Summer 6-19-2015

An Innovative Practice System of Information Management and Information System Specialty Based on Actual Projects

Jianghua Dai
School of Management, Wuhan University of Science and Technology, Wuhan, 430081, China, wustdjh@126.com

Ruijun Zhang
School of Management, Wuhan University of Science and Technology, Wuhan, 430081, China

Yanhua Ren
School of Management, Wuhan University of Science and Technology, Wuhan, 430081, China

ZhiQing Zhang
School of Management, Wuhan University of Science and Technology, Wuhan, 430081, China

Zhonghua Yang
School of Management, Wuhan University of Science and Technology, Wuhan, 430081, China

An Innovative Practice System of Information Management and Information System Specialty Based on Actual Projects

Jianghua Dai[1*], *Ruijun Zhang*[1], *Yanhua Ren*[1], *ZhiQing Zhang*[1], *Zhonghua Yang*[1]
[1]School of Management, Wuhan University of Science and Technology, Wuhan, 430081, China

Abstract: The practical teaching is the key link of training the students' practical and creative ability in major of information management and information system. On the basis of analyzing the training goal and social demand of the major, an innovative practice system based on actual projects is constructed to solve the main problems exist in the practical teaching, by combining with the successful experience of the practical teaching innovation in Wuhan University of Science and Technology. The system provides a good practical teaching environment and an innovation practical platform for the cultivation of high quality innovation talents. To study in actual projects will accumulate the students' project experience, cultivate their innovation consciousness and promote their competition ability.

Keywords: actual projects, information management and information system, practical teaching

1. INTRODUCTION

With the rapid development in information technology, and information-oriented management in corporations and organizations, the societal demand for professionals in information management has been increasing continuously, as well as for the knowledge structure, capability and quality of the professional in information management and information system (abbreviated as information management) [1-3]. Information management is an interdisciplinary subject with high applicability and innovation. Traditional practical teaching system has its deficiency in cultivating students' creativity, and therefore fails to meet the need of educating creative talents in a new era [4-5]. The purpose of the study is to introduce a practical innovation system based on actual projects. By analyzing the goal of producing professionals in information system and the societal demand, the authors start with investigating the key issues in practical teaching, and then generalize successful experience of practical teaching reform in information management in Wuhan University of Science and Technology. With the goal of producing professionals in information management with practical knowledge and innovation needed by enterprise and public administration agencies, the proposed system is able to improve students' all-around quality, practical knowledge and creativity with a non-traditional practical teaching model.

2. CONTEXT OF INNOVATION

2.1 The goal of information management education

In 1998, information management became a new discipline emerged from five disciplines by the Ministry of Education, namely technology information, economic information management, management information systems, and information. The List of Undergraduate Programs and Majors by the Ministry of Education provides a defined goal of information management education, which is to produce highly specialized talents in information management, and information system analysis, design and application, management and evaluation. The graduates will be equipped with up-to-date knowledge in management theories, computer science and technology and practical skills. With their systematic knowledge and capability in information system analysis and design, and information management, graduates will be able to work at administrative units across all levels, corporations and enterprises, financial agencies, and research institutes [6-8].

* Corresponding author. Email: wustdjh@126.com(Jianghua Dai)

2.2 Analysis of social demand

A research on the demand for human resources in information management done by Chinese Higher Education Information System Curriculum group shows that with regards to program focus, 38% of the surveyed enterprises consider the computer applicability as important, 32% lay stress on strong creativity; in terms of curriculum, 60% believe that curriculum related to computer science are critical, and 93% regard internship very important or fairly important [9]. There is a societal demand for highly specialized talents who are equipped with not only the knowledge of management theories and information technology, but professional knowledge and practical skills. Those talents will be capable of analyzing, designing, applying, managing and evaluating the organizational information system, as well as developing and utilizing information resources. In the information era of increasing competition, only creative information management professionals with strong practical skills will be able to adapt to the societal development.

2.3 The main problems in the practical teaching

Traditional practical teaching system revolves around a theme "in-class experiment-> Cognitive Exercitation-> Production Practice-> Curriculum Design-> Graduation Field Work-> Graduation Design", which lacks of organic links across individual elements, and fails to reflect the characteristics of the interdisciplinary subject. The critical issues are as follows:

- Practical teaching is affiliated to theory teaching. With a lack of systematic research and design, current practical teaching fails to emphasize practical skills, with low pertinence, applicability, diversity and individual-orientation.
- The curriculum is not up-to-date. With the majority of the experiment conducted for show-case and theory proof, the content is far from comprehensive, creative, and is lack of depth, width and design. The curriculum fails to inspire students to innovate and design, and therefore students are lack of enthusiasm.
- The majority of the practice for students is imaginary projects with little applicability and personal features, such as student grade management system and dormitory management system, which do not reflect the real society and organizational situation. Students often times are lost when facing real problems in enterprise information management.

3. AN INNOVATIVE PRACTICE SYSTEM BASED ON ACTUAL PROJECTS

3.1 Thoughts about practical teaching system reform

The main goal of practical teaching in information management is to cultivate students' practical skills of operating and utilizing modern information appliances, and their creativity in applying knowledge to solve information management problems [10-11]. With the purpose of meeting the demand for an information-oriented society and program development, a practical teaching innovation system has been created in our university. The establishment of the new system is based on the long history of engineering programs and strengths in management programs in the University, its academic performance and program design. With deepened reform and innovation in practical teaching, and the combination of information technology and management, this reform is to realize a transition to cultivate students' creative thinking and innovation based on evidence-based knowledge, with the characteristics of comprehensiveness, design-orientation and intensive exploration.

Based on constructivism, the actual project-oriented innovation system is a transition from traditional pedagogy to multi-dimensional, interactive model emphasizing problem solving skills and tackling tasks, by means of working on actual projects. Students become the main entity of the learning process, whose are active and independent, whereas the faculty provides instruction in accordance with individual students' practical skills to encourage their all-around development. Students will be able to understand the professional skills required by corporations and job market by working on real projects [12]. This approach enables students to practice their

work methods and professional skills, as a means to improve their cognitive skills. Solving real problems will expand students' knowledge, encourage them to self-study, and cultivate their creativity and practical skills. The practical innovation system based on actual projects is shown in Figure 1.

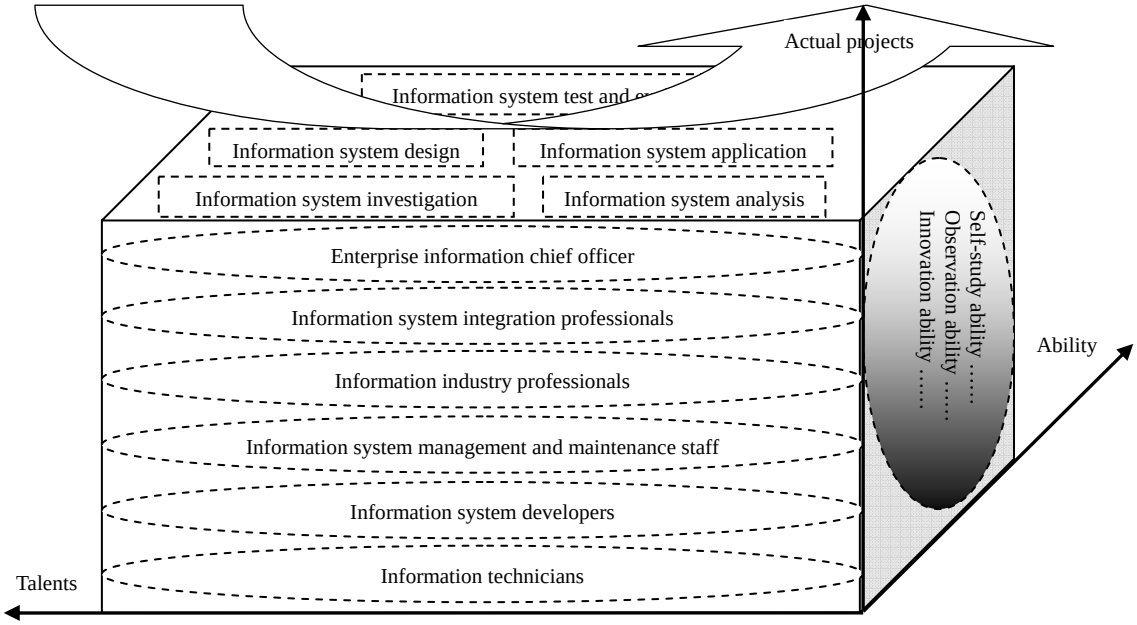

Figure 1. The practical innovation system based on actual projects

3.2 The main content of the practical innovation system

3.2.1 Career-Oriented

The majority graduates majoring in information management choose to work for enterprise and public service for information system establishment, management, maintenance and information resource management, etc. National Professional Criteria for Enterprise Chief Information Officer defines a Chief Information Officer as interdisciplinary talents who engage in enterprise informatization, in information technology application, and in information system development, maintenance, management, and information resource development and utility. The main functions of this profession are information-oriented management, information system development, information network development, information system maintenance and operation, as well as information resource development and utility. The definition clearly identifies the career outlook of graduates majoring in information management. From the perspective of positions, talents need for information development are information technicians, information system developers, information system management and maintenance staff, information industry professionals, information system integration professionals, and enterprise information chief officer [13]. By emphasizing their practical skills in the six main functions, students' information system analytical and development skills will be enhanced, as well as their skills in information system development, operation, management and maintenance. The improvement of those skills will lay a solid foundation for students' career development, and to adjust the needs of information development and management of enterprise.

3.2.2 Actual projects as the theme

Actual projects are practical teaching activity revolving around the real case of projects development in enterprise and public services [14]. Students form as groups to engage in the whole process from information system analysis to development and application. Under the faculty's guidance, students fulfill the projects requirement by team work, information research, seminar, and technology exchange.

- Information system investigation. System investigation is an important step in the information system

development. Under the faculty's guidance, students conduct field research at enterprise or public service agencies to understand the customer's demand for the function and quality of the system, its reliability, safety, resource utility, development schedule and interface, etc. After the analysis of customer demand, students will finish a feasibility study report in alignment with the national regulation on software development.

- Information system analysis. Based on the feasibility study and preliminary market investigation, students will identify the organizational structure and develop an organizational chart; analyze the business process flow and create a flow chart; analyze the data flow, draw a data flow chart, E-R chart and create a data dictionary; evaluate the relationship between the function and data, draw a U/C matrix and categorize sub-systems; and eventually come up with a system analysis report.
- Information system design. This step consists of system overall design and detailed design. The overall design includes: determining the detailed application scheme and its hardware structure model; categorizing the functions of each information system module, determining the software structure, creating a system hierarchical structure diagram, describing the interface among modules, designing a database, and identifying the physical structure of the database with data access description; and creating a test plan with test cases. The detailed design includes the code design, input/output design, user-interface design, process design for each categorized model, and creating data process flow chart for each module and input/output interface graph. The last step is to compose a system design instruction.
- Information system application. Information system application is to develop an application plan based on the system design instruction. With the use of UML diagrams and approaches, such as use case diagram, activity diagram, sequence diagram and profile diagram, students will identify appropriate software development tools (such as JAVA, VB, PowerBuilder, Delphi) and database management system (such as MS SOL Server, Oracle) to realize the information system code, to commission each module, and to compose a system operation instruction.
- Information system test and evaluation. Prior to submitting the designed system, students are required to test the system with the customer, based on the test case on the test plan. What will be tested are the function of the system, the completeness, accuracy, and safety of the data, as well as the reliability and adaptability of the system, etc. Students will compose a system test report, conduct self-evaluation of the system based on the test report, and provide the completed evaluation index.

3.2.3 The cultivation of students' ability as the core

Including real cases in the actual projects has significantly encouraged students' interest in learning and desire for knowledge. Under the faculty's guidance, students will be able to understand the work environment in enterprise, the job responsibility, the required skills and knowledge and professional ability, and positions in this field, by engaging in the entire process of information system development projects [15]. Students will be able to enhance their understanding of the basic theories and fundamental knowledge about information system analysis and design, and to solve real problems in informatization of the enterprise with their knowledge. The entire learning process is geared by the real case, which enables students to be actively engaged in the process, rather than as a passive knowledge receiver. This actual practice teaching system embraces openness and innovation, which overcomes the weakness of traditional teaching by imaginary projects. Students then will have the opportunity to take initiative, to innovate and to master the work flow, methodology and skills of information system analysis and design. Students' capability to self-study, to observe, to express themselves, to lead, to communicate, to practice, to research, to innovate and to work as a team, will then be enhanced, which will ultimately enhance their real experience, professional quality needed to compete in the job market.

3.2.4 Platform support

The practical teaching innovation platform consists of high quality faculty, high level scientific research

projects, and high quality hardware and software environment, which lays a solid foundation and assurance for educating students with innovation and practical skills. High quality faculty is the prerequisite and key factor in guiding students' practical innovation activities; whereas high level research projects provide students with access to cutting edge theories, technologies and information, which broadens their vision, and enlightens their creative thinking. A fine hardware and software facilities in the experimental center provide students with adequate material support, with an open-access system resources and network resources expanding the virtual teaching space, and facilitating students' self-study and interaction with the faculty. The University also creates an innovation fund to attract more students to engage in innovation by providing those credits for innovation. Moreover, by providing a variety of on campus activities such as seminar and workshops, students' academic thinking will be encouraged, and an environment in favor of science and research will be created.

4. THE APPLICATION OF THE PRACTICAL INNOVATION SYSTEM

The faculty from the information management department of our university has knowledge and background of computer science and IT, who apply for several research projects across all levels of government agencies annually. By categorizing the research topics into several projects, the experimental center serves as the research base to conduct open research, which will enable students to take initiatives and enhance their innovation potential.

Take the project of the embankment information system of the Yangtze River for instance. Under the faculty's guidance, students were grouped as several units to finish the analysis, design, application, test and evaluation of the information system step by step, one stage after another. The purpose was to enable students to understand the job responsibility and the approach for a complete information system project.

By gathering, storing, managing and processing the original geographic information through the system, students were able to provide evidence to support the selection of embankment design, flood prevention and emergency solving, as a means to improve the information-base geological prospecting data management and processing for the Yangtze River embankment project. During the information system investigation, students investigated customers of all levels' requirements for the overall function of the system, and the specific requirement for each sub-system by interview, survey, and document analysis. It was a process to improve students' ability to conduct research, and to gather and process information. During information system analysis, students analyzed the system's current business and data to establish a concrete model, virtual model and data model for the system. This process was to cultivate students' analytical skills and problem solving skills. During the information system design, application, test and evaluation, the system adopted a dual model structure with C/S and B/S, where C/S responsible for database input/output, search, report process, authority management, data printing, data exporting, distribution and combination, etc.; whereas the B/S responsible for information search, authority management, geological report download, etc. By designing the structure, process flow, interface, and input/output of the information system, students realized functions of the construction information import, editing, deleting, map browsing, data search, statistical analysis, statement export, printing, and database backup and recovery, etc. They also ensured the system operation stability, the simple operation, the user-friendly interface, the fast and convenient data search, and the readable and manageable data, as shown in Figure 2. The purpose of the process was to cultivate students' practical skills, creativity and exploration, and ultimately to improve their practical skills to design and operate an information system.

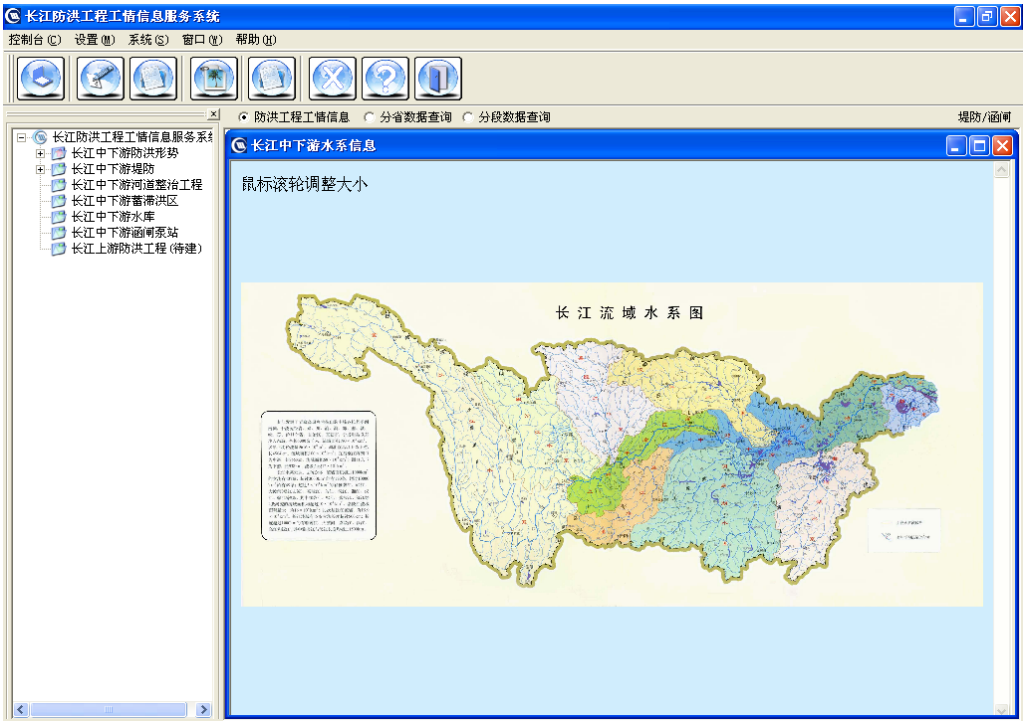

Figure 2. The main interface for embankment information system of the Yangtze River

Through the project, students have increasingly formed an accurate idea of information system design, digested theories and knowledge of information system analysis and design, deeply understood approaches for information gathering, information system analysis, design process, code composition and debug, system assembly, management and maintenance. Their design and practical skills, and creativity have been effectively trained. Upon the completion of the project, the corporation conducted tests based on the technical and quality index, and evaluated student' overall performance based on their attitude, project quality and personal ability. The evaluation focused on how the students solved real problems with their knowledge, rather than how much knowledge the student learned. This model fundamentally changed the traditional exam-oriented pedagogy. It enabled students to design an information system in alignment with the development flow and code, to apply strict management during the process, and eventually encouraged students to participate in actual projects.

During the project, students assume different roles in the information system development based on their interest and strengths. For instance, students who are good at communication, observation or analysis can work as the system analyst, in charge of analyzing the customer's need of the information system. Students who excel at drawing can work as the system designer to be responsible for the software interface design. Male students who are comparatively strong at programming work as the system programmer; whereas those female students who are detail-oriented work as testing staff to test the system. The faculty's function is project manager to provide guidance and coordination. Moreover, students who engage in several projects can assume different roles to cater for their needs, and to encourage the overall development of their ability.

5. FUNCTIONS OF THE PRACTICAL INNOVATION SYSTEM

The practical innovation system based on actual projects is closely oriented to the information management program, which emphasizes on students' practical skills and professional ability. Each project is a complete process including information system analysis, design and development, and therefore, students receive training throughout the whole process, which enables them to better understand each step of system development, and

improves their analytical skills, the ability to design and practical skills.

Among the student-participated research projects, the customers included the Ministry of Water Reservation, the Urban Management Bureau of Wuhan City, Wuhan Genie Scale Manufacturing Co., Ltd., Wuhan ID Tech Development Co., Ltd., Gezhou Dam Cement Factory, etc., who all gave satisfactory comments to the students' performance.

Two of the projects, the embankment project of Yangtze River information management system and the national mountain torrents disaster prevention planning information system, won the best software design award by Ministry of Water Reservation, and high evaluation ratings from the leaders of the Ministry and Yangtze River Water Resources Committee. Take another project, the Urban Management Bureau of Wuhan City Waste Ground Self-Monitoring Counting System, the faculty led students to conduct several field studies. By extensive research and document analysis, a new data acquisition system based on time slot and circular queue was proposed, which tackled the key issue of the project and the system application. This system is leading the way in the home self-monitoring management system field.

6. CONCLUSIONS

The individual needs of the enterprise information-based management system projects provide students with a real-world opportunity to develop their creativity. Through actual projects which combine practical teaching with enterprise business, students' sense of innovation has been significantly encouraged, their creativity, practical skills, professional quality and team work spirit, have also been cultivated and practiced. The graduates of the information management program in the Wuhan University of Science and Technology have become competitive in furthering their education and in the job market.

ACKNOWLEDGEMENT

This research is supported by the special task project of Humanities and Social Sciences Research-Engineering science and technology talent training research, under Grant 13JDGC009 from the State Education Ministry, and by High School Education Research Program, under Grant 2013235, 2012220 and 2014233 from Hubei Province, China.

REFERENCES

[1] Ruijun Zhang, Jiajun Ruan, Ling Qin. (2010).Study on training mode of information management and information system major in the perspective of students. China Management Informatization, 13(20): 74-77(in Chinese)

[2] Xinhua News Agency. (2010).The national medium-term and long-term plan for human resource development. (2010-2020).http://news.xinhuanet.com/pocitics/2010-061061C-12188202.htm

[3] Xinhua News Agency. (2010).The national medium-term and long-term plan for education reform and development. (2010-2020).http:// www.gov.cn/jrzg/2010-071291/content_1667143.htm

[4] Lin Jing. (2012). Reform of the two-side teaching mode in information management and information system discipline. Proceedings of ICCI 2012. New York: Springer, 603-608

[5] Luo Siqing, Liang Ke, Wang Jing. (2013).The curricula building for information management and information system major. Proceedings of ICCS 2013. Heidelberg: Springer, 399-404

[6] Buckland M. (2012). What kind of science can information science be? Journal of the American Society for Information Science and Technology, 63(1): 1-7

[7] Hawkins D T, Larson S E, Caton B Q. (2003).Information science abstracts: Tracking the literature of information science. Part 2: A new taxonomy for information science. Journal of the American Society for Information Science and Technology, 54(8): 771-783

[8] Bharosa N, Lee J, Janssen M. (2009).A case study of information flows in multi-agency emergency response exercises. The Proceedings of the 10th International Digital Government Research Conference. Puebla: Digital Government Research Center, 277-282

[9] Jipeng Jing, Haitao Zhang. (2006).Enterprise Informatization Planning & Management. Beijing: China Machine Press, 178-193 (In Chinese)

[10] Cassel L, Reis R A. (2003).Informatics Curricula and Teaching Methods. Boston: Kluwer Academic Publishers,69-78

[11] Harder J T, Harper J S. (2003).A stage model for professional development: Assessing students and curriculum in an MIS program. Review of Business Information System, 38(7): 83-92

[12] Zongjian Tang. (2010).Practice and research on self project-driving teaching mode. Experimental Technology and Management, 27(7): 133-135(in Chinese)

[13] Enns H, Huff S, Golden B R. (2003).CIO influence behaviors: The impact of technical background. Information & Management, 40(5): 467-485

[14] Ruijun Zhang, Ting Hu, Jie Lu. (2014).An IT talent cultivation mode driven by actual projects—based on mixed research of questionnaires and interviews. World Transactions on Engineering and Technology Education, 12(1): 21-26

[15] Anderson L W, Krathwohl D R, Airasian P W. (2001).A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. New York: Longman, 41-46