The knowledge management functions of corporate university and their evolution: case studies of two Chinese corporate universities

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Abstract

Purpose – *The purpose of this paper is to investigate the knowledge management functions of corporate universities and their evolution.*

Design/methodology/approach – *Two Chinese corporate universities in the ICT industry were selected for the case studies. Data were collected by interviews and consulting the documents of the two corporate universities. Grounded theory was used for data analysis.*

Findings – *The research found that the knowledge management functions of the corporate universities encompass knowledge transfer, knowledge creation and knowledge services for intrapreneurship. The knowledge management functions of the corporate universities are enhancing with the development of the corporate universities. The knowledge management functions mutually reinforce each other. The knowledge network of the corporate universities is expanding and the scope of knowledge managed is broadening.*

Practical implications – *Companies should make full use of corporate universities in facilitating knowledge transfer, knowledge creation and knowledge services for intrapreneurship.*

Originality/value – *Analyzing the knowledge management functions of corporate universities and their evolution from the perspective of knowledge network enriches research on knowledge management of corporate universities.*

Keywords *China, Knowledge management, Knowledge network, Corporate university*

Paper type *Research paper*

1. Introduction

Since the 1980s, a growing number of corporates have set up their own corporate universities to adapt to the rapid changes of knowledge and meet their needs for high-skilled employees (Meister, 2001; Cappiello and Pedrini, 2017). According to Nixon and Helms (2002), 80 per cent of the Fortune Global 500 companies have established their own corporate universities. In China, corporate universities started late, but they have developed rapidly over the past two decades. By 2015, the number of Chinese corporate universities had reached nearly 3,700 (Li *et al.*, 2015).

The rapid development of corporate universities has attracted the interests of both practitioners and researchers. In recent years, the functions undertaken by corporate universities have drawn great attention of researchers (Stewart *et al.*, 2005; Allen, 2010; Antonelli *et al.*, 2013). Some literatures show that corporate universities are corporate knowledge management institutions (Shaw, 2010; Scarso *et al.*, 2017). More and more scholars begin to attach importance to the knowledge management functions of corporate

universities (Baporikar, 2014; Slettli, 2017). Scholars have studied the functions of corporate universities from different perspectives, such as human resources management, strategic management and knowledge management (Clarke and Hermens, 2001; Wang *et al.*, 2010; Abel and Li, 2012; Alagaraja and Li, 2015). These studies more or less touch upon the knowledge management of corporate universities. Some scholars pay attention to the knowledge transfer function of corporate universities (Doody, 2001; Tsipes *et al.*, 2016), while others focused on the knowledge creation function of corporate universities (Stewart *et al.*, 2005; Dealtry, 2006). The extant research on the knowledge management functions of corporate universities only studied a single knowledge management function from a certain perspective (Andresen and Lichtenberger, 2007; Baporikar, 2014). As only one dimension of the knowledge management function is tackled in the extant research, they cannot demonstrate the interactions among the knowledge management functions of corporate universities.

Stewart and Walton (2005) noted that the functions of corporate universities are dynamic. However, extant studies looked at the knowledge management functions of corporate universities from a static perspective (Baporikar, 2014; Scarso *et al.*, 2017). To our knowledge, no research has explored the dynamic change of the knowledge management functions of corporate universities.

The extant researches on knowledge management of corporate universities are mainly about the corporate universities in developed countries or regions. For example, there are studies of the knowledge management of corporate universities in Germany (Andresen and Lichtenberger, 2007), Russia (Slettli, 2017), Britain (Prince and Allison, 2003), the Italy (Guerci *et al.*, 2010). We have not found any English literature on knowledge management of corporate universities in China.

To fill the above mentioned research gaps, this paper intends to explore knowledge management functions, the interaction and dynamic change of the functions of corporate universities.

Specifically, this research will try to answer the following two research questions:

RQ1. What are the knowledge management functions of corporate universities?

RQ2. What are the evolution processes of the knowledge management functions of corporate universities?

The current research will try to answer the research questions from the perspective of knowledge network. According to Seufert *et al.* (1999), knowledge network is a dynamic structure rather than as a static institution. The role of the knowledge network is to promote the interaction of knowledge activities such as knowledge acquisition, knowledge transfer and knowledge innovation and the transmission of knowledge by connecting a series of interconnected network nodes (Phelps *et al.*, 2012; Rusanen *et al.*, 2014). Therefore, knowledge network is the right lenses to examine the interactions of various knowledge management functions of corporate universities and the dynamic change of the knowledge network of corporate universities.

The structure of the rest of the paper is set as follows. In the next section, we reviewed the literature on knowledge network, the knowledge management functions of corporate universities, the relationship among knowledge management functions, and the evolution of knowledge management functions. The section after that outlines the research method, followed by the case studies and the findings. The final sections of the paper present the discussions implications and limitations of the study.

2. Literature review

2.1 Knowledge network

Knowledge network is defined as a set of nodes – individuals or higher level collectives that serve as heterogeneously distributed repositories of knowledge and agents that search for,

transmit, and create knowledge – interconnected by social relationships that enable and constrain nodes' efforts to acquire, transfer, and create knowledge (Phelps *et al.*, 2012). In our research, we refer knowledge network as the network of corporate universities, the company, and relevant parties outside the company in the knowledge chain. Knowledge network is a dynamic network structure composed of different types of interactive knowledge resources organizations (Phelps *et al.*, 2012). The network can change the internal structure to promote knowledge transfer and knowledge creation by connecting with the external environment (Rusanen *et al.*, 2014). Knowledge resource organization is the basic node of knowledge network (Seufert *et al.*, 1999). Information exchanges and knowledge flows between the nodes (Mcevily, 2003). Knowledge network can be considered as the carrier and medium of knowledge acquisition, storage, transfer and innovation (Capaldo, 2007). Knowledge networks are characterized by interactivity and dynamic changes (Rusanen *et al.*, 2014). In the knowledge network, the knowledge resource organization is not an isolated individual, but connected with other knowledge resources (Rusanen *et al.*, 2014). Knowledge resource organizations acquire the knowledge resources they need through the interaction with network participants (Beesley, 2004). The dynamics of knowledge network is derived from the dynamic nature of knowledge and knowledge connections (Seufert *et al.*, 1999). With the formation and expansion of the network, the subject, the way of contact and the knowledge in the network are constantly changing (Seufert *et al.*, 1999). As a result, the knowledge network can promote the sharing and collaboration of important and effective knowledge (Dyer and Nobeoka, 2000). More importantly, the internal knowledge network can fully utilize knowledge within the companies and improve the ability of knowledge innovation (Bettina and Raub, 2002). Knowledge network can integrate the dispersed organizational knowledge and personal knowledge, and effectively promote the optimal allocation of knowledge within the whole companies, and make knowledge network of companies constantly updated (Bergman *et al.*, 2004).

2.2 The knowledge management functions of corporate universities

Scholars hold different views on the knowledge management function of corporate universities. Many scholars hold that corporate universities mainly encompass the function of knowledge transfer (Doody, 2001; Clinton *et al.*, 2009; Tsipes *et al.*, 2016). Knowledge transfer of corporate universities is to disseminate corporate knowledge through organizational learning and training (Akram, 2002). Most scholars believe that corporate universities have set up a platform for staff education, training and knowledge exchange (Guerci *et al.*, 2010; Baporikar, 2015). In terms of training, scholars mainly focus on the curriculum design of teaching activities, learning model and knowledge dissemination channels (Sandelands, 1997; Paton *et al.*, 2005; Wang *et al.*, 2010; Schultz, 2015). Existing studies have found that the target of training is not limited to the employees of the company, but also to the related companies in the upstream and downstream industrial chain (Dealtry and Rademakers, 2005). Consequently, some scholars pay attention to the targeted training services provided by corporate universities for customers and partners (Guerci *et al.*, 2010; Patrucco *et al.*, 2017). Corporate universities have created a platform for knowledge sharing, which is the exchange center of internal and external knowledge and improves the efficiency of knowledge transfer (Scarso *et al.*, 2017).

With the continuous development of corporate universities, scholars extended their interest from the knowledge transfer to knowledge creation (Landau, 2000; Dealtry, 2006). Nonaka (1994) proposed that knowledge creation of an organization is achieved through the transformation and interaction between implicit knowledge and tacit knowledge, which include the internalization, externalization, combination and socialization of knowledge. Essentially, knowledge creation is a process in which subjects search for and absorb external knowledge and integrate it into new knowledge (Campbell and Dealtry, 2003). The

extraction of internal knowledge processes and the acquisition of external resources have a positive effect on knowledge creation activities (Mors, 2010). Some scholars propose that corporate universities can not only reserve corporate knowledge in advance to make companies more adaptable to changes, but also add external useful resources to the knowledge base, bringing new knowledge and ideas for companies (Dealtry, 2006; Patrucco *et al.*, 2017). Although some scholars believe that corporate universities can motivate organizational change in knowledge creation (Prince and Stewart, 2002), their main focus is how to create curriculum and teaching technology, namely, to provide valuable learning content for corporate employees and the community of shared interests in the value chain through innovative ways of organizational learning (Sandelands, 1997; Antonelli *et al.*, 2013; Petr and Elena, 2018). Allen (2010) believes the new generation of corporate universities can go beyond their original mission of training and development, to provide more innovative services that expand the competitive advantage of companies, serving as the propeller for further development of companies. Some scholars even pointed out that corporate university is a "service creation" organization, which facilitates the company's knowledge creation through integration and production of new knowledge and ideas or industry-university-research cooperation (Scarso *et al.*, 2017). Generally speaking, the expectations of companies for corporate universities are increasing, which requires corporate universities to play more roles in knowledge management. The corporate universities are not simply a training department of companies in the traditional sense; they also provide services for knowledge activities of parent companies in knowledge sharing, knowledge dissemination, knowledge innovation and knowledge application (Rhéaume and Gardoni, 2016).

2.3 The interrelation of the knowledge management functions of corporate universities

Stewart and Walton (2005) argued that the functions of knowledge management are not separated, independent or self-contained, but are interrelated. In terms of organizational knowledge creation, the existing studies demonstrated that the movement of knowledge from individual level to the group level or organizational level, and the interaction of explicit knowledge and tacit knowledge may generate new knowledge (Nonaka, 1994). While knowledge transfer is the basis of knowledge creation, knowledge creation further transfers and diffuses knowledge through knowledge internalization and externalization, which promotes knowledge transfer and application (Abel and Li, 2012). As for research on the interrelation between the functions of knowledge management in corporate universities. Rademakers and Huizinga (2002) views the issue from the angle of corporate strategy and puts forward three stages of the corporate university development, namely, battle stage, tactical stage and strategic stage, as well as their main features. They believe that corporate universities achieve knowledge transfer based on the existing knowledge in the first two stages. Only in the final strategic stage are corporate universities regarded as the knowledge factories of the companies and carry out knowledge production activities. In contrast, the previous studies assume that the function of the advanced stage is simply knowledge creation (Dealtry and Rademakers, 2005; Rhéaume and Gardoni, 2015).

From the review of the above studies, it can be found that the main focuses of knowledge transfer are limited to the knowledge dissemination channels, cross-border communication and knowledge creation in view of personal knowledge internalization and externalization and knowledge integration (Crocetti, 2001; Clinton *et al.*, 2009; Baporikar, 2015). The understanding of the functional connotation of knowledge transfer and knowledge creation in corporate universities is also narrow. Most of the existing literature only considers a single function, that is, knowledge transfer function or knowledge creation function (Blass, 2001; Dealtry, 2006; Baporikar, 2014), while ignoring the comprehensive knowledge management function of corporate universities, and there is even no literature to explore the interaction

between the functions of corporate universities. The existing researches have learned about the static knowledge management functions of corporate universities (Prince and Stewart, 2002; Baporikar, 2014; Rhéaume and Gardoni, 2016), but rarely touch upon on the interaction and dynamic evolutionary process of their functions.

3. Research method

3.1 The cases

Two corporate universities, ZTE College and Hewlett Packard University (HP University) were selected for the case studies. The two corporate universities are part of ZTE Corporation (ZTE) and China Hewlett Packard Corporation (HP China) respectively. Both ZTE and HP China are in the ICT industry and are the world's top 500 companies. Both corporate universities were well established corporate universities in China and are well recognized in the ICT industry in China. The characteristics of the ICT industry are the fast renewal of technology for products, strong demand in innovation, and the extensive internal and external links in the supply chain. The corporate universities of ICT companies are deeply engaged in knowledge activity services. The characteristics of the industry and the well establishment of these two corporate universities make the study of the multiple functions of knowledge management available. Additionally, the relatively long history of the two corporate universities makes the research of the evolution of the knowledge management of corporate university possible. The reason to select two cases, rather than a single case is to make verification of the research results via comparison of the two cases.

ZTE is a Chinese company. The subsidiaries and research centers of ZTE are scattered in about 160 countries and regions around the world. ZTE provides innovative technology and product solutions to telecom operators and company network customers. ZTE College was founded in 2003 by combing ZTE Customer Training Centre and ZTE Staff Training Department, with the aim of providing professional knowledge services to ZTE staff, customers and suppliers. Since then, ZTE College has established 16 training centers around the world. ZTE College provides knowledge services to more than 600,000 domestic and foreign customers over 100 countries and regions. The knowledge services to the ZTE staff and customers include professional training, consulting, evaluation certification, learning tools services. In China, it is recognized as a leading practitioner in training, consulting, and international talent cultivation. One of the authors of this article was invited by ZTE College to participate in its planning.

HP University is part of HP China, a Sino-US joint venture company. HP University was founded in 1985. At the start, it mainly provided products and technological services to Chinese customers, and companies in the supply chain. With the development of Chinese companies and China's economy, HP University actively adapted to the change of the market and the demands of customers. HP Company has accumulated lots of knowledge in management, production, operation, quality and marketing, supply chain, and each business unit within the enterprise. Internally, HP University provides customer demand investigation, carry out on-site business diagnosis and process optimization management. Externally, HP University shares the HP way with the companies in the supply chain, and train talents for other companies. HP University provides a full range of three-dimensional, hybrid business training, comprehensive solutions to customers. In 2004, HP University became the first training institution to train customers in ITIL memorabilia. In recent years, HP University has evolved into HP knowledge center. It not only works as "talent incubation base", but also actively builds a technological innovation and innovative intrapreneurship incubation base. One of the authors of this article has worked at the Corporate University Leadership Training Center.

3.2 Data collection

From May to July in 2017, two of the authors conducted semi-structured interviews with 15 senior managers of the two corporate universities. The interview was done at the corporate universities where the interviewee was located. The job positions of the interviewees and the time of each interview are shown in Table I. Around the roles of the corporate universities in knowledge management, we asked respondents to present some typical activities and key activities in the development of the corporate universities. In addition, the authors consulted the Business Manager of China Consulting Company, the Director of Research Department at China Business Executive Academy at Dalian, and experts in corporate universities from Continuing Education School of Shanghai Jiaotong University to verify the relevant information and express their views on the main research results obtained in this paper.

3.3 Milestone events of ZTE College and Hewlett Packard University

Based on the interviews and the relevant documents, the milestone events of ZTE College and HP University are refined, and presented in Tables II and III. The milestone events of the two corporate universities in the two tables can provide overall picture of the evolution of the knowledge management roles of the two corporate universities.

3.4 Data analysis

Following the procedures suggested by Strauss and Corbin (1998) for research using grounded theory, the researchers go through the procedures to refine concepts, categorize concepts, find thems, and get the theoretical foundation by a series of coding. Figure 1 provides a summary of the process used for data analysis of the interviews, milestone events and documents of the two corporate universities.

3.4.1 Open coding. Open coding is used to generate concepts from the interview recordes and documents (Donald *et al.*, 2018). Interview records and corporate university documents were analyzed using a line-by-line coding approach, as advocated by Strauss and Corbin (1998). Initially, codes were generated from the interview records, milestone events and other documents. Then the codes are further processed to create concepts. For ZTE College, initially 205 codes (selected codes or fragments) were generated from the interview records and documents, and 138 codes were extracted from the original data of HP University.

3.4.2 Categoring. Axial coding was used to categorize the concepts obtained from the open coding. Axial coding involved relating concepts to each other via a combination of inductive and simple deductive thinking based on the number of co-occurrences of open

Table I Job positions of the interviewees and hours of interview

Position	*Times of interviews*	*Total interview time (hours)*
Executive President (A)	2	4.5
Vice President (B)	2	4
Director of the Department of Training and Planning (A)	2	4
Director of the Department of Internal Training and Management (B)	2	4.5
Director of Department of External Exchange (A)	1	2
Director of External Training (B)	1	1.5
Director of Department of Learning and Development (A)	1	1
Director of Research and Development Office (B)	2	1.5
Director of the Department of Production (A)	2	3
Manager of Project Management Department (B)	1	2
Marketing Manager (A)	1	2.5
Marketing Manager (B)	1	2.5

Note: "A" stands for ZTE College , "B" stands for HP University

Table II Milestone events of ZTE College

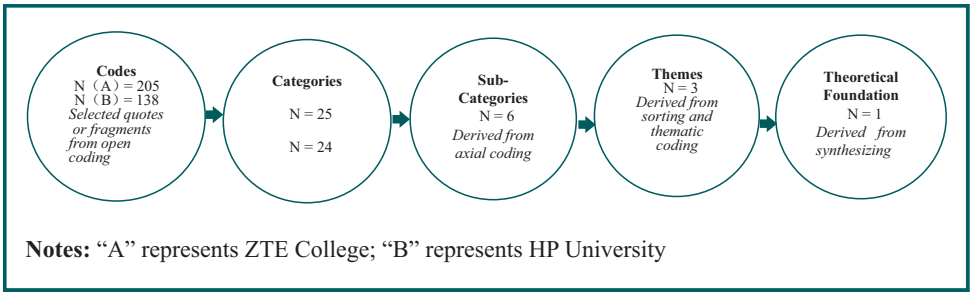
Time	*Milestone events*
2003	New staff training; Mentoring; Knowledge contest
2004	ZTE E-Learning; Setting staff learning plan; 26 multi-media classrooms; Online simulation of business operation for products
2005	Provide technique, business and management promotion paths; More than 5,000 complete curriculums on job knowledge and skill; "Two Best" Project; Oversea sunshine action project
2006	Establish company-level, division-level and department-level training; Introduction of Six Sigma management philosophy; establish 2 training centers in Pakistan; Cooperate with University of Engineering & Technology, Lahore to provide technical training for customers and employees; Establish Mid-East training center in Cairo, Egypt
2007	Introduce American Excellent Performance Model and TL 900 standards; Establish ZTE NC education certificate management center; Cooperate with Ethiopian Telecommunications and CTIT to establish a training center for ETC engineers and telecom talents
2008	Introduce American WLP project based on workplace learning and performance measurement; Involvement of curriculum developing department; 18 executives popularize strategy; Group up cross-department communication team
2009	Set up collaborative research institutes with 17 domestic universities and 4 communications research institutes; Hold "ZTE Company, universities, and research institutes collaboration Forum" in Shenzhen; Customized curriculums; Internal business process document
2011	Become a certificated training institute under American PMI; Provide project management training and consultant service to China Mobile, China Telecom and China Unicom; Establish online curriculum, develop "ZTE E-Asking" (an online ask/reply platform); Provide operation solution as BaaS business service mode
2012	Introduce BLM Model and double interpolation method from IBM; Quality monitoring of the effectiveness of the training; Establish joint conference practice with clients and business units
2013	Integrate "ZTE Share" platform; Provide fragmented knowledge on APP; Collaborate with University de Poitiers, France to conduct international customized training; Set up industrial cooperation with Xidian University and Harbin Institute of Technology; Training network covering more than 90 countries
2014	Establish ZTE IT Technology Institute, Professional Skill Center, Technology Lab; Establish ICT production-training innovation base with Ministry of Education; Produce information and communication technology innovation practice platform with universities; Introduce Ram Chachan's JPS efficient management tool to solve problems in business development. Cooperate with German National Institute of Technology Application and other consulting companies. Follow up the top knowledge in the field of global communication engineering. Introduce advanced production technology and quality control methods. Establish management research center and employee innovation platform
2015	Edit Encyclopedia of Information and Communication Technology involving 15 professional areas; Participate in science popularization plan with China Association of Science and Technology; Improve the standardization and efficiency of China Mobile network PTN operation and documentation system; Participate in CITIC Bank distributed data road project. The secretariat of ZTE's entrepreneurship committee was located in the college
2016	Participate in ZTE communication project delivery and research; Establish 16 oversea training and research centers; Hold development forum with the Ministry of Education, advocating on establishing international human resource alliance; entrepreneur training and practice
2017	Establish Italian Silk Road Collage, Innovation & Research Center and Logistic Center with University of Rome "Tor Vergata"; Invite Changxiang Shen, an academician to ZTE College; Found student employment training base with Xiamen University; Start application research with Shanghai Customs College; Lead the "Distributed Light Prestrain Monitor" project, –a national level scientific instruments project, with Harbin Institute of Technology and China Railway Bridge Academy of Science; Hold the optoelectronics industry development forum to strengthen the "China High-End Chip Alliance". Innovative project competition

codes (Corbin and Strauss, 1990). Through axial coding, related concepts, categories or groups can be further grouped into higher order groups (Donald *et al.*, 2018). All concepts and categories are named with the diversity and accuracy of the source of the concepts and categories, and all of them are based on the relevant keywords in the existing literature. Using the axial coding method, three researchers independently analyzed the 205 concepts refined from the open coding of ZTE College interviews. Then the three researchers had a meeting to discuss their results and get a consensus to grouping the concepts into 25 categories. Using the same procedure, the 25 initial categories are further grouped into 6 higher order categories by the three researchers. Three experts in corporate university were invited to comment on the results of the classification of the six categories. The results were further revised by the three researchers based on the comments of the experts. The open coding and axial coding result of ZTE College is shown in Table IV.

Table III Milestone events of HP University

Time	*Milestone events*
1985 to 2000	Established the IT Technology Institute of HP University and the HP Education and Training department to train internal Engineers, cultivate professional IT personnel, and focus on HP product solution training
2001	"Lions Project" training on new management; More than 20 direct job skill platforms; Product and business development training with new management
2002	Obtain ISO9000 international quality certificate; Launch Business Requirements Analysis Series, R & D Test Series, Project Management Series, Data Center Management Training Series; Conduct MBA training course based on Hewlett Packard for 4 modules of leadership, strategy, operation and organization
2004	Establish the first ITIL talents training institute for clients; coordinate with Stanford to develop technology leadership course
2005	Establish a low-to-high level training system; Conduct RPG simulation of business management practice
2006	Leading on the implementation of ISO/IEC 20000 international service management standard; Refine HP supply chain management method to form precise 6-sigma method; Provide thorough supply chain solution based on SCOR model
2007	Help business units to improve their ROI on learning project; Establish 6-level learning system on key position; Summarize business steps and technology knowledge on each internal business units
2009	Training graduate students in IT service management jointly with Chinese Academy of Sciences; Provide business consultant and training service to China Mobile; Become the first corporate university with ITILV3 course certificate, responsible for the core text translation
2010	Conduct field diagnosis and optimize process management according to clients' requirements; Introduce international professional course of data center and international certificate of online security; Design and implement the HP Senior Manager Leadership Enhancement Project for HP University; Found Outsource Collage
2011	Found HP Quality Management Collage to enhance research on corporate quality management; Absorb internal controlling management method from Motorola to implement innovation management
2012	Research and implement IT talents training and IT team counseling solution based on capability model; Implement "Talent 20000 Training Project" with government; Establish a practice platform based on performance POL; Advocate and implement mixed learning
2013	Provide innovative consulting service for enterprises in finance, IT, real estate and manufacture; Introduce international high-quality courses and hold communication forum with international professions
2014	Introduce the leading training certification of big data application platform "Hadoop"; Construct precisely simulated real data center; Develop client experience series courses for supply chain simulated practice; Hold "Garage Lecture"- a course that invites domestic and international industrial professions to teach frontier knowledge. Establish a database of experts, invite experts from universities and corporates to provide guidance to the innovative intrepreneurship projects proposed by employees, and evaluate the feasibility of the projects
2015 to 2017	Parallelize ISO and TQC quality management; Improve organizational innovation method of change management by various mobile learning product; Explore frontier research and technological hot topics by innovation discussion; Participate in HP Living Progress venture project to provide free business skill training, innovation consulting and technical solution for students, potential venture companies and Small/Micro Companies. Establish innovation laboratories to accelerate the growth of entrepreneurs, provide market information, legal advice and technical advice, and promote cooperation between entrepreneurs and 20 resources such as Baidu and Jingdong Crowdsourcing

Figure 1 Summary of converting observed phenomena to abstract generalization



Notes: "A" represents ZTE College; "B" represents HP University

The same procedure is subjected to the HP University data. Out of the 138 initial codes, we get 24 categories and its further categorization into six categories. The results are presented in Table V. The six subcategories of HP University is the same as those of ZTE College.

3.4.3 Finding themes. The final step is selective coding. The purpose of selective coding is to link the main category and briefly describe the whole phenomenon, which is the process of further abstracting and theoriziing (Howell, 2000). After selective coding, the six sub-categories were further grouped into three higher order categories. The categories of "enterprise knowledge training" and "upgrading subject knowledge and industrial knowledge training" are about knowledge transfer through training. They are categorized into a main category of "knowledge transfer". The sub-categories of "review of internal knowledge" and "exploration of external knowledge" reflected the corporate universities using existing knowledge within or outside the company to slove the existing business problems or creating new knowledge. These two sub-categories are group into a main category named Knowledge Creation. The sub-categories of "cultivation of intrapreneurship" and "project incubation" constitute the main category of "knowledge services for intrapreneurship". The knowledge management functions of corporate university has been clearly explained. The functions of knowledge transfer, knowledge creation and knowledge services for intrapreneureship together constitute the knowledge management functions of corporate university. Figure 2 provides an overview of the structure of the knowledge magement functions of corporate universities.

4. Findings

4.1 Functions of corporate university

Data analysis results show that the knowledge management functions of ZTE College and HP University include knowledge transfer, knowledge creation and knowledge services for intrapreneurship.

4.1.1 Knowledge transfer. In our research, we defined the knowledge transfer function as the role of corporate universities in knowledge transfer among the company, its staff, and its upstream and downstream industrial chain. The knowledge transfer function of corporate universities is shown in Figure 3. Internally, the corporate university carried on the vocational skills training to the employees, to develop the employees' company knowledge, as the knowledge gained from tertiary education cannot meet the needs of the actual work. Corporate universities set up courses which connect industrial standards with the production process, so that new employees can understand the company strategy, operation, procedures, position, and integrate the knowledge from tertiary education with company knowledge. In addition, corporate universities help employees continuously acquire upgraded and cutting-edge industry knowledge to meet the needs of employees' lifelong learning. Externally, corporate universities provide training to suppliers, distributors and customers on company knowledge and product knowledge, so that they can have a better understanding of the products and operations of the company. Corporate universities integrated the knowledge of the industrial chain by connecting market information, policies and regulations, industry knowledge and company knowledge.

As noted by an interviewee from ZTE College:

> The college designed induction training for new recruits through training programs, knowledge contesting, company cultural activities and other forms to enable employees to understand the business philosophy, vision and mission, policies, regulations, products and services of the company. At the same time, the college has established a mentoring approach, through which the new employees learn from the more experienced employees the needed knowledge and skills.
>
> The college provides three levels of training to the employees, the company level, the division level and the department level. Through the three levels of training, the company enhanced the capabilities of the employees and optimized the use of the human resources. To meet the demand of overseas markets and realize the company's globalization strategy, the college has organized the cutting-edge knowledge training for employees at different levels for many

Table IV The open coding and axial coding of ZTE college

Codes	*25Categories*	*6Sub-Categories*
41: Helping employees understand corporate values and business philosophy to integrate them into corporate culture	Business process training	
14: Selection and allocation of mentors to guide new recruits	Job skill training	
102: Training enterprise system.	Delivery of the corporate culture	Training in company knowledge
149: Training staff's job operation procedure and necessary skills	Learning platform	
46: Designing team work projects to increase staff communication skills	Professional certificate	
79: Organizing knowledge contests and other activities to train the practical ability of employees	Qualification	
86: Designing career plans for employees		
156: Building an online learning platform to provide knowledge services for employees, customers and partners		
164: Improving the learning map to educate employees about the knowledge and skills that should be learned and mastered at each stage.	Career planning	Training in updated knowledge and industrial knowledge
67: Providing modular and personalized training path for employees	Career development	
43: A complete curriculum of quality and technology has been formed	Industrial knowledge training	
164: Establishment of three-level training		
28: Exploring the frontier knowledge of industry		
76: Identifying the lack of corporate knowledge.	Internal knowledge weakness detection	
12: Participation in high-level seminars.	Acquiring matched knowledge	Exploration of company knowledge
122: Providing advisory services for continuous operation, management change and management decision-making of the Group	Knowledge of internal technology update	
56: Participate in business unit projects.	Internal cross-department knowledge connection	
70: Collect the needs of each department.	Engineering and scientific research	
13: Refining business processes		
55: Solving business difficulties		
135: Editing science and technology books.	Introducing external knowledge	Exploration of external knowledge
94: Organize case seminars for specific projects	Coordinating to form technicalalliance	
32: Cross-sectorial course construction.	Connecting upstream and downstream	
61: Integrating internal and external resources of the company		
172: Research customer needs		
129: Multinational cooperation has established training centers to train international talents	Refining creative ideas	
106: Introducing advanced production technology.	Intrapreneurship k related knowledge training	Intrapreneurship guidance
92: Collaborate to develop standards of industry technical	Developing knowledge and opportunities	
56: Inviting academicians to give lectures	Strategic renewal	
13: Building platform of technology alliance		
116: Providing innovative technology and product solutions		
71: Incubation of small and micro teams.	Collaborative development projects	
85: Setting up entrepreneurship courses to teach intrapreneurship knowledge and skills	Incubation of entrepreneurship projects information search	Project incubation
105: Hosting entrepreneurship contest inspires intrapreneurship ideas		
181: Inviting experts from universities and companies to give guidance and evaluation to entrepreneurship projects proposed by employees	Connection of entrepreneurial resources	

Note: Only some codes are provided in the table as examples

Table V Axial coding result of HP university

24Categories	*6Sub-Categories*
Business process training; Job skill training; Corporate knowledge training; Learning platform	Training in company knowledge
Professional certificate; Qualification; Career planning; Career development; Frontier knowledge training	Training in updated knowledge and industrial knowledge
Internal knowledge weakness detection; Exploring existing internal knowledge; Acquiring matched knowledge; Internal cross-department knowledge connection; Knowledge sharing	Exploration of company knowledge
External knowledge valuation; Technology information exchange; Introducing external knowledge; Connecting upstream and downstream; Connecting universities, research institutes	Exploration of external knowledge
Intrapreneurship related knowledge training; Invite teachersTechnical consultation and guidance	Entrepreneurial guidance
Search for new technologies; Incubation of entrepreneurial projects; Project evaluation	Project incubation

Figure 2 Structure of the knowledge management functions of the ZTE College and HP universities

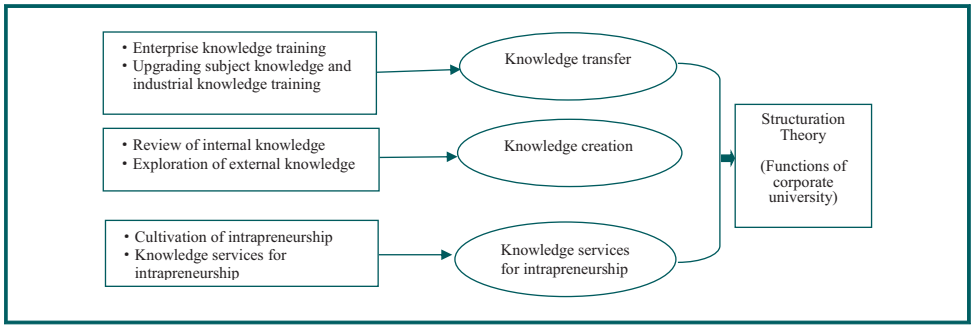
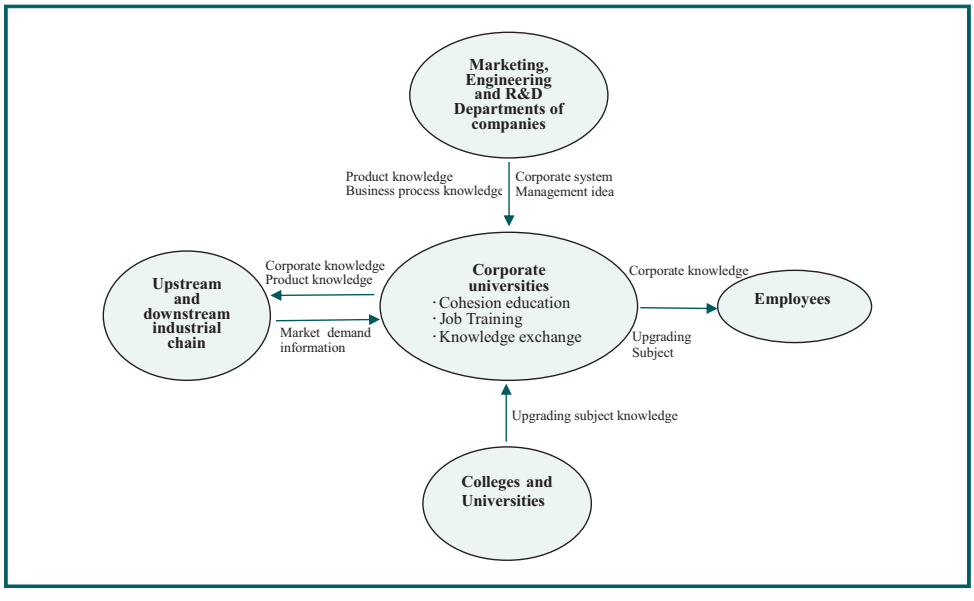


Figure 3 Knowledge transfer function of ZTE College and HP University



> cohorts. To meet the needs of the position on knowledge and skills, the college designed training programs tailored for each kinds of employees. The training programs are "career development in management", "career development in business", "career development in techniques" and "career development in internationalization". These training programs aligned the career development of individuals, and the company goals of business development, and globalization.

Another ZTE interviewee also noted:

> Except training of the company's own employees, the college also provided training for customers, outsourcers, agents and other cooperative institutions. The college shared the ZTE business service ideology with them.

HP University has also designed knowledge training programs for HP employees and customers. Compared to ZTE College, HP University approach differs mainly in two aspects. First, HP University has designed a series of standardized courses and highlighted position oriented training. Second, HP University mainly upgrades the knowledge of its employees through cooperation with universities, while ZTE College focuses more on upgrading individuals' job skills through in-house training. An interviewee at HP University said:

> Oriented to the skills required by the position, the HP University designed a hybrid learning design of core curriculum and on-the-job practices. The training helps individuals to understand the rules and regulations, business operations, and the procedures of production. In 2001, HP University launched a series of HP courses, called the HP Way. The HP Way covers management, sales, and services. This course provided company knowledge to the employees, connecting the industrial standards with the production and services. HP University also designed a training program called the "Lions Program" for managers and potential managers. In this program, a mentorship approach was implemented. Through on-the-job training such as cross-team collaboration, seminars, and virtual team projects, the trainees improve their working skills.

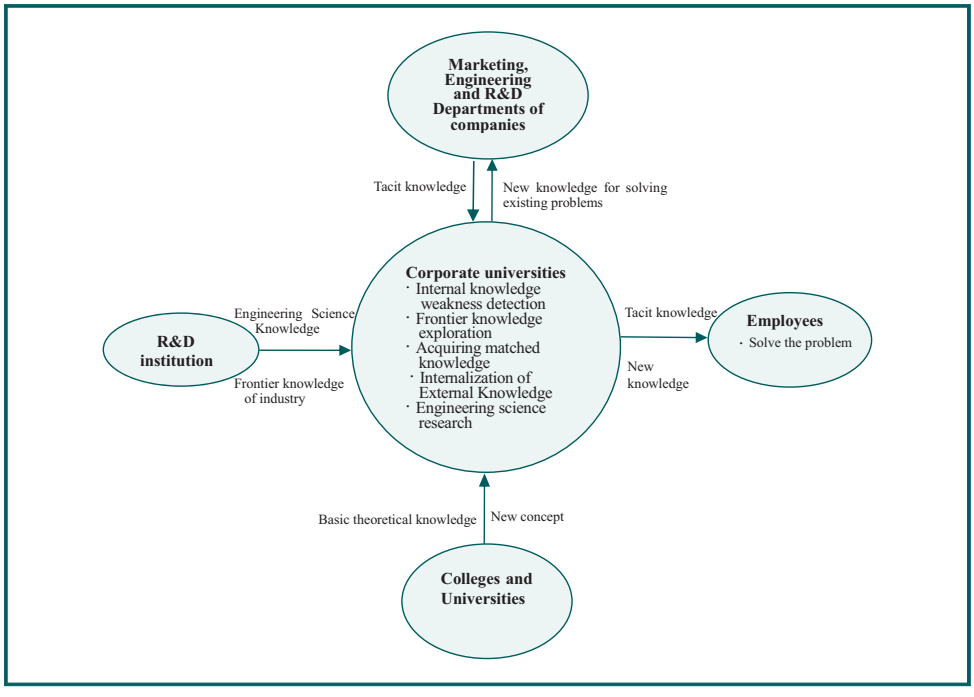
Another HP University interviewee said:

> In 2002, HP University initiated a MBA training program in collaboration with some universities for individuals to get a higher degree. To update and upgrade the knowledge of individuals, HP University also invited experts in the industry to deliver lectures to the trainees. In 2004, HP University, in collaboration with Stanford University, launched an advanced program on development of leadership skills. In 2006, HP University launched a "Million Consultants" training program to provide technical training and industry expertise to distributors, suppliers and customers. The training program smoothed the communication with companies in the upstream and downstream supply chain.

4.1.2 Knowledge creation. We defined knowledge creation as creating new knowledge for the company. It could be knowledge generated from using the existing knowledge to solve the problems of the company in working process, products or services. It could also be new knowledge created by using the internal and external resources. To create knowledge, internally the corporate universities reviewed the knowledge of the company, and externally the corporate universities explore the knowledge outside the company. The knowledge creation function is shown in Figure 4.

Review of the internal knowledge refers to the acquisition of knowledge needed by the business units in the company, and finding the matching knowledge from inside or outside (Martin, 2015). Internally, in the knowledge network, corporate universities reviewed the knowledge of each working units, and the knowledge flow between the units to find out the existing knowledge within the companies and knowledge needs of the working units. Exploration of external knowledge refers to collecting the relevant information such as information on market, customers, products, frontier knowledge, and connecting them with the company products and services information, and internalizing the outside information to

Figure 4 Knowledge creation function of ZTE College and HP University



create new knowledge (Duysters and Lokshin, 2011). Corporate university as a coordinator of the knowledge activities in the knowledge network, can introduce new frontier technology, new management practice, and knowledge from multiple channels. Through refining and integrating the knowledge from inside and outside the company, the corporate university find solutions of the existing problems, and create new knowledge. Through reviewing and summarizing the knowledge of the company, corporate universities also converted some implicit knowledge to explicit knowledge.

ZTE College and HP University applied similar approaches in internal knowledge exploration. Both companies explored the knowledge gap in the business unit in various approaches.

A ZTE College interviewee noted:

> The College organized work oriented meetings of trainees from different working units. By doing so, the knowledge of different working units are connected. In the meetings, the trainees exchanged their knowledge and the problems in their work. Through discussion, and knowledge sharing, sometimes they find solutions of the problems and created new knowledge.
>
> The college organized and participated in meetings to analyse obstacles to achieve the business objectives of the company and to screen the required knowledge information. Through inter-department cooperation, the internal knowledge were reviewed and refined. As a result new knowledge can be created for managers to solve the business problems.

An HP University interviewee expressed a similar view:

> HP University kept the knowledge of the operations of the business units, and constantly collect information on the operations of the business units. In the process, HP University can find out whether the relevant expertise in a business unit is missing and where the technical knowledge is available. Therefore, HP University can ultimately acquire the knowledge which matches the needs of the relevant units and develop plans for continuous improvement.

Another interviewee at HP University also noted that:

> By computer simulation of the business operation with production, R & D, and marketing department, the trainees had a better understanding of the roles of each department and the interconnection among the departments. As a result, the knowledge flow between those departments were improved. In addition, HP University introduced Motorola's Lean six Sigma approach, which contributes to trainees continuous improvement in quality management, operations, and solutions of practical problems in the business.

A HP University interviewee also said:

> HP University has developed its own innovative ways of management such as its goal management, dynamic management, and employee shareholding programs, and put those into the practice of the management of the company. HP University developed a variety of learning products. Employees can learn the latest ideas and technical knowledge online and apply them in HP companies.

In terms of using external resources to create new knowledge of the company, both corporate universities introduced new knowledge and technologies outside, and to transform the knowledge into the company knowledge.

As a ZTE College interviewee noted:

> ZTE College worked with consulting firms such as the German National Institute of Technology, tracked the top knowledge in the field of global communications engineering and introduced advanced production processes and quality control methods.

Similarly, a HP University interviewee said:

> In 2011, HP University introduced ISO9000 and TQC management. Under the guidance of the principles of ISO9000 and TQM, the activities of the departments were coordinated through cross-departmental projects.

However, the approaches adopted by the two corporate universities are not the same. ZTE College put lots of efforts in collaboration with research institutions and universities to create new knowledge. Specifically, ZTE College established collaboration centers of ZTE, university, research institute, and actively participated in research projects, to create knowledge.

An interviewee from ZTE College explained:

> In 2009, ZTE College initiated the collaboration with 17 Chinese universities and four communications research institutes in China, and established the largest company, university and research institute collaboration centre in China. Through exchange and exploration of new knowledge and ideas, the centre provided industry frontier dynamic knowledge and technical advisory services for ZTE. ZTE College also established an ICT production and education integration innovation base. To service the company innovation, ZTE College in collaboration with some local universities jointly established an information and communication technology innovation practice base, a professional competence centre in communication, and technical laboratory.

Another ZTE College interviewee also said:

> ZTE College led the compilation of the Encyclopaedia of Information and Communication technologies, which covers 15 areas of expertise. In addition, the college also participated in some major national instrument development projects led by Chinese Academy of Sciences. In collaboration with an Italian university, ZTE College established the Italian Silk Road International College, Innovation Research Center and Logistics Center.

The knowledge creation function of corporate universities is shown in Figure 4.

4.1.3 Knowledge services for intrapreneurship. Intrapreneurship refers to an organization's corporate venturing and strategic renewal activities (Antoncic and Hisrich, 2001). Corporate

venturing refers to the creation and integration of new businesses, or portions of new businesses into the overall business portfolio of an organization (Narayanan *et al.*, 2009). These businesses may span new products or services, but they may also be new (semi-autonomous) organizational entities residing both internally and externally (Gawke *et al.*, 2017). While, strategic renewal involves opportunity-seeking and advantage-seeking behaviors to enhance an organization's ability to compete with industry rivals and to adequately react to internal advancements and developments in the market (Belousova and Gailly, 2013). Internal entrepreneurship refers to the cultivation and incubation of innovative projects. Corporate universities provide a platform in generating innovative ideas, acquiring the financial resource, the technology and information. Corporate universities promote the development of new projects, the formation of new business, and integrated training, production and scientific research, application to serve the knowledge needs of intrapreneurship.

As a link between the company and the environment of the company in the knowledge flow, corporate universities have quick responses to the advancement of knowledge both inside and outside the company. Corporate university provides entrepreneurs the latest information on new technology and market.

In terms of integrating technical resources, corporate universities can act as intermediaries to strengthen the development of technical cooperation among companies, universities and research institutes, through providing technical advice and technical evaluation for companies to promote technological innovation, for existing markets, supplier relations, technology and brands and other resources to build a wide range of network links.

Corporate universities provided guidance in innovation. Corporate universities invited experts from universities, and research institutions knowledge of intrapreneurship such as project management, commercialization guidance, and legal advices.

One of the interviewees at ZTE College said:

> The College has designed training camps for intrapreneurship training. Entrepreneurs, experts and scholars conduct coaching through training on topics such as products, operations, business planning, investment and financing.

Another interviewee at ZTE College said:

> The secretariat of ZTE has been set up at ZTE College. As the corporate university is close to business units, close to the market, and close to customers, it can grasp the latest information on technology development, change of the market and customers.
>
> The College hosts the innovation contest every year, which is open to everyone in the company. The purpose is to create an atmosphere of innovation and entrepreneurship that frees up truly viable ideas. If an innovative idea demonstrated in the competition or innovation training camp past the company evaluation. The company will invest and promote the innovative project. Employees can hold shares and share the profit. If an employee forms a team in the course of studying at the college and leaves the ZTE to set up a new company, the ZTE also allows employees to be on leave for three years.

An interviewee at HP University said:

> HP University has an experts pool invited from universities and the company. Experts in the pool not only provide training to the employees, but also provide mentoring for employees on innovative projects proposed by employees. Experts in the pool also evaluate the possibility of the application of the innovative project in the industry, make value judgment, project judgment and technical judgment, so as to carry out the project evaluation.

Another HP University interviewee said:

HP University participated in HP Living Progress, innovative project start-up learning program. In this program, HP University provided free service on business skills training, innovative project advice, and technical solutions for students, potential entrepreneurs and small business owners.

HP University has set up an innovative laboratory to facilitate business transformation and upgrading, as well as technological transformation, and to generate innovative products and technologies. When employees got a new ideas for transforming business or technology, the university can explore which university or institution has the technology, and mobilize human resources and technical resources to support the technological innovation and transformation of the industry.

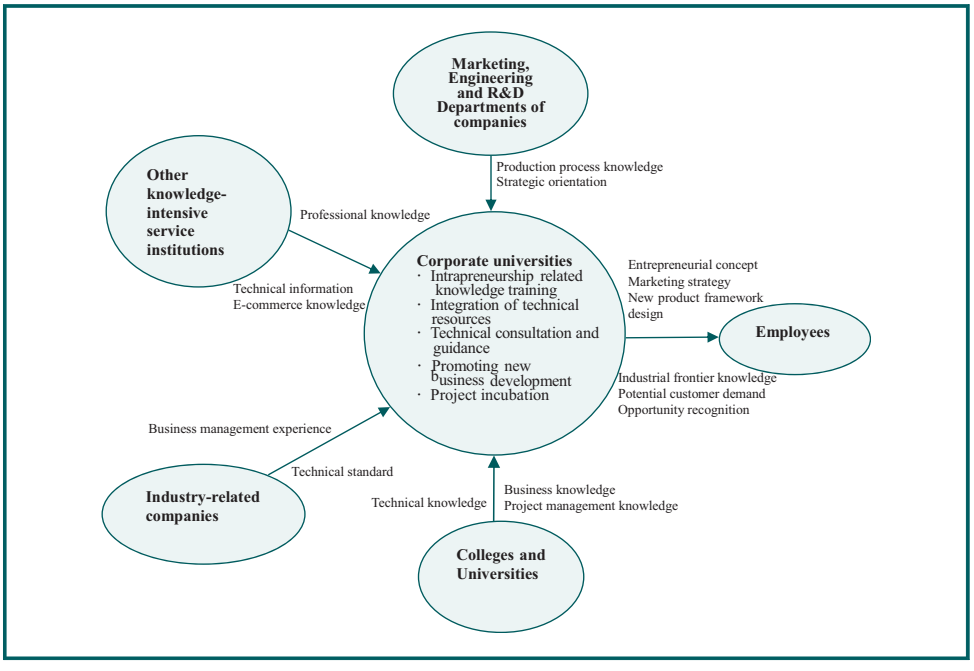
Compare the similarities and differences of the two corporate universities in the specific practices of intrapreneurship functions. ZTE College mainly go through the innovation and intrapreneurship competition to stimulate innovative ideas, and set up an intrapreneurship training camp for entrepreneurs to carry out a full range of coaching training. HP University focuses on building platforms to seek appropriate resources for new projects. The knowledge service for intrapreneurship function of corporate universities is shown in Figure 5.

4.2 The evolution of the knowledge management in corporate universities

With the development of corporate universities, the Knowledge management functions of corporate universities are enhancing, the connections outside the organization is expanding and the scope of knowledge managed is deepened.

4.2.1 Change of the knowledge management functions of corporate university. For both ZTE College and HP University, there were knowledge management functions of knowledge transfer, knowledge creation and knowledge service for intrapreneurship. All the knowledge management functions are enhanced with the development of the two universities. The three functions mutually reinforce each other.

Figure 5 Knowledge services for intrapreneurship function of ZTE College and HP University



Knowledge transfer function runs through the whole development process of corporate university, which is the basic function of corporate university. The knowledge transfer function is driven by the function of knowledge creation, and the knowledge service for intrapreneurship.

Knowledge creation was weak in the early stage of corporate university development. With the deepening of knowledge transfer, the corporate university accumulated more and more knowledge, and the ties between corporate universities and the enterprise, and the organizations outside the enterprise are broadened and strengthened. The accumulated knowledge and increasing knowledge flow from outside the corporate provided the based for knowledge creation. The development of the training in both width and breadth can also rise individuals' desire for creating knowledge or put the knowledge into application. Intrapreneurship also promoted the knowledge creation of corporate universities by creating a demand for new knowledge.

In the early stage of the development of corporate university, there is little knowledge service for intrapreneurship. The knowledge service for intrapreneurship function of corporate university also embodies the process of upgrading step by step. One of the goals established by corporate universities is to apply the acquired knowledge to technological transformation and upgrading through knowledge transfer. With companies requiring corporate universities to play more and more direct role, corporate universities are not limited to knowledge transfer and knowledge creation, and begin to gradually participate in the process of knowledge services for intrapreneurship, promote the development of innovative projects, for innovative and entrepreneurial projects to build a platform for resources. The development of knowledge creation function of corporate university promoted the development of knowledge services for intrapreneurship function in corporate universities.

Figure 6 depicts the evolution of the knowledge management functions of the two corporate universities.

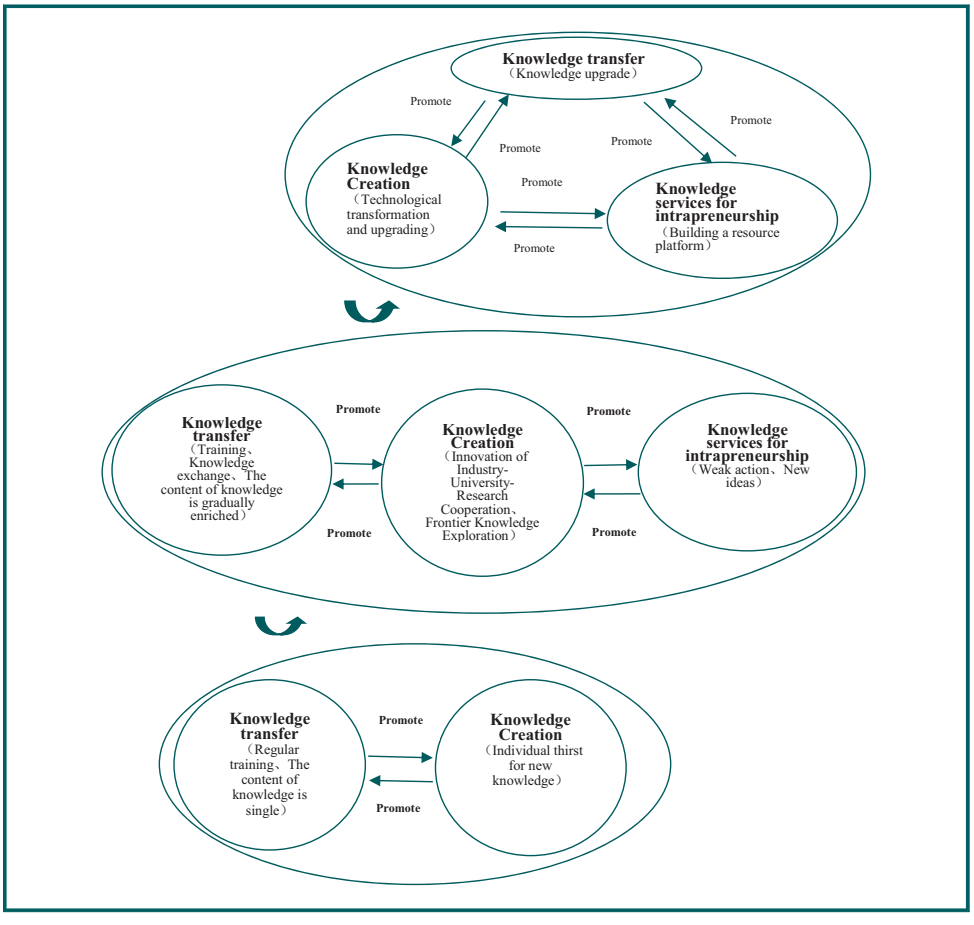
4.2.2 Change of the knowledge network of corporate universities in terms of parties involved. The corporate universities and the various departments within the company, the upstream and downstream companies, universities and research institutes in their knowledge activities constitute the knowledge network of corporate universities. With the continuous change of the functions of corporate universities, the knowledge network of corporate university has become more complicated. The knowledge node of corporate university has also been established from the beginning only as a face-to-face exchange between teachers and students, and further expanded into the enterprise's internal R & D, Engineering department, Marketing department and enterprise external upstream and downstream industrial chain, and universities. In the early stage of the establishment of corporate universities, they only assumed the function of knowledge transfer as "bridging classes" to make the new employees adapted to the company. The corporate university simply managed explicit knowledge transfer. In the knowledge network, the nodes are teachers and trainees from the enterprise, from suppliers, from distributors and from customers. As interviewees at ZTE said:

> The college provided learning platforms and training services in its infancy, mainly for internal employees and agents, outsourcers and customers in the upstream and downstream industrial chain.

HP University respondents also noted that:

> HP University was founded primarily as a platform for the integration of internal resources, providing technical support to business partners, customers and channel operators, and delivering HP's corporate values.

Figure 6 Evolution of the knowledge management functions of ZTE College and HP University



With the continuous development of the knowledge management functions of corporate university, it played a more and more important role in coordinating the knowledge activities within and outside the company. New nodes emerged in the knowledge network of the corporate universities. The knowledge network extended to parties such as various departments in the organizations, upstream and downstream industrial chains, universities and research institutions. One interviewee at ZTE, for example, said:

> Internally, the college gradually established and maintained a stable process of information exchange across departments within the company through cross-departmental communication. More and more departments were added to the knowledge network. Externally, the college was becoming more open to the outside. About 60 per cent of ZTE's training capacity were used for training on customers and partners both at home and abroad. In addition, ZTE College collaborated with nearly one hundred domestic universities such as Xian University, Harbin Institute of Technology on ZTE employee training and publishing books jointly. The collaboration with the universities provided support for the cultivation of talents for ZTE.

Another ZTE College interviewee said:

> The college connected all the relevant internal business departments, and the strategic department of the Board of Directors. To take a full play of the adavantage of the company's leading technical advanement in the communications industry, in 16 countries around "Belt and

> Road" area, such as Indonesia, Malaysia, India training centres. ZTE College had trained people about 130,000 customers from more than 100 countries and regions.

An interviewee at HP University said:

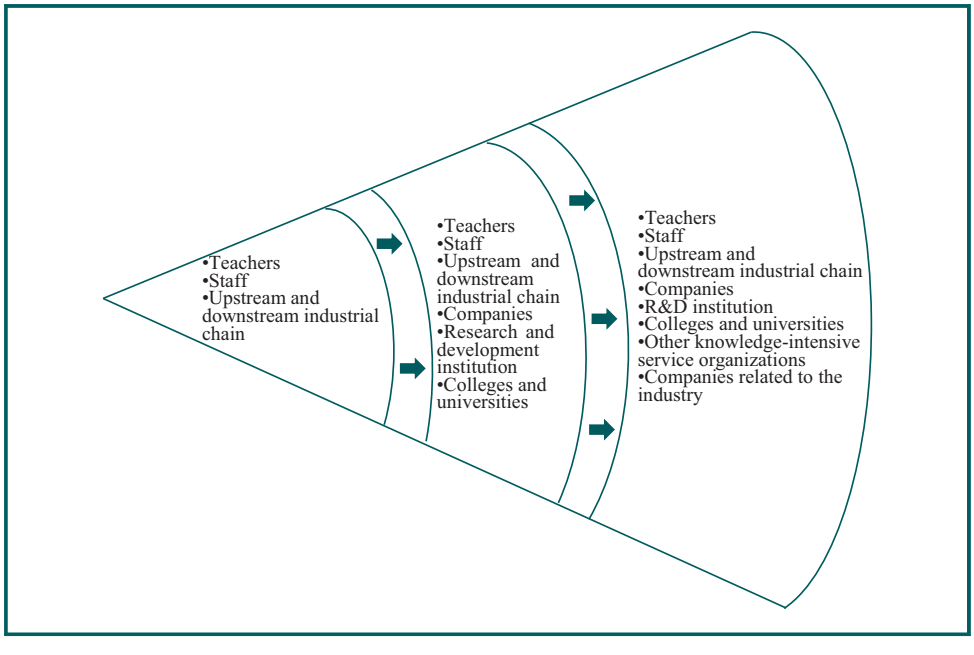
> To better serve R & D, Departments of Production, Department of Marketing and other departments, internally HP University coordinated the knowledge flows among these departments to meet the needs of these departments. Externally, HP University actively pursue collaboration with universities and research institutesto to acquire knowledge from outside to match the needs of these departments. For instance, in the 2004, HP University started its collaboration with Stanford University.

In summary, through playing the roles of knowledge transfer, knowledge creation and knowledge service for intrapreneureship, corporate universities coordinated the knowledge activities both within and outside the company. Corporate universities is a centrial point in the knowledge network to connect the company with its environment. The knowledge network of the corporate universities has been expanding in terms of the parties involved (Figure 7).

4.2.3 Change of the content of the knowledge in the knowledge network. The content of knowledge managed by the corporate university and the complexity of the knowledge management of the corporate university is also changing along its way of development.

In the early stage of the development of the corporate university, the knowledge transferred by the corporate universities is mainly the knowledge of the enterprise. There is little new knowledge received from outside. The knowledge management is relatively simple. Specifically, for the internal training, the knowledge is mainly explicit knowledge such as policy and regulations of the enterprise, enterprise values, business procedures, and operating procedures. For the upstream and downstream industrial chain, the knowledge conveyed is mainly relevant enterprise knowledge and product knowledge. As one ZTE College interviewees put it:

Figure 7 Change of the knowledge network of ZTE College and HP University



> At the start of the establishment of ZTE College, the main tasks of the college was to develop the new employees' knowledge in enterprise culture, job knowledge, and general professional skills. The training programs were about ZTE enterprise culture, and technical knowledge. Through formal training, mentoring and learning by doing, the college was trying to complete the transition of new employees to their new post.

With the enrichment of knowledge management functions of corporate universities, and the expansion of the connections with the environment of the enterprise, the speed of knowledge transfer was accelerated, and the scope of the knowledge managed by the corporate university also enriched. The corporate university managed both internal explicit and implicit knowledge, and knowledge from outside. Accompanying the expansion of the knowledge network of the corporate universities, the interactions among the parties in the network were deepened. The involved parties in the knowledge network became more and more familiar with other parties language to transfer the tacit knowledge. As a result, the transfer of the implicit knowledge among the parties in the knowledge network increased. With the strengthening of the ties between the corporate universities and the other parties in the knowledge network, the knowledge sharing atmosphere was created. Corporate university through the connection with more external parties to obtain external knowledge such as information on potential customer needs, market prospects, and technology development. The information and knowledge were valuable for the enterprise to identify the opportunities to develop new product. One interviewee at ZTE College said:

> With the development of ZTE College and the expansion of ZTE overseas business, ZTE College, Planning Department, Operations Management Department jointly introduce external mature and excellent methodologies such as IBM's BLM model, double-plug analysis method to provide ZTE with the updated knowledge.

In contrast to ZTE College's introduction of external knowledge, HP University put lots of efforts in exploiting the tacit knowledge and creating new knowledge. One interviewee at HP University mentioned:

> In most of the training courses in HP University, nearly half of the time was used for discussion among the students and the trainer. The interactions among the students, and the trainer created an atmosphere for creating new ideas. HP University also sets up projects such as cross-border learning to bring employees from different business unit together. The sharing of knowledge for people from different working units break the barrier of the working units resulting in the generation of new knowledge. These kinds of interaction also freed the tacit knowledge, such as informal know-how, skills, and individual unique work skills hidden in the minds of employees, which in turn leads to the generation of new knowledge.

With the acceleration of knowledge transfer, knowledge creation and the enhancement of intrapreneurship, the new knowledge increased in the knowledge network. Corporate universities add a lot of new knowledge as they innovate. There are mainly two sources of new knowledge. One source of new knowledge is the knowledge acquired from the individual unit such as R & D, production and marketing within the enterprise or outside the enterprise such as the upstream and downstream industrial chain and other interrelated parties in the knowledge network. Another source is the new knowledge created from the interaction of the parties in the knowledge network. As described by an interviewee from ZTE College:

> ZTE College as a coordinator of a number of R&D Centers, National Key Research Studios, and research institutes, ZTE College participated in the evaluation of new products, new procedures and technical methods to promote the transformation and upgrading of technology. ZTE College coordinated the collaboration of the production department, marketing department, R&D department, upstream and downstream industry chain, to solve technical difficulties, and to generate new knowledge. ZTE College introduced IBM's integrated product development process to restructure the enterprise's business. The introduced externally specialized

knowledge reconstructed the original process of market research and information use, forming new knowledge for the enterprise.

Compared with ZTE College's approach of integration of internal and external knowledge to create new knowledge, HP University emphasized knowledge creation via internal entrepreneurship. As described by an interviewee from HP University:

> HP University regularly invited domestic and foreign experts and scholars to give lectures on some specific topics for employees, so that employees know the updated international advanced management ideas and technological innovation methods. In the innovation project and coordination of the work between different work units or between the work units and outside parties, explore innovative business practices.

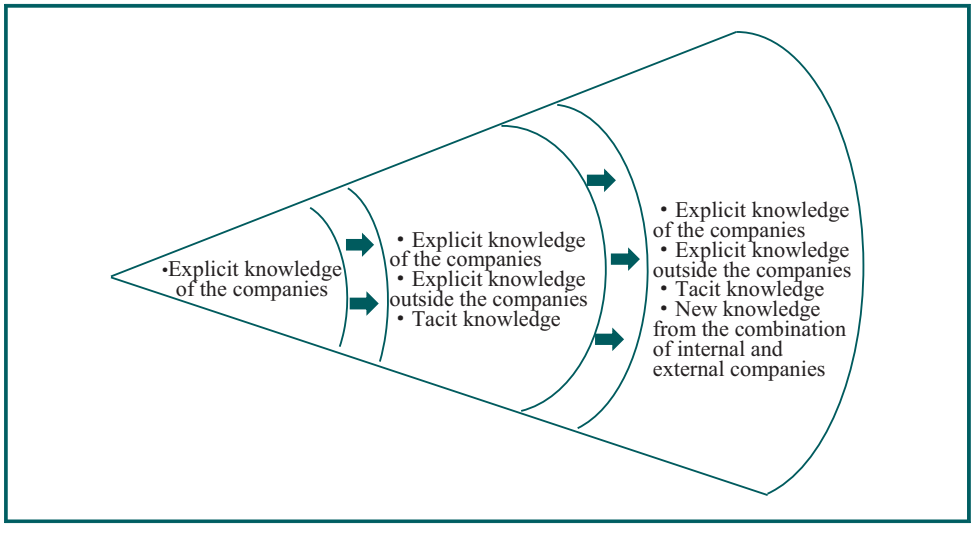
Figure 8 depicts the change of the content of the knowledge managed by the corporate universities.

5. Discussion and conclusions

The research found that the knowledge management functions of the corporate universities encompass knowledge transfer, knowledge creation and knowledge services for intrapreneurship. The knowledge management functions of the corporate universities are enhancing with the development of the corporate universities. The knowledge management function mutually reinforce each other. The knowledge network of the corporate universities is expanding, and the scope of knowledge managed is broadening.

In comparison with extant studies on knowledge management functions of corporate universities, our findings of the knowledge transfer and knowledge creation functions of corporate universities are consistent with the existing research findings (Nixon and Helms, 2002; Lane and Li, 2004; Stewart *et al.*, 2005; Rhéaume and Gardoni, 2015). The finding of the function of knowledge service for intrapreneurship could be unique to the corporate universities in China. No existing research has reported this function. The explanation of this finding could be that China put lots of emphasis on innovation. Company in China encourages the corporate universities to coordinate the intrapreneurship of employees.

Figure 8 Change of the content of the knowledge managed by ZTE College and HP University



There is a difference in specific features of knowledge transfer and knowledge creation functions. For example, in regard to the subject of knowledge transfer, previous researches always stress the service of knowledge exchange and dissemination for employees and the upstream and downstream industry chains (Patrucco *et al.*, 2017), while neglect the content of knowledge transferred. This paper further puts forward the connection subject and knowledge type of knowledge transfer. In terms of knowledge creation, some studies focus on the innovation of curriculum system and training technology (Guerci *et al.*, 2010; Antonelli *et al.*, 2013; Cappiello and Pedrini, 2017). Besides, there are also some scholars holding that knowledge creation of corporate universities is to combine tacit knowledge of employees with explicit knowledge of corporations and then transform them into new knowledge (Rhéaume and Gardoni, 2016; Scarso *et al.*, 2017). In this paper, we propose that corporate universities not only provide service of creative knowledge for employees, but also build a platform for exploring internal and external knowledge and frontier knowledge. In terms of the similarities and differences of the two corporate universities, both corporate universities were engaged in the three types of knowledge management. However, the emphasis of the two corporate universities was different. ZTE College attaches more importance to establishing cooperative partnerships with research institutions and universities, and focuses on introducing external resources to enhance its ability of knowledge transfer, knowledge creation and the knowledge service for intrapreneurship. In contrast, HP University focused on transformation of the internal implicit knowledge to explicit knowledge.

Moreover, this paper emphasizes the relationship between nodes and knowledge flow of corporate universities from the perspective of knowledge network. Most Scholars believe that corporate universities are open organizations across borders (Patrucco *et al.*, 2017; Slettli, 2017). However, previous studies have neglected the role of corporate universities in connecting internal and external knowledge of companies. This paper finds that corporate universities have the characteristics of connecting tacit knowledge and decentralized knowledge to form a knowledge network for corporate knowledge management.

Featuring implicitness, embeddedness and decentralization, the enterprise knowledge has great practical difficulties in its transmission, transformation and application (Duysters and Lokshin, 2011). Each department of a company can only assume the knowledge management function of its own department, so it requires an organization to connect the whole knowledge system and manage the internal and external knowledge network of the company (Mors, 2010). corporate universities are exactly coming into being with the function of connecting employees, companies, R&D institutions, universities and other knowledge-intensive service organizations by taking advantages of their cross-border characteristics, and forming a knowledge network to manage the flow of knowledge inside and outside the companies (Meister, 1997; Slettli, 2017). Therefore, we believe that the research of corporate universities from the perspective of knowledge network is more conducive to demonstrating the characteristics of their knowledge activities. From the case of ZTE College and HP University, it is found that the knowledge network of these two corporate universities connect individual, companies, R&D institutions, universities and other knowledge-intensive service institutions and manage their knowledge flow. On the one hand, they actively acquire and absorb market information and technological knowledge from outside the companies, so as to prepare the necessary knowledge resources for knowledge creation of the R&D, production and other departments; On the other hand, corporate universities provide a place for formal and informal communication among employees, enhance the effective integration of knowledge resources within the organization through the sharing of knowledge. They help the companies update their knowledge systems, creatively combine diversified views and expertise of their members, and thus inspire specific new ideas and new solutions. In addition, corporate universities guide and influence the acquisition, sharing and creation process of internal and external knowledge, and achieve the effective integration of externally acquired knowledge with

existing knowledge. In this sense, the knowledge network of corporate universities can optimize and update knowledge activities inside and outside the companies.

Third, this paper finds mutual promotion and synergistic development of knowledge management functions of corporate universities. At present, most scholars only pay attention to one of the functions of the corporate university (Holland and Pyman, 2006; Schultz, 2015; Cappiello and Pedrini, 2017), while neglect the interaction between the functions of the corporate university. Also, some scholars often devote their attention to the functions of corporate universities from a static point of view (Prince and Stewart, 2002; Baporikar, 2014). This paper constructs a dynamic evolution model of knowledge management functions in corporate universities and figures out the interaction and dynamic development process of functions. With the continuous expansion of knowledge management functions of corporate universities, the knowledge network of corporate universities is more complex with more nodes linked and more types of knowledge included. From the interviews of ZTE College and HP University, it is also concluded that the evolution of knowledge management function in corporate universities have gone through a monotonous-to-diverse process. The extension of functions from knowledge transfer to knowledge creation and intrapreneurship marks the development trend of corporate university functions. The two corporate universities have different emphases on each knowledge management function and ways of knowledge management. ZTE College focuses on introducing external knowledge, while HP gradually focuses on the internalization of tacit knowledge. With the continuous expansion of functions, both ZTE College and HP University have extended their connectivity nodes from stuffs to corporate departments, upstream and downstream industry chains, universities and R&D institutions, and other knowledge-intensive service organizations. The scope of knowledge involved in the two corporate universities is gradually expanding from explicit knowledge within the companies to tacit knowledge and external frontier knowledge. As the nodes becoming more interconnected, the knowledge managed by the corporate universities is more complex, and a growing amount of knowledge is added.

5.2 Theoretical implications

This paper makes several contributions to the extant literature on knowledge management function of corporate universities. First, the in depth study exposed what and how knowledge were transferred and new knowledge was created. In addition, the research also exposed a knowledge management role of the corporate universities in China, i.e. the knowledge service function for intrapreneurship. Second, by studying the multiple knowledge management functions of the corporate university. The research reveals the interactions among the functions of knowledge transfer, knowledge creation and knowledge service for employee intrapreneurship. Finally, from the perspective of the knowledge network, this research demonstrated that the dynamic change of the knowledge network of the corporate universities. Specifically, the research exposed how the enrichment of the knowledge management functions, the expansion of the knowledge network, and the deepening and the broadening of the knowledge management.

5.3 Practice implications

The findings of the study are of great significance to guide knowledge management of corporate universities. By summarizing the practical experience of ZTE College and HP University, the study offers valuable reference for the developing corporate universities in China. First, when operating corporate universities, the operators should not just attach great importance to the training functions concerning knowledge sharing and knowledge transfer, but also stress on the knowledge creation and intrapreneurship service functions. In a sense, matured corporate universities should not only limit itself to knowledge transfer, but also be actively engaged in other knowledge activities such as knowledge innovation

and knowledge application. Especially, as the innovation and entrepreneurship enjoy vigor and vitality in China, corporate universities should actively perform the function of facilitating intrapreneurship, unlock creation potential of companies and entrepreneurs, build platforms for communication, industrial connection and project incubation, scout for and cultivate excellent projects and teams, develop new products, technology and models, and promote the transformation, upgrade and innovation development of companies. In addition, with a cross-border feature, corporate universities can make full use of knowledge network. Not only can they establish effective links with external industry chains, but they can also provide more abundant knowledge connection services for the knowledge activities in departments of R&D, production and marketing. We should take a "dynamic view" to define the functions undertaken by corporate universities, which are varied and expanded in different stages of corporate development. The evolutionary trend of ZTE College and HP University also suggests that other corporate universities can be oriented towards the platforms that provide knowledge linking service inside and outside companies and even the incubation centers that explore frontier industry knowledge and undertake creation and intrapreneurship service activities.

6. Limitations and further research

The current research has a number of limitations. First, as both corporate universities for the case studies were selected from the ICT industry, the study may have limited implications for corporate universities outside the ICT industry. Future research can investigate corporate universities from other industries. Additionally, this research adopted a qualitative research approach. Future research can use mixed research method to further enrich the study.

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