The cultivating of information literacy and information technology in a classification talent training system

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ABSTRACT: The development of the network economy is a main feature of the current economy. It transforms behaviour and makes new demands for training, especially of university students. Noting the characteristics of the network economy and the demand for information literacy, expounded in this article are the connotations of information literacy, viewed from three aspects. Meanwhile, aimed at cultivating technical and business talent, a teaching model is proposed involving the classification of training systems, which includes the purpose for training, a multi-level teaching mode, modular curriculum and contextualised practical teaching.

INTRODUCTION

With the development of the private economy, the regional features of the Chinese economy become more obvious [1]. For example, Zhejiang Province has experienced rapid economic development, has an export-oriented economy, small- and medium-sized enterprises and a developed market for professionals. These are the characteristics of a network economy. According to statistics, there are more than 3,000 industry Web sites in China and Zhejiang Province accounts for about 21% of the total. Electronic commerce Web sites account for about two-thirds. Nearly 60% of the enterprises develop electronic commerce. More than half of the small- and medium-sized enterprises establish an enterprise Web site and more than 20% of them carry out on-line transactions. Zhejiang has become the leader in the development of the network economy.

In industry and enterprise, there are three classes of professional. The first is technical, with knowledge of computers, information and networks. These professionals include network engineers, Web designers and programmers. The second class is business, which engages in electronic business services and promotion, e.g. information collection, on-line customer service, network marketing and media promotion. The third class is management who are in charge of electronic commerce (EC) operations, product planning, data statistics and analysis, etc. No matter what kind of job, the demand for professionals with information technology skills is urgent.

PROBLEMS AND DISADVANTAGES

The characteristics of the network economy directly affect the way in which people obtain knowledge and they impact on people's learning and cognitive behaviour. This, in turn, leads to changes in training ideas and higher education. At present, several problems with university teaching are as follows:

- The relationship between theory and practice is not close enough. It is the root cause of graduates lacking practical experience and professional competitiveness. Because of funding limitations, the limited number of internships and jobs available in enterprises and other practical considerations, students only do simple laboratory experiments and lack learning opportunities of actual practice during school learning.
- The preparation of students to become professionals is inadequate. Due to a lack of understanding of social demands, some universities' professional development of students is not clear or appropriate. Business students with an emphasis on information technology are not technologically equal to students who major in computing or software engineering. At the same time, they lack the systematic theoretical knowledge and practical ability of students who major in enterprise management, marketing, trade, etc.
- The teaching lags behind the developments in society. The network economy is changing, from data sharing based on the Internet, to mobile business using wires and wireless networks. Therefore, the teaching system, including

course content, textbook selection, case study selection and practical work, needs a fundamental update to reflect the new trends and direction of technology.

- Teachers' knowledge of new technologies and trends should be improved. Most teachers teach theory and seldom go into industry or enterprise. So, their lack of understanding and acceptance of new technologies and trends negatively influences the quality of their teaching.
- Students need better direction and guidance about future employment. During their course, students do not obtain systematic guidance regarding their futures. Especially for students who want to become self-employed, though they may have innovative ideas, they still need help from the teachers to complete their business plans and enhance their innovative abilities.

In conclusion, the university not only needs to reform the education system, it also needs to cultivate students' information literacy [2].

THE CONNOTATION OF INFORMATION LITERACY

As reported by Zheng, in 1989, the American Library Association (ALA) defined information literacy as the ability to determine when there is a need for information and, then, how to obtain, evaluate and effectively use the information. Information literacy was originally applied to libraries and library-related skills [3]. With the penetration of information technology into many fields of society and, especially, with the development of the network economy, information literacy has become a necessary skill. Information literacy has three levels.

- Technical level. Information technology requirements include the basic knowledge and skills of computer science and information management. From the perspective of professional training it is important to improve the ability to deal with a specific field by integrating the professional knowledge of computer science, management information systems and the corresponding software.
- Knowledge level. The network economy requires knowledge of economics, management and information. Therefore, it is especially important to be able to make connections between different professional knowledge areas in solving practical problems.
- Consciousness level. Developing consciousness has two aspects. First is to develop the student's ability of life-long learning and capacity for independent innovation. Second is strengthening the students' awareness of the ethics of using information in a complex economic environment. Information should be distributed and used reasonably and legally, while protecting the interests of direct users and others.

The information literacy requirements of business major students pay more attention to the first two levels, while technical major students concentrate on the third level. For example, business major students with good information literacy should possess the following skills: determining information needs including the scope, efficiently obtaining and evaluating the information, integrating the information with existing knowledge, using information for analysis, forecasting and decision making and understanding the relevant legal position [4]. In the network economy, skills are important for the evaluation of information and for the software for analysing and mining the information, and so on. Information literacy is no longer the special skill of technical fields, but has become a necessary skill in all fields.

CASE STUDY OF THE CLASSIFICATION OF A TRAINING SYSTEM

The Purpose of Training

Through the above analysis, the required talent is mainly divided into two classes, viz. technical and business. To support the rapid progress of the regional network economy, the training system requires a redeveloped curriculum and updated teaching methods with a strong practical component. The training system should be produced by means of university-industry collaboration to cultivate talent of high quality, strong ability and innovative ability. The framework of this system is shown in Figure 1.
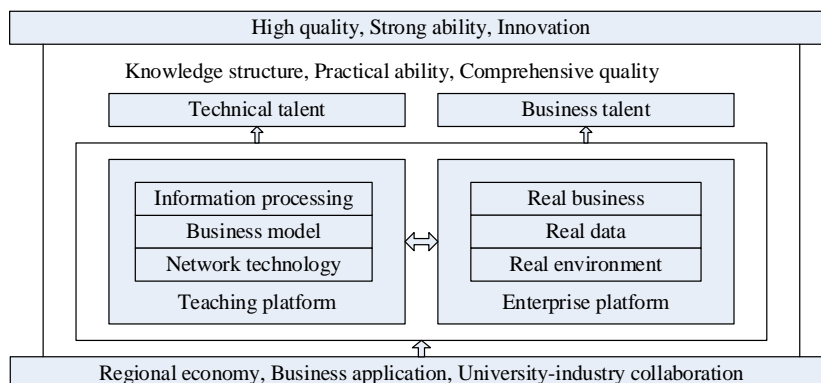

Figure 1: Framework for the training system.

Technical students mainly take computer and information majors. The purpose of the training is to cultivate knowledge of computer hardware and software and Internet programming. The technology can be divided into three levels, viz. system operation and maintenance, system analysis and development, system planning and design. The knowledge is mainly composed of computer science and information technology, including developing and designing systems for specific applications. These students have some understanding of business, including planning and management, market and customer behaviour and electronic commerce. Their future job includes research, application development and maintenance.

Business students mainly take business administration, finance, economics or accounting majors. The purpose of the training is to cultivate the ability to identify various information systems to support business activities for specific industries. The knowledge required is management and business theory. The priority is to become familiar with, and master, various business activities in the network economy and to co-operate with business and technical professionals to determine new business management concepts and the information systems needed to support them. In the future, they may be engaged in such fields as business management, applications and services, network marketing, international trade and business services.

Multi-level Teaching

The teaching has three levels:

- Basic information technology: the main purpose of this level is to give students the basic computer skills. It develops students to be able to use computers, networks and other information technologies to collect, edit, transform and transport all kinds of information. The course content for this level includes the basic knowledge of operating systems, office automation software, computer networks and database applications. These courses develop the students' knowledge to help them meet the requirements of the information society.
- Professional information processing: the main purpose of this level is to give students the skills required by specific fields. Students are, thus, able to solve practical problems using information technology and software applications. In addition, students' interests in independent research should be stimulated. The course content should include the latest information processing technology. The courses are to help students understand how information is organised, managed and processed. Due to the development of the network economy, various majors including financial, economic, computer science and information engineering increasingly are interlinked. Thus, the course content should reflect this, e.g. the links between the network economy, e-government and e-business.
- Applied information technology: the main purpose of this level is to develop students' comprehensive skills. It includes the ability to analyse and summarise, to solve problems using analysis tools, independent research and innovation in real environments. Course content at this level should recognise students' characteristics and personalised development. Personal knowledge management (PKM) is a new kind of knowledge management that can help people enhance their information literacy, improve their professional knowledge and lay a solid foundation to realise personal values for sustainable development [5]. The tools of PKM can help to store and organise personal knowledge and share this with others. The networked PKM tools support automatic coding and classification indexing, automatic searching and filtering. By making good use of these tools, students can manage multidisciplinary knowledge according to their professional interest.

Modular Curriculum

The technical curriculum adopts the format of compulsory and elective courses, and gives priority to research and development courses based on information technology. It contains three stages, i.e. basic course, applied course and practical course. These courses will cultivate students' abilities in the three technology levels. In addition to the technical courses, the teaching of basic information system theory should be carried out at the same time. The courses include Introduction to Electronic Commerce (EC), Technological Frontier of EC, Information Management, EC and the Law, EC Technology and Society. Also, students can choose one or more business courses based upon their career and development plans. The business course options are drawn from the courses offered by other majors. The technical curriculum is shown in Figure 2.
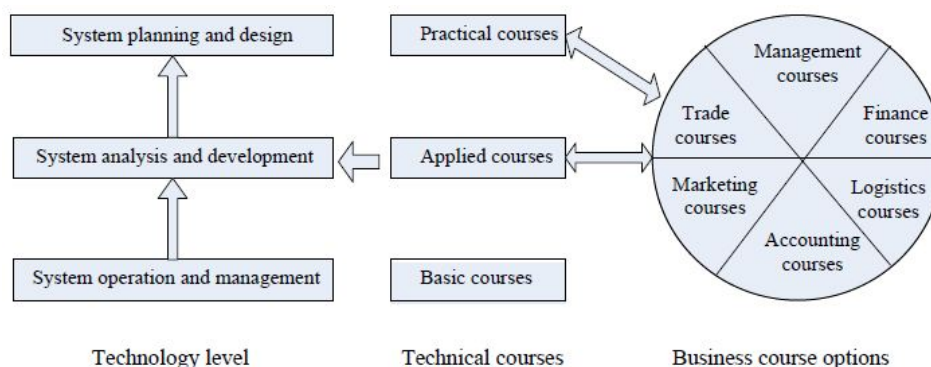

Figure 2: The technical curriculum.

The business curriculum gives priority to the application of information technology to business activities and business management. In this curriculum, the technical courses develop the student's information literacy. Through the teaching of computer applications, students should understand how to organise, manage and process information and how to design and manage information systems. Some technical courses, such as Databases, MIS, could be compulsory, while courses, such as Software Kit and Application Systems, could be electives. The business courses should be more comprehensive and more professional. Through the business curriculum, business students should master the basic methods of on-line business in a specific field. The business curriculum is shown in Figure 3.
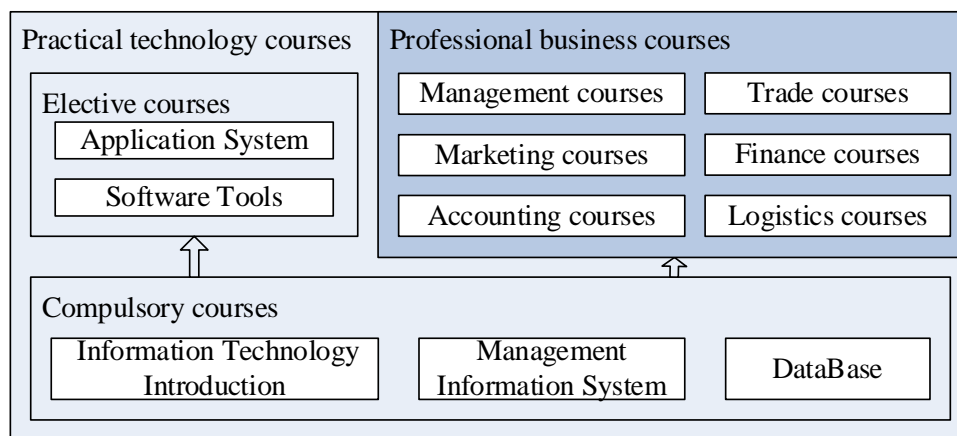

Figure 3: The business curriculum.

Contextualised Practical Teaching

A contextualised practical teaching system should integrate and apply various multimedia resources available over the computer network, such as audio and visual teaching materials, courseware and network-based courses. This can increase the utilisation of resources and, meanwhile, guide the students to form the habit of using teaching resources delivered using information technology. Also, integration of internal business teaching resources with information technology resources can allow the students have good contact with all kinds of information and tools in various network environments.

Contextualised practical teaching includes two parts, i.e. assisted practical teaching and independent practical teaching. The assisted practical teaching curriculum includes the practical content, timetable, practical examination and other specific content. The independent practical teaching can include all kinds of practical activities, including application development, open experiments and independent research, which are now expanded upon.

- Application development lets the students participate in the analysis and design of an information system. Students are organised into project groups to solve an application problem. They plan the project and analyse and design the system. They produce a detailed requirements for proposal (RFP) document and a system design. The development of information technology products involves systems engineering and, in order to achieve a more ideal result, business students may co-operate with computer science or information engineering students. Students play different roles as they might, if involved in development of an application in an enterprise.
- Open experiments involve students independently using their spare time in study and research [6]. Open experiments improve, expand and enrich practical teaching. An open experiment could be a verification, a design or be a comprehensive or innovative experiment. The former three help students consolidate in-class knowledge. Also, students can design the content of the experiment according to their interests.
- Independent research involves the extension of learning from the introductory teaching. It is an extension of ability at the three levels of the multi-level teaching. Use of resources should be made of government, industry organisations and research institutions, to undertake scientific research [7]. This will improve the student's practical ability and strengthen theoretical understanding.

Teachers must participate in the students' learning and practical activities; they should give correct reviews and heuristic guidance to help students sum-up and learn from experience. Teachers should make full use of various teaching methods, such as simulations, teaching games, contextualised learning, virtual laboratories, collaborative laboratories, and network teaching to strengthen students' information consciousness and to cultivate their ability for life-long learning [8].

REFORM EFFECT

This training system gradually has been implemented in some majors at Zhejiang Gongshang University since 2006. Some of the majors are shown in Table 1 and Table 2.

Table 1: Some courses for business students.

Major	Elective courses (two or more)	Compulsory courses
Financial Management	Accounting Information System	Information Technology Introduction
	ERP Software	
	Sandbox Simulation of ERP	Management Information Systems
International Trade	International Electronic Commerce	Databases
	International Logistics	
	Simulation Experiment of International Trade	

Table 2: Some courses for technical students.

Major	Elective courses (from the business courses)	Compulsory courses	
Electronic Commerce (technical)	Network Economy	Basic courses	Computer ABCs Databases Data Structures
	Business and Logistics		
	International Trade	Applied courses	Web Design Information Security Computer Networks
Information System	Enterprise Management		
	Trade Case Study	Technical courses	OOP Middleware
	Production and Operations Management		

For example, these courses allow financial management students to use software packages to produce a financial data analysis report. Accountancy students can use an information system to design personal financial tools. International trade students can use simulation software to simulate business negotiations. Meanwhile, the business courses in EC and Information Management can help students understand the business processes more deeply.

From 2009 to 2011, the employment rate had shown significant growth. Influenced by supply and demand, there was a small decline in 2012, but the overall situation is still good. The employment rate for the four majors over the past four years is shown in Table 3 and Figure 4.

Table 3: The employment rate for four majors over the past four years (2009-2012).

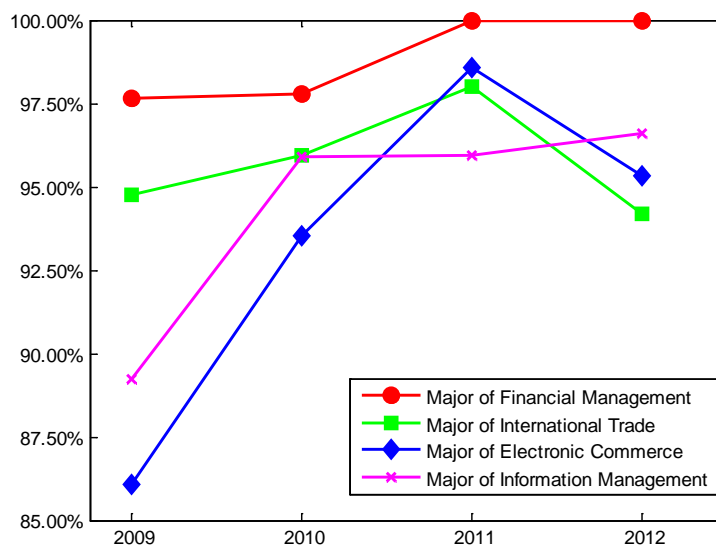| Classification	Major	2009 (before reform)	2010 (after reform)	2011	2012
Business	Financial Management	97.64%	97.80%	100%	100%
	International Trade	94.77%	95.93%	97.99%	94.17%
Technical	Electronic Commerce	86.08%	93.55%	98.57%	95.31%
	Information Management	89.22%	95.88%	95.96%	96.59%

Figure 4: The employment rate for four majors over the past four years (2009-2012).

CONCLUSIONS

The training systems must adapt to the requirements of the new network economy. Information technology education needs to improve the students' ability to master and, then, use information technology to solve problems and strengthen students' competitiveness. The reform of teaching information technology incorporating field knowledge is a long-term task. It is required to meet the needs of the developing network economy and, hence, is a necessity for the development of higher education. Universities should take a more active role in the exploration and promotion of these reforms to improve students' qualities in information technology.

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