (top 5 in MIS in US, according to (U.S.News, 2009)),
- Department of MIS, School of Management, The University of Arizona (top 5 in MIS in US, according to (U.S.News, 2009)),
- Department of MIS, School of Management, Tsinghua University (top 4 in MIS in China, according to (Wu, S., Lv, J., and Guo, S. , 2008)),
- And Department of MIS, School of Management, Huazhong University of Science and Technology (top 4 in MIS in China, according to (Wu, S., Lv, J., and Guo, S. , 2008))

In this section, we explain in detail the cultivation goals, employment opportunities and directions of our program. We also categorize the difference among MIS undergraduate programs in colleges and universities in China.

Cultivation goals

The MIS undergraduate program at SJTU has the following objectives in cultivating our students. That is, students graduated from MIS are expected to:

- acquire the basics of modern economic and management theories;
- acquire theory foundation and application ability of hardware and software in computer system, knowledge and capability in system science theory, analysis and design of management information system, and information management;
- be competent of technical work including the analysis, design, implementation, management, and estimate of information management and information system, in national administrative departments, commercial enterprises, financial institutions, scientific researching organizations.

Employment Opportunities and Directions

- Staff for analyzing, designing and developing information systems: including *system analysts*, who are responsible for user demand analyzing and overall design for an information system; *project managers*, in charge of the management of the developing project; *information system consultants*, who guide users in the participation of several steps such as planning, development supervising, system testing and validation; *information system designers*, those responsible for the design of management information systems; and *programmers*, i.e., developers who implement the systems. Experienced system analysts are provided with the administrative position CIO.
- Staff for data collection, processing and system maintenance: *management information collectors*, responsible for the collection, processing, input and output of data; *maintainers*, in charge of the installation of computer hardware, software (including network), daily system

maintenance, and network information security; *data analysts*, analyzing the daily data with different tools; *superior information managers*, responsible for utilization of information technology and management of information resources, e.g. CIO.

- Marketing staff: *hardware and software marketing*, responsible for the marketing of computer hardware and software products; *information system software marketing*, particularly in charge of the marketing of information systems.

The course curriculum for MIS undergraduate program in Shanghai Jiao Tong University is established according to the above cultivation goals and employment directions.

Existing MIS undergraduate programs in China can be divided into three typical categories, as shown in Table 2, due to different professional backgrounds of the faculty in different universities.

Table 2. Categories of Undergraduate MIS Programs in China

Classes	Faculty Professional Backgrounds	Course Curriculum	Experimental Focus	Employment Direction
1	Engineering and scientific background, good IT capability	Systematic IT courses, auxiliary economic and management courses	Information system development	technician and manager in IT companies
2	Social science background, limited IT capability	Non systematic economic and management courses, IT courses added	Information system operating	Operator
3	Social science background, certain Engineering and scientific capability	Systematic economic and management courses, and non systematic IT courses	Website and database develop	IT technician and manager in non IT organizations

When the Ministry of Education of China regrouped and renamed the information system major as Information Management and Information System, the cultivation goals are a little bit ambiguous. Different understanding has resulted in three different types of explanation: category 1, cultivating MIS developers with management and technical capability; category 2, cultivating MIS operators with both management and technical capability; category 3, cultivating system architects in MIS programs while leave programming positions for graduates from Computer Science.

Comparing these types, we hold the opinion that category 1 is the best. As the faculties for category 2 are mostly from economic information management, informatics, Scientific and Technologic Information, and forestry management, lacking information technology background and system developing experience, it is obvious the capability of graduates from category 2 is limited. In fact, the expanding presence of MIS applications implies that the operation of MIS systems to be not a discipline, but a daily technique. For example, it is necessary to have a television manufacturing course but not a television watching class. The third category seems to enhancing the statue and importance of MIS programs, but lacks feasibility. As the students major in computer science always have a higher university entrance score in China, and the faculty in computer science is usually better than in MIS, it is improper to metaphor MIS should play a more significant role than computer science. In the ranking of MIS programs in recent 3

years, all of the top4 universities with A++ grade belong to type 1, which strongly support our opinion.

III. THE RANKING OF UNDERGRADUATE MIS PROGRAMS IN CHINA

In the most famous unofficial university ranking in China (no official ranking is available), the top 4 universities (the only 4 universities achieved A++ score in MIS undergraduate programs in China) in the last 3 years are listed in Table 3 (Wu, S., Lv, J., and Guo, S., 2008).

Table 3. The Top 4 Undergraduate MIS Programs in China

Rank	University	Total Number	Score
1	Tsinghua University	376	A++
2	Shanghai Jiao Tong University	376	A++
3	Huazhong University of Science and Technology	376	A++
4	Tianjin University	376	A++

The close scrutiny of the MIS programs in these 4 universities reveals that,

- 1) All of these universities are famous for their engineering professional background.
- 2) All their cultivation goals belong to type 1, which is cultivating MIS developer with both management and technical capability.
- 3) The professional backgrounds of their faculties are mostly engineering and scientific, with good IT capability.

IV. THE COURSE CURRICULUM OF OUR MIS UNDERGRADUATE PROGRAM

The MIS undergraduate program at Shanghai Jiao Tong University has been ranked the top 2 in recent 3 years. This program adopts the course curriculum as shown in Table 4.

Table 4. The Course Curriculum of the MIS Undergraduate Program at Shanghai Jiao Tong University

Basic Courses	Social Sciences, Advanced Mathematics, Linear Algebra, Probability and Statistics, College Physics, College English, Computer Culture Basics, Advanced Programming Language Design, Introduction of Modern Chemistry, Introduction of Life Science	65.5 credits, 41% in total curriculum credits
Management	Principles of Management, Management	13 credits, 8% in total

courses 1	Communication, Management Ethics, Principles of Finance, Marketing, Introduction of Accounting	curriculum credits
Management Courses 2	Basics in System Science, Operational Research, Applied Statistics, Research and Innovation Management, Management Information System	14 credits, 9% in total curriculum credits
Economic Courses	Elementary Economics 1, Elementary Economics 2, Intermediate Microeconomics	8 credits, 5% in total curriculum credits
Information Technology Courses	Assembly Language and Computer Architecture, Computer Operating System, Data Structures and Program Design, Computer Networks and Internets, Fundamentals of Database Systems, System Analysis and Design Methods	26 credits, 16% in total curriculum credits (Original English textbooks and teaching materials are adopted)
Experiments	Database Programming, System Analysis, System Design, Website Development, Software Testing, Graduation Project	33.5 credits, 21% in all syllabus

Table 5 shows the comparison of different components in the course curriculum for MIS programs, including basic courses, management courses, economic courses, information technology courses, and experiments, in the top 4 universities: Tsinghua University (TSU), Shanghai Jiao Tong University (SJTU), Huazhong University of Science and Technology (HUST), Tianjin University (TJU).

Table 5. Comparison of Course Curriculum in Different Universities

Courses	TSU	SJTU	HUST	TJU
Basic Courses	↑	41%	↓	↓
Management courses 1	↓	8%	↑	↑
Management Courses 2	↓	9%	↑	↑
Economic Courses	↓	5%	↑	↑
Information Technology Courses	↑	16%	↓	↓
Experiments	↑	21%	↓	↓

The result reveals that the university with higher percentage of IT courses occupies a better ranking than those have more economics and management courses.

V. EXISTING PROBLEMS OF MIS UNDERGRADUATE PROGRAMS IN CHINA

Limited Professional Capability

It is a typical consequential problem of following category 2 in the education, as shown in Table 2. In fact, all these programs used to only have social science professional backgrounds, including economic information management, informatics, Scientific and Technologic Information, and forestry information management, and their faculties lack enough information technology theory and knowledge to cultivate qualified students with sufficient capability. The course curriculum consists of many social science courses and insufficient computer courses. As a result, the graduates are poor in computer technologies and their professional capability is limited.

Confusion of Computer Science and MIS

Considering the categories 2 and 3 in Table 3, it seems to be true that MIS graduates should only aim at positions for the design, application, and management of information systems, while computer science graduates should be responsible for the development of information systems. However, the fact is that the development of information systems still acts significantly in most positions for MIS graduates, while management and planning take only up to 10% of the total workload.

Then, what positions are for Computer Science graduates? No doubt computer hardware and system software are. For example, there are considerable software developments including operation system, compiler system, communication protocol, database management system, etc. However, the lack of excellence software development capability and sufficient professional cultivation, which are indispensable in the development of these system software, has compelled an invasion of Computer Science fields to MIS fields and resulted in the confusion of roles played by graduates from these two majors. It reveals that the cultivation goals of most Computer Science programs are abandoned. It also reflects a relatively low level of information system development in China.

The marshal incompetent for being a soldier

It is widely accepted that the final cultivation goal of MIS programs is cultivating qualified system analysts. However, without adequate management information system development capability, it is chimerically to aim at technical leaders of development teams with only management knowledge and theories. A marshal should first be a competent soldier; it is a step that cannot be ignored. It is faulty to confuse system requirement investigator with system analyst, just as mistaking recon team for marshal.

It is clearly stated in documents from Japanese companies, that system analysts should be promoted from experienced programmers and system designers. As a result, the MIS or CIS graduates in such developed nations start their careers as programmers, just like the cadets from West Point begin their services as second lieutenants.

System analyst is a position as well as a career. Not only acting as the technical leader in the system development team, it is also the analyst's duty to inform the programmers and system designers what to do and how to do, which requiring a better capability to solve the problems the programmers and designers cannot handle. To system analysts, the capabilities of programming and system designing are definitely indispensable, but in most conditions, it is just not necessary to present these capabilities and do anything on their own.

The Confusion of Undergraduate Cultivation Goals and Discipline Researching Directions

There are two genres in international information system research: Design Science Research, and Behavior Science Research. The previous one mainly concerns about the application research of information technology in management, while the latter one leans to the analysis of the effect on management after the adoption of information technology. But these two genres hold a same cultivation goal for undergraduate programs, i.e., improving the capability as a programmer and a system designer. Evidence is that even authorities in the genre of behavior science research, e.g., former AIS president, Rick Watson, still insist on system development.

VI. PROPOSED SOLUTIONS

Gear the Cultivation Goals and Curriculum to International Conventions

In the department of MIS in Shanghai Jiao Tong University, for instance, the cultivation planning is guided by international conventions; the original teaching materials from famous international universities are widely adopted in specialized courses and specialized basic courses; Class content, assignments, as well as final exam are all in English and the daily teaching is bilingual.

Combination of Basic Theory and Practice

Cultivating students with sufficient theory and technical basics, including mathematics, physics, economics, management, computer science, benefits the students for their further studying as graduate students.

On the other hand, besides training and practice in experimental classes, it is required in each graduate project that every student should experience system design and development in the advantage they choose for themselves, for instance, advanced programming languages such as Visual C. Net, java, system design as Client/Server, the application of SOA and Web Services. All these practice and advantage would be useful and even decisive in the employment. Such professional skills are more important for new graduates to start their careers while becoming superior IT managers is something they can only pursue in later development of their careers.

A professional laboratory is necessary to achieve this goal. Although information management and information system belongs to management discipline, it is an interdisciplinary major with practical technical characters. A professional laboratory is required to guarantee the experiments in specialized courses, course design, intern projects, and graduation projects; otherwise, the cultivation quality of graduates would probably be affected.

It seems to be true that present computer laboratories are competent for these experiments. However, there are more requirements for MIS graduate projects, including: underlying software and hardware interface experiment, the install and configuration of system software, the establishment and connecting of network, the installation and configuration of web-based operating system, the software and hardware experiment of distributed information system, the security experiment of information system, etc. The actual coding only accounts a very small part of the entire graduate projects. While ordinary computer laboratories can only provide limited services, the hardware cannot meet the requirements of these experiments. Even if the conditions are met, the students are usually not authorized to have these experiments because of the security of hardware and software.

Prominent Advantages against Computer Science

The curriculum of Computer Science is always more profusive in technical courses than MIS, such as Discrete Mathematics, Analogue Electronic and Digital Logic Technique, Compile Principle, Computer Interface Technology, etc. All these courses concern on the basic theories

on hardware and software in engineering technical fields, with limited connection with management and economics.

The curriculum of a MIS program covers most computer theory and technical courses about software development, which ensures an equivalent software development foundation for MIS students against CS students. Sparing the time, which CS students spend on hardware and software basic theories, on management and economics, guarantee MIS students a better understanding about user system requirements, consequentially the possibility of designing an information system according to actual circumstances.

Lacking adequate training of management and economics theories results in the disability of utilizing computer theories in satisfying user demand and system requirements. It often takes a long period of time for a computer science graduate to acquire management and economic knowledge so as to be competent for analyzing and designing management information systems. In such situations, the superiority of MIS students is presented, and this is why MIS and CIS undergraduate programs are still in prosperity with the competition against CS programs.

This is a true story; a computer science graduate from a top university and a MIS graduate from an average university were designing a sale system simultaneously. In order to improve system response time, and minimize system redundancy, in the sale system by the CS graduate, the price (generated by other files) was retrieved logically each time and copied to customer directly, while the latter system by the MIS graduate saves this data into a physical file for every sale record. In the theory of computer science the previous improvement is correct and complies with the principle of system optimization. However, one fact is ignored. The product price varies constantly, and with no history price record, it is impossible to get the sale detail of each product at various times. It is obvious the latter system would better meet demands from the sale department.

In non computerized sale systems, the problem just mentioned is impossible to occur because every trade is recorded on documents, and the statistic of receipts would help acquiring the sale price of each product. After the introduction of computer-based information systems, such new inter-discipline problems are revealed, and they are named of Business Process Reengineering (BPR). In fact, BPR derives from MIS and CIS majors.

The Good Soldiers Carry a Marshal's Baton in Their Knapsack

Fortifying the experiment and practice step; encouraging the spirit of pragmatism and preciseness; finishing the entire system development from basic programming to all other steps; from inferior to superior, this is the road from soldier (programmer) to marshal (system analyst).

Adjusting the Relationship between Academic Research and Undergraduate Cultivation

In the instance of the call for papers (<http://www.ics09.org/>) from INTERNATIONAL CONFERENCE ON INFORMATION SYSTEMS (ICIS2009), interests cover the following topics: Doing IT Research that Matters, Breakthrough Ideas, Culture and IT, Data and Web Mining, Design Science, Economics and Information Systems, General Topics, Global Information & Communications Technologies and E-Business, Green Information Systems, Human Behavior and IT, Human Computer Interaction, Information Systems Curriculum and Education, Information Systems Security and Privacy, Innovations in IT Project & Program Management, IT in Healthcare, IT Strategy and Leadership, Knowledge Management, Panels, Research Methods, Services Computing and Process Management, Social and Organizational Aspects of Information Systems, Web 2.0 and Social Media Analytics, Web-based Information Systems and Applications, etc.

These topics represent the current research trends in this discipline, but which cannot stand for the cultivation direction for undergraduates. It is more important for undergraduates to establish a good basic knowledge foundation than participating in research work. The basic knowledge and

the new professional trends should be added into the undergraduate cultivation continuously. The present curriculum and course content might be adjusted, for example, Grid might be added into the curriculum like Network did years ago, so as to catch the developing direction of MIS or CIS discipline. Reviewing, regaining, and recreating, and through necessary adjustment of our curriculum, figuring the specialty to reach the internationalization level.

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Huizhang Shen is professor of IT and IS at the Department of Management Information Systems, College of Economics & Management, Shanghai Jiao Tong University. He is the founder of the MIS undergraduate program at Shanghai Jiao Tong University and has been teaching IS courses since 1985. His teaching and research interests include system architecture, system design, group decision support system, group decision making, emergency response, data mining, electronic commerce and information security. He has published over 60 research papers in journals and international conferences. He is a member of AIS, IEEE and CAIS.