信息服务工程与管理专业的精英式工程教育模式探讨①

刘 宇 徐秀娟 马瑞新 (大连理工大学 软件学院 辽宁 大连 116021)

Discussion on Elite-Oriented Engineering Education for Information Service Engineering and Management

Yu Liu, Xiujuan Xu, Ruixin Ma (School of Software, Dalian University of Technology, Dalian 116024)

Abstract: Under the guidance of the training tactics for the graduate, “first to guarantee the solid technology, then to expand the knowledge field of management and business”, the new discipline named Information Service Engineering and Management introduces eleven courses mentioned below：<Introduction to Service Science and Technology>, <Formal Language and Automata>, <Artificial Intelligence>, <Object-Oriented System Analysis and Design using UML>, <Web Development Technology and Practice>, <SOA and Service Computation>, <Project Management Method and Practice>, <Enterprise Resource Planning and Integration>, <Modern Enterprise Management and Innovation>, <Introduction of E-commerce>, <Business Intelligence and Data Mining>, 9 courses of which will be first introduced in SSDUT. In the second term for the juniors, basing on the course of Project Management Method and Practice and Web Development Technology and Practice, with the orientation of project practice, focusing on the main line of students, elite engineering education is to be promoted through team development practice with whole interaction in the certain classrooms to cultivate compound talents with comprehensive knowledge of technology, management and business.

Key words: elite-oriented engineering education; service science management engineering (SSME); engineering master

The Software School of Dalian University of Technology (SSDUT) was founded in 2001. It is one of the 17 schools of Dalian University of Technology, which is one of the national key universities in China. It is also one of the first batches of national-level demonstrative software schools approved by the State Ministry of Education and the State Development Planning Commission. The school will continue making full use of DUT's educational resource advantage and Dalian City's software industrial advantage and cultivate more high-level, comprehensive, application-oriented software engineers and managers for national and local industry and make bigger contribution to the development of China's software industry through its own steadier and faster development.

The world economy is experiencing the largest labor force migration in history. Now that economies are shifting, industrial and academic research facilities need to apply more scientific rigor to the practices of services,

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such as finding better ways to use mathematical optimization to increase productivity and efficiency on demand. Unfortunately, this shift to focusing on services has created a skills gap, especially in the area of high value services, which requires people who are knowledgeable about business and information technology, as well as the human factors that go into a successful services operation. A new field called Services Science is beginning to emerge in academia.

Meanwhile, it is a big challenge how to play Chinese universities' advantage for national rejuvenation and prosperity when orienting economic globalizetion and the challenges of internationalization of higher education [1]. But now the education of graduate university has not yet broken through the traditional mode of teaching content which lacks of an organic integration and short of the experimental conditions of practice [2].

Faced with this challenge, SSDUT recently established an "IT Services Engineering and Management Institute," in order to strengthen engineering services related to scientific research work, and promote services related to the teaching of science. The Software School of Dalian University of Technology plans to promote this discipline on graduate students in September this year, at the same time, prepares to promote Information Service Engineering and Management Master of Engineering in professional teaching duties. This paper introduces the disciplines of the curriculum and training model situation of the Software School of Dalian University of Technology.

1 Curriculum for Information Service Engineering and Management

A new curriculum initiative in Services Science Management Engineering (SSME) is designed to prepare graduate students for careers in the emerging multi-disciplinary field of services sciences, engine- ering, and management. The new curriculum is needed because most students will work in a services economy, but their backgrounds in engineering, business, etc, will still be extremely relevant because of the ecosystem that includes services, technology and management. That is what SSME on campus will be preparing for students[3].

1.1 Training objective

The objective is to cultivate high-level inter-discipline talents with comprehensive capacity of the capability of computer application technology and service engineering, the theoretical knowledge of modern service science and engineering, the ability of modern management and network economics[4]. After training, basing on solid theoretical knowledge on software engineering and latest service engineering, our graduate students should be capable of software analysis, development and management with teamwork spirit and outstanding professionalism, as well as with capacities of innovative R & D and service management. The discipline focuses on strengthening the technical characteristics of information services technology based on the general direction of the computer application. The discipline will establish the pattern of personnel training so as to promote the characteristics of elite education[4].

Elite education[5] has its special position on the first goal of the training, that is, its goal is not to cultivate general technical experts in a certain area or industry, but to develop the industry leaders with a significant impact in a certain field. Cultivated elite talents were not referring to "the spirit of nobility" or the privileged class of society, nor certain rights and status symbol. Elite education in large has its role in the quality and the requirements of the elite[6]. It can cultivate outstanding engineering elite talents with practice. It helps to amplify SSDUT's reputation, and to enlarge the influence in enterprises. It does good to recruitment activities with social recognition. It also can urge students' interests in learning, resulting in the whole improvement of students' qualities in SSDUT.

Engineering education includes engineering practice teaching. Such idea is implemented on its teaching plan, put forward to a new type of curriculum teaching objective, combined with the concept of quality of work and content. A broad engineering practice education is the Polytechnic engineering integration of the humanities, social sciences and so on. Information Service Engineering and Management is a direction of vigorously developing modern services and the national information technology of the country. Information Service Engineering and Management will train the senior engineering and technical personnel with solid technical and engineering services of the basic knowledge and

practical ability.

1.2 Contents of SSME

Service Science Management Engineering (SSME)[7] is a newly created interdisciplinary approach based on the background of modern service industry, which combines disciplines of computer science, operations research, industrial engineering, business strategy, management sciences, social cognitive behavioral science and law together to develop the necessary skills for service-oriented economies. SSME's final objective is able to provide innovative services to produce new commercial values in response to variable demand. As shown in Fig.1, Service Innovation refers to innovations in different aspects such as demand, business, social organization and technology. As for our SSDUT, the key issue should be the technology innovation in terms of science and engineering.

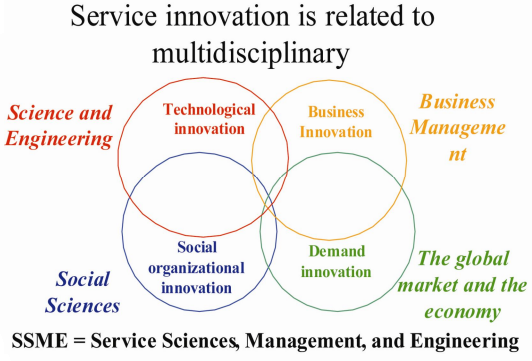

Fig.1 Service Sciences is interdisciplinary

1.3 Software talents' knowledge structure in service economy

In the modern service industry, the service sector employees need a large span of different field knowledge, and need comprehensive knowledge varies from busin- ess, management to technology and so on in Fig.2. While the focus of required knowledge and skills for students from different disciplines should be respectively different, and for our students in SSDUT should focus on the mastery of information service support technology and engineering. In the graduate's cultivation, basically we should guarantee their solid professional technology, and then expand their knowledge view in the field of management and business practices and acquaint themselves with the key knowledge points. Thus our graduated students can quickly search and access to the corresponding materials and information for the specific requirements in their career to reinforce their knowledge and improve themselves to feed the employers' needs, with the help of their acquired key knowledge point in the graduate phase.

It's not realistic to request the colleges and universities to supply their cultivated graduate students that can immediately become employers' required high-level talents. But it's possible and necessary for us to cultivate our students to master solid information service technology, and to gain the key knowledge points for SSME in their graduate study. So they can quickly makeup their insufficient knowledge or skills for their work, and easily become the required compound talents for the employers.

As for the graduates' cultivation, we should focus on the project and management teaching and practice basing on their graduate education.

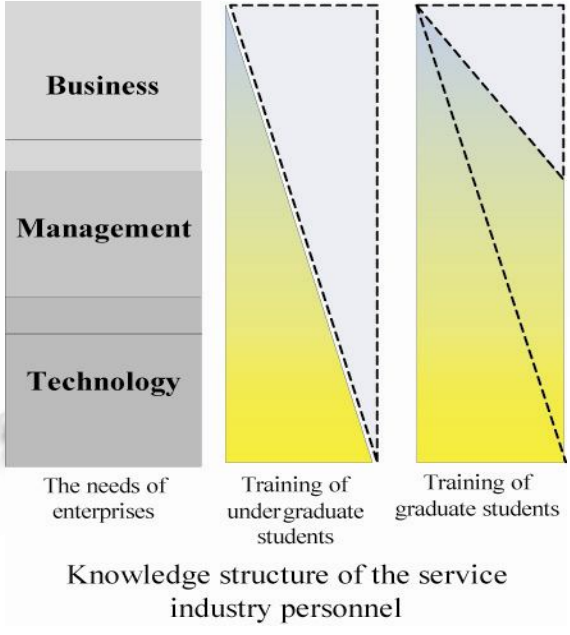

Fig.2 Knowledge structure in service economy

1.4 Curriculum content for SSME

Under the guidance of the training tactics for the graduate, "first to guarantee the solid technology, then to expand the knowledge field of management and business", our curriculum is set up as follows, technology aspect making up the largest part, followed by management aspect, as well as business aspect with the smallest proportion. Each course introduces knowledge points from different aspects of SSME.

So 9 new courses will be developed under the support of NSFC as is shown in Fig.3. <Introduction to Service Science and Technology> makes a overall introduction to the almost knowledge points related to SSME. <Formal Language and Automata>, <Artificial Intelligence> introduce the required fundamental knowledge of formal expression for the services' definition and expression in services' modeling and analysis. <SOA and Service Computation>, <Project Management Method and Practice> explain system construction and development management related to service system architecture. And the contents about management of services will be lectured in the course <Enterprise Resource Planning and Integration> and <Modern Enterprise Management and Innovation>. While the commercial value created in service innovation is introduced in <Introduction of E-commerce> and <Business Intelligence and Data Mining>. In summery, among all different aspects in SSME, service support technology and knowledge related to service system structure should be the learning focus for student from SSME.

2 Elite Engineering Education Cultivation Mode

Engineering disciplines evolved to meet the changing needs of society. Little engineering expertise has been applied to the design and operation of service enterprises/ organizations. However, it is clear that globalization is affecting engineering education. Univers- ities in China need to cultivate thousands of software talents to meet the requirement of the rapidly developing market[8]. It is a common challenge for them to quickly accumulate enough experience in both new technologies and efficient software engineering methodology to train their students[9].

2.1 Positioning for information service engineering and management talents

Since the objective for Information Service Engineering and Management is to cultivate compound talents with comprehensive knowledge of business, management and technology, so our students should not only have well-developed technical skills, but also should be capable of service and technology management, so they can become high-level inter-discipline talents after enterprises' practices in the future.

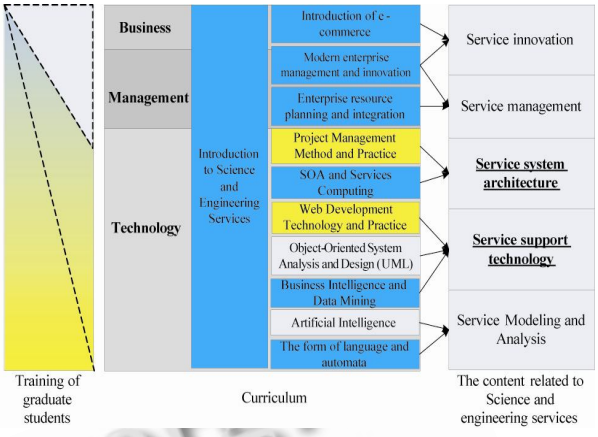

Fig.3　Curriculum content for SSME

2.2 Graduate constitute information service engineering and management

Information Service Engineering and Management discipline will be launched from our Master of Science in engineering program. Considering the fact that Informa- tion Service Engineering and Management covers multi- field knowledge, and the cultivation position that as high- level compound talents, so we just choose some of the top students with high comprehensive qualities to promote the elite cultivation. It's planned to choose only 30 students to cultivate, aiming to become West Point in China's software sector

2.3 Teaching mode for information service engineering and management

With the orientation of project practice, focusing on the main line of students, elite engineering education is to be promoted through team development practice with whole interaction in the fixed classrooms.

In the first year of graduate study, students learn technical

Professional courses just as they do in the normal classes in Fig.4. But in the second year, basing on <Web Development Technology and Practice> and <Project Management Method and Practice>, they will be divided into teams to develop practical systems in terms of enterprise information integration and Web2.0, which give the students chances to touch the actual problems in practice and inspire them to learn their interested knowledge independently, and at the same time teachers act as couch to teach and guide students. In this progress, students is allowed to select other relating selective courses, since they can search the answers for the encountered problems in project development in the course learning, and they can take the knowledge gained

in the course into project practice, it forms a virtuous cycle for knowledge acquisition.

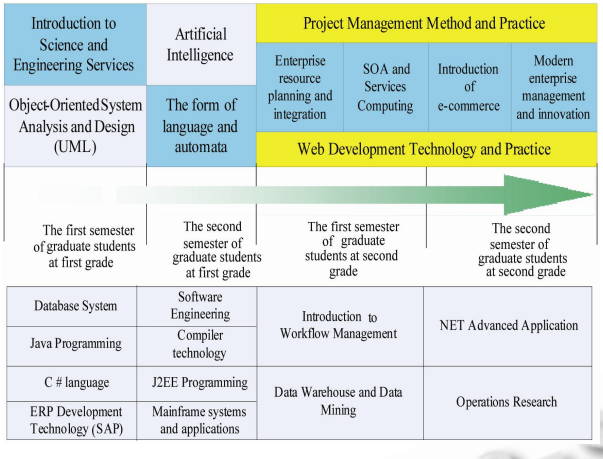

Fig.4 Teaching mode for information service engineering and management

A sound technical foundation with a disciplinary focus and the flexibility to pursue professional interests in areas outside of engineering that could lead to a wide variety of career paths. In-depth technical preparation in multidisciplinary or emerging engineering fields could serve as a springboard to professional degree programs such as the Master of Engineering. The knowledge, skills, and attitudes are needed to facilitate a lifetime of professional success. These attributes would include excellent communication skills, an understanding of ethical and global issues, and a commitment to life-long learning and professional development, the ability to function on multidisciplinary teams that extend the traditional boundaries of engineering. Graduates will be able to design and improve systems and processes that provide services by applying a system perspective coupled with a thorough understanding of the customer [10].

3 Conclusion

With the purpose of providing innovative services to produce new commercial values in respond to variable social demand, the planning new discipline SSME aims to cultivate high-level compound talents with comprehensive capability of technology, business and management. By introducing a new type of curriculum teaching model and bringing analytical rigor to key issues such as services efficiency and services innovation, this new discipline will play an important role in the new field called Services Science and make increasing contribution to the nation's rejuvenation and prosperity.

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