The cultivation of application talent in the *Information Management and Information System* major by long-term university-enterprise cooperation

Shuxia Liu, Jinzhu Hou, Enfeng Liu, Qinjuan Jin & Haibin Liu

Hebei Normal University of Science and Technology
Qinhuangdao, Hebei, People's Republic of China

ABSTRACT: To analyse the current employment status and problems of students in the *Information Management and Information System* (IMIS) major, the authors have developed a model of long-term university-enterprise cooperation so as to develop talent in IMIS applications. A specific pattern on how to adapt to the training requirements for IMIS talents was proposed, and a new approach to improving the teaching model, the course system, special teaching, resources and the establishment of high-quality teacher group were considered. In the article, it is demonstrated that university-enterprise cooperation is a win-win mechanism that has a great benefiting effect for both the universities and the enterprises.

INTRODUCTION

In recent years, some universities have involved themselves in cooperation with enterprises for personnel training. Along this line, Guo explored the practice, including the background, related work and enterprise training programmes [1]. Li stated that the professional knowledge of the scientific and engineering programmes was deeply integrated with the labour market [2]. Zhang thought that the college-enterprise cooperation was an inevitable outcome of higher education reform [3].

The cultivating pattern of cooperation between universities and enterprises combines learning with working, where *team development* is based on the professional values of both the college and industry [4]. College-enterprise cooperation and working-universities combination are the only ways open to higher vocational colleges [5][6].

Huang suggested that a government-ensured mechanism, a win-win cooperation mechanism, a mutual engagement mechanism, an evaluation and incentive mechanism and a cultural penetration mechanism, should be established [7]. Du argued that the government should specify the responsibilities of enterprises for participating in vocational education in light of laws and regulations, and motivate them by tax relief and ensure wide publicity about the cooperation at the same time [8]. University-enterprise cooperation has proven to be a good way to improve the students' ability, and this mode has a positive impact on individuals and colleges [9]. Zhang explored the training of software testing based on university-enterprise cooperation [10], and Yin developed a CDIO engineering education mode through the reform and practice of universities and enterprises [11].

Although these patterns imply a cooperative mode in regard to all aspects and partners (government, universities, enterprise, etc), some aspects of this cooperation are relatively weak, especially, university-enterprise cooperation in personnel training; and the practical level of specific measures is not perfect, and it is insufficient for solving puzzles and problems in practice. The whole approach to ensuring high-quality in talent cultivation is relatively deficient [12].

As the widespread development of enterprises and universities calls for applied talent to be urgently cultivated, a mechanism that is suitable for long-term cooperation between universities and enterprises should be developed. A system should be established to enable graduates to become suitable personnel and appropriate training should be set up for this purpose.

To achieve this goal, relevant surveys should be conducted to find out the nature and requirements of graduates' initial jobs and potential future development; only then one can establish a new model to train employees suitable for industry and business organisations. Also, a functional mechanism for a long-term and stable cooperation between universities and enterprises should be established, which would make well-trained personnel available and accessible in order to

provide a well-planned flow of technological support for students who, in turn, would become human resources for the faster development of enterprises.

A LONG-TERM UNIVERSITIES-ENTERPRISES COOPERATION MECHANISM FOR THE INFORMATION AND MANAGEMENT INFORMATION SYSTEM MAJOR

An enterprise specialising in information development can achieve its goal for faster personnel training and gain a higher competitive edge with the help of expertise in teaching and research in order to arm their employees with theoretical knowledge and on-the-job skilful techniques. As for universities, cooperation with enterprises can go a long way toward reforming teaching approaches, improving teaching equipment and, hence, students' practical ability, all of which contribute to better employment opportunities.

An incentive system and mechanism: an incentive-based sound mechanism will improve cooperation between universities and enterprises. Both the central and local levels of government should take initiative in supporting and rewarding the enterprises and universities that cooperate with each other. Moreover, the government should encourage them to link production to learning and research, so as to provide better training for high-skilled employees.

An incentive safeguard mechanism between universities and enterprises: it is essential for the two parties to set up an all-round safeguard mechanism. At first, improving the policy behind safeguard mechanisms, such as special compensation packages and tax reduction, can facilitate such cooperation. Specifically, enterprises could be exempted partly from certain taxes in order to create incentives for them to take on a number of students and engage the enterprise resources for this purpose, so that more students are able to participate in industrial activities. More enterprises would be attracted to a scheme with such an incentive and the expenditure safeguard mechanism would be put in place and be welcomed by enterprises.

Incentive policies and regulations would ensure the possibility of establishing long-term university-enterprise cooperation. The universities should improve the details of cooperation while strictly conforming to the agreement in the course of cooperation with the enterprise for the purpose of continuation and effectiveness of the cooperation. The universities need to make the agreements and norms more practical at all times as the participants involved seek to safeguard their benefits and financial security during probation and initial periods of operation. In the process, the universities should take an active part in exchanging ideas with enterprises and students. By doing this, the management rules and regulations will be continuously readjusted.

A new training scheme for the students: to identify and address the problem in the process of talent development and cultivation, the authors used survey data about students from the information management and information system major course at Hebei Normal University of Science and Technology. Additionally, they sought to find an creative solution about personnel training targets and training models. According to the training standard, they pay particular attention to the focal point i.e. the service and application of management and applied engineering software to set up the training plans, training systems, course arrangements, teaching models, innovative-teacher teams and enterprise training programme that meet all the demands of the university-enterprise cooperation.

The approach to the choice and order of course content largely depends on the experiences of practical application, supplemented by the skills of proper content segmentation and arrangement. The teachers must also keep an eye on customising the course structure. That means that the way to set up a rational course system is to focus more on the development of the application of professional knowledge of the students as they concentrate their attention on the advancement of both the theoretical knowledge and practical ability.

DEEPENING TEACHING REFORM

Change and reorganisation of the course system: it is imperative to reform and reorganise the curriculum system in the context of increasing university-enterprise cooperation. The progress and improvement of the curriculum depends on both the university and the enterprise. Both teachers and engineers need to give lessons closely linked to reality, which should help advance the knowledge and skills of senior personnel.

According to the training standard, the university should give top priority to the practical ability and implementation, and service capability of software management and conform to the integration and innovation of applied programme of management of software as a way of redesigning the curriculum system and the teaching content. Every teaching step plays an interactive role with other parts and, as a result, a continuous and complete teaching system helps improve the practical application capacity of university students. As academic teachers combine theoretical classes with practical teaching, they can make sure that the students become proficient in the theoretical knowledge and practical applications.

Developing special teaching resources: teachers must work with enterprise partners to prepare and make available a comprehensive series of integrated teaching resources for the major students of IMIS according to the novel curriculum system and teaching content. Advanced teaching content of specialised courses includes the latest innovations and contemporary developments in technology, as well as the best practical experiences from enterprises. Enterprises, along

with universities, must participate in talent training to make full use of all resources available. As a result, the universities and the enterprises will complement each other, so as to create a student-university-enterprise multi-win outcome in order to improve students' practical ability.

Enterprise training programme: undergraduates should study at the enterprise for at least a year. The practice is not an extension of a probation period or the expansion of the traditional probation, which includes awareness of the new work environment, production practice and graduation practice. The fundamental purpose of studying at enterprises is to fulfil its training tasks, which cannot be achieved at universities. Working together with the universities is central to defining future senior personnel, while they study for the major of IMIS, and it holds the key to success for the model of cooperation. Highly experienced senior engineers and scholars need to make a concerted effort to develop a long-term cooperation mechanism in which to lay down plans for the implementation of measures to achieve excellent quality of cooperation in accordance with the goals of personnel training of universities, as well as the requirements of the enterprises.

The designers of the programme for personnel training obtain much advice from the so-called first-line engineers. They even discuss with those engineers such issues as, for example, which course should be emphasised, which should be discontinue, and even which university should give strong support to students to improve their ability. The enterprises and universities take different responsibilities in training students: the former identifies the personnel standard and fulfils orders, while the latter trains their students according to the requirements within the amount of time proposed by the enterprise. The teaching arrangement is implemented by both parties. A training scheme and a theoretical and practical teaching system are identified according to the knowledge structure, ability structure and business requirements for the job. The enterprises participate in the formulation of the training scheme by attending systematic consultations held with universities, and passing relevant information on the requirements of positions by giving advice as representatives of an employer.

Assembling a higher quality teaching team: the whole process of students' independent undergraduate graduation design should be guided by academic teachers, so that students improve their topic selection, viewpoint, proper structure, format and writing quality. In addition, the thesis design, development and presentation by students are closely monitored and guided by teachers, so that the thesis demonstrates the correct understanding and application of basic concepts and theories, comprehensive analysis ability, testing, basic skills for calculation and compilation, writing skills, correct thought, proper presentation style, foreign language reading ability, etc.

Teachers should guide students according to their different styles and talent, which are demonstrated through the difference in their learning base, ways of reasoning, comprehensive analysis and independent work ability; thus, teachers will provide different guidance in solving different problems. According to the individual characteristics of each student, teachers recommend relevant and appropriate Chinese and foreign reading resources for reference, encourage and expand the students' innovation spirit, and discover and guide students' correct work in analysis and investigation.

IMPROVING THE PRACTICAL AND INNOVATIVE CAPACITY OF STUDENTS

Intensive programme of development of innovation ability of students: innovative capacity represents a steady theoretical and technical base of any professional, and practice makes better professionals. Hence, the involvement of students in the work and professional activities of the so-called first-line engineers will make a considerable difference to their professional development. In their last year as undergraduates, every student enters the workshop with a mentor according to a dual-choice principle. Emphasis is placed on individual development, and practical and innovative awareness of students for the purpose of their holistic development to satisfy the requirements of enterprises. Their skills and competence will gain further momentum if they participate in national contests, such as software design and mathematical modelling as a way of broadening their field of expertise, gaining real life experience and improving their innovation capacity.

An information management practice platform: both the computer and telephone can help students who need to have access to the teaching platform, and will make their studies more convenient. At universities, students can share resources and knowledge through the network information platform, which will benefit students' holistic capacity. The university objective should be to enhance the quality and quantity of technological innovation activities as a way of improving the applied innovative capacity of students in the IMIS major with the help of the practice platform.

Nothing is better than building a joint university-enterprise research and development (R&D) centre with the objective of enhancing their common development. Such a centre, composed of academic teachers and general staff, would better utilise the resources of enterprises and universities, where training can be realised from academic teachers, students and youth teachers, as well as enterprise personnel.

The R&D base serving the personnel training of the two parties provides an easier way to train dual-capacity teachers. This scheme would address another matter, i.e. the fact that academic teachers are mostly out of touch with reality by having no involvement in industry. So teachers taking part in such a programme may become familiar with contemporary technology and improve the knowledge and skills needed to realise real programmes carried out by enterprises.

A standardised, long-term-effect training system and multi-promotion approach: if well developed, such a scheme will help build a professional, well-organised skill-training base. The incentive for the universities and enterprises is that there will be a better training system that cultivates well prepared, skilful personnel for senior and managerial positions for both parties involved, as any training scheme that can cultivate technical talent for enterprises is the right way forward.

EFFECT ANALYSIS

The primary objective of university-enterprise cooperation is to benefit both parties. Universities and enterprises share their interests and achieve a win-win situation by establishing long-term and stable cooperation relations, in terms of talent training through industrial practice. The authors of this article have built close relations with Yanshan University Software Centre and Foxconn, Qinhuangdao, involved in formulating education schemes and designing a knowledge framework. Both of the two courses are made by enterprises and universities. The university-enterprise cooperation connects students' interests to enterprises' demands; hence, it creates more channels for students' future jobs.

Students have more comprehensive professional knowledge and competitive skills: dedication and hard work by students at universities and enterprises have helped to lay the groundwork for a better future. The cooperation is based on a platform that will go a long way toward their business and innovation capacity. In this context, students will become more experienced in practical operations through training and experimentation.

Students' excellent and holistic competence is greatly demonstrated in the Blue Bridge Software Design Competition where they received the National Special Award, Provincial First and Second Prize, and where their teachers won the Excellent Instructor Prize for *fully educated students*. Figure 1 shows the graduates' employment rate rose from 68% in 2012 to 75% in 2013, and the figure rose to 94% in 2014. At the same time, the salaries of graduates in 2013 increased by 11%, compared with 2012; and it experienced a 14% rise in 2014, higher than the annual average level of increase (see Figure 2).
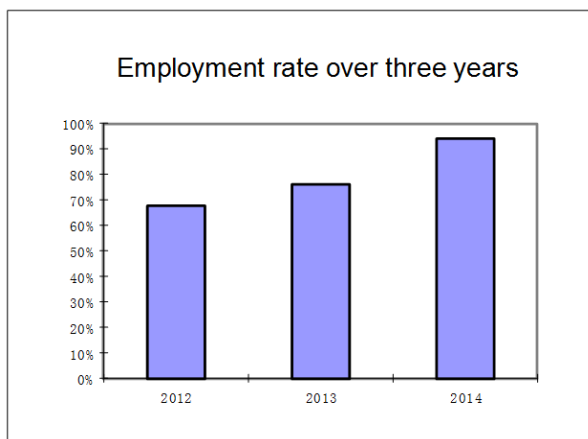

Figure 1: The employment rate over the three-year period between 2012 and 2014.
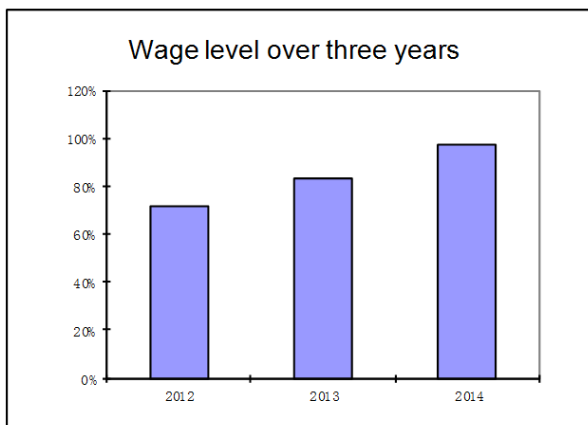

Figure 2: The wage level over the three-year period between 2012 and 2014.

Teacher teams featuring double division types: the university-enterprise cooperation has already made great achievements. Remarkable progress has been made through the technical research platform, and by undertaking provincial research subjects and tackling key technological problems. The number of teacher teams featuring double division types grows annually, from 30 in 2012 to more than 90 in 2013.

In those years, over 30 papers have been published in EI and CSSCI 10 research programmes undertaken by academic teachers, where five programmes were at a provincial level and three were at a municipal level. Teachers' hard work has paid off, great achievements have been made, including more than 10 provincial-level programmes, and 8 provincial-level programmes in collaboration with the enterprises. Moreover, there were 12 university-level programmes in recent years, and the University has more professors' lectures for students.

Undergraduate graduation design is to cultivate students' ability with comprehensive analysis and solving problems by using theoretical knowledge and basic skills. To be more specific, it requires students to systematically arrange and analyse all kinds of data, draw diagrams, analyse problems related to the exploration and development of coal and CBM, and put forward their opinions based on field investigations, tests, analysis and data collection. Therefore, the questions in a thesis should not only be about the thesis itself, but students must pay more attention to the whole process of designing the thesis. Meanwhile, teachers should be stricter in the examination and supervision of students' graduation practice, topic selection, thesis proposal, mid-term screening, thesis writing, PPT presentation, etc, to improve the quality of their final theses.

CONCLUSIONS

The personnel training model under a university-enterprise cooperation scheme manifests the market rule of complementary resources working collaboratively. The model makes up for textbook knowledge falling behind the social and technological development. Teaching content keeps pace with the needs and resources of enterprises and universities, and it also optimises the allocation of resources. It is the goal of all the parties involved to further improve this university-enterprise cooperation teaching model. Furthermore, it is believed that if enterprises become involved in the process of personnel training of university teachers, the effect of tripartite win-win should be achieved among universities enterprises and IMIS students.

ACKNOWLEDGMENT

REFERENCES

1. Cai, Y. and Zhou, W.Z., Exploration of computer specialty enterprise work practices for ordinary university. *Proc. 2011 MSEC Inter. Conf. on Multimedia, Software Engng. and Computing,* Wuhan, China, 641-647 (2012).
2. He, L., Cao, H. and Deng, Y., Study on the universities-enterprise cooperation teaching model for digital media major in scientific and engineering programs. *Proc. 2nd Inter. Conf. on Green Communications and Networks 2012,* 783-790 (2012).
3. Zheng, X., Zhang, Y. and Feng, Y., Decisive factors influencing establishment of long-term mechanism of college-enterprise cooperation and corresponding counter-measures. *Proc. 19th Inter. Conf. on Industrial Engng. and Engng. Manage.,* 1391-1401 (2013).
4. He, Y. and Liu, F., *Research and Practice on Cultivating Pattern of Cooperation Between School and Enterprise, Combining Learning with Working, Group Developing.* Berlin, Heidelberg: Springer, 225-236 (2015).
5. Hong, G. and Xiaoning, L., Practice and exploration of college-enterprise cooperation on major establishment. *Proc. Inter. Conf., ICCIC 2011,* Wuhan, China, 64-68 (2011).
6. Zhao, Z.G., Luo, Z.S. and Gu, D.L., *Innovative Models of More Interactive Cooperation of VET Schools and Enterprise in China, The Architecture of Innovative Apprenticeship Technical and Vocational Education and Training: Issues, Concerns and Prospects.* Netherlands: Springer, 193-205 (2013).
7. Huang, G.Q., Yang, T.H. and Xu, S., On the improvement of motive mechanism to enhance the college-enterprise corporation on vocational education. *Proc. Second Inter. Conf., ICICA,* Qinhuangdao, China, 518-523 (2011).
8. Du, S.J. and Su, S., *Inspiration of Cooperation between School and Enterprise in Germany and USA to China.* Berlin, Heidelberg: Springer, 667-672 (2012).
9. Guo, D., Mao, L. and Sun, H., *Improve Practice Engineering Teaching Ability of Young Teachers by School-Enterprise Cooperation.* Berlin, Heidelberg: Springer, 555-560 (2012).
10. Zhang, S. and Zhou, Z., *Talent Training of Software Testing Based on University-Enterprise Cooperation.* Berlin, Heidelberg: Springer, 315-320 (2011).
11. Yin, N., Yu, H., Yang, X. and Wu, J., Reform and practice of schools and enterprises build CDIO engineering education mode. *Proc. 2011 Inter. Conf. on Engng. Educ. and Manage.,* 45-48 (2011).
12. Chen, J., The innovation of new talent training mode of school-enterprise cooperation. *Proc. Inter. Conf. on Educ., Manage. and Social Science*, 116-119 (2013).