Managing Knowledge in Enterprises
Evidences from China

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Abstract: Knowledge management is an essential key in order to obtain competitive advantages in organizations. In this scenario, an interesting study about the first global power, China, is presented. The paper analyzes how Chinese enterprises manage their knowledge using variables linked to knowledge sharing and knowledge creation. Data were extracted by World Bank between December 2011 and February 2013, and the analysis has two parts. First the percentage of innovative enterprises within China is identified and then, a descriptive analysis about the situation of Chinese innovative firms is realized. In addition ANOVA technique is used. Results show that almost the half of Chinese enterprises (around 47 per cent) is considered as innovative, and these innovative firms make decisions focused on active measures related to knowledge management. Then they realize an active used of new technologies in order to communicate with people related to the organization (sharing knowledge) and also to develop new ideas within the organization (creation knowledge). Chinese Government could use our paper in order to know how their enterprises manage their knowledge and, accordingly, they could motivate non-innovative enterprises to incorporate actively knowledge management process.

1 INTRODUCTION

In today´s society, knowledge is considered as an essential resource for organizations in order to achieve competitive advantages (Nonaka and Takeuchi, 1995). Its popularity as an excellent management tool has increased rapidly as can be demonstrated by the growing number of research in the area (Edvardsson, 2009).

In this scenario an original analysis located in one of the most interesting countries around the world is presented: China. China has had an extraordinary growth in the last years transforming the first global power. From this point, the aim of this paper is to identify what innovative enterprises in the first global power are doing related to knowledge management. First, the degree of innovation from Chinese is identified firms analyzing what percentage of them is considered as innovative. Then we set out if there are any differences in innovation results within the innovative firms based on industries. Finally, the Chinese situation is explained in order to contribute to the literature explaining what innovative enterprises in the first global power are doing managing their knowledge.

2 THEORETICAL FRAMEWORK

2.1 Knowledge Management

Nowadays, we are in society known as “knowledge society”, concept introduced by Taichi Sakaiya in 1991 bringing to light the relevance of knowledge for people in general and organizations in particular. Accordingly, knowledge is considered a key resource and knowledge management is considered an essential tool in order to achieve competitive advantages (Zyngier and Venkitachalam, 2011) because it cannot be imitated easily by competitors, thus the process is related to business survival (Liao et al., 2008).

There are several definitions about knowledge management, because it includes different activities such as data collection, analysis, storage, diffusion or use in organizations (Lancioni and Chandran, 2009). For instance Kebede (2010) defines the

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process as manage process and tools linked with knowledge with the aim to take advantage of its potential and support to decision making process facilitating innovation and creativity promoting competitive advantages.

Knowledge management is linked to two processes: knowledge sharing and knowledge creation interrelated between each other, considering knowledge sharing like the previous step of knowledge creation (Nonaka, 1991). Both of them are influenced by managers who support knowledge sharing and knowledge creation in enterprises (Reid, 2014).

2.1.1 Knowledge Sharing

Knowledge sharing is defined as *"the provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas or implement policies or procedures (...) and it can occur via written correspondence or face-to-face communications through networking with other experts, of documenting, organizing and capturing knowledge for others"* (Wang and Noe, 2010, p. 117). Accordingly this process is related to acquire knowledge (Chow and Chan, 2008).

Literature about knowledge management shows that knowledge sharing is linked with several benefits within organizations like reductions in production costs, improve team performance, increase innovation activity and, then, increase firm´s performance between others (Cummings, 2004). In addition, in difficult situations knowledge management could increase the credibility of firm´s commitments because of the interrelations in organizations (McEvily et al., 2000). Following Amayah *"in the knowledge-based economy, knowledge sharing is increasingly viewed as critical to organizational effectiveness"* (2013: p. 454).

Although with general character knowledge sharing related to research and learning in the Universities is the most common, enterprises can´t forget it (Fullwood et al., 2013). Knowledge sharing is related to inter-organizational communication, that is to say, between employees (internal process), but also knowledge could be shared with suppliers or clients (external process) (Renzl, 2008). Besides this, enterprises should promote wellness with the aim of preventing disengagement from knowledge sharing (Ford et al., 2015).

2.1.2 Knowledge Creation

Knowledge creation is related to new knowledge. In this way, this concept is linked to the innovation process. Plessis defines innovation as *"the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services"* (2007: p. 21). Authors like Parlby and Taylor (2000) (cited by Plessis, 2007) explain that knowledge management process support innovation activity within the organization, because it promotes the development of new ideas and the organization´s thinking. In this sense, Amar and Juneja show the relationship between innovation and knowledge like an analogy from a plant: *"The seed is the tacit knowledge, the fertilizer is the explicit knowledge and the soil is human creativity; all three are essential to get innovation"* (2008: p. 299). Following Akhavan *et al.* (2014) there is a positive relationship between knowledge creation process and organizational performance. That highlights knowledge creation process.

There is a positive relationship between research and development (R&D) activity and innovation, because R&D is considered font of the innovation process (Crepon et al., 1998). Following Roper *et al.* (2008: p. 843) *"R&D increase the market success of innovative products"*, and a strong R&D expenditure influence internal knowledge needed for product innovation (Rosenberg, 1990).

Authors like Boisot (1998) has been identified a positive relationship between organizational learning and knowledge creation. Addleson (1999) defines organizational learning like the process to obtain knowledge and develop abilities in employees in order to improve the performance. Accordingly the main aim of organizational learning is develop new knowledge and increase knowledge existing in organization (Pemberton and Stonehouse, 2000).

2.2 The Case of China

For the first time in the recent history, China lead the global rank in 2014, overtaken The United States of America if the gross domestic product (GDP) is measured using the purchasing power parity (PPP) (data extracted from International Monetary Fund (IMF) website). This event is according to the prevision realized by O´Neill in 2001, when the economist from Goldman Sachs identified the countries known as BRIC, acronym of their names: Brazil, Russia, India and China. O´Neill predicted the extraordinary growth of China before this country took off.

Curiously the majority of Chinese enterprises are between 6 and 15 years old (more than 70 per cent

of them), thus the creation of new enterprises in China coincided with the publication of O´Neill´s contribution.

China is a country located on East Asia and Pacific region with a population around 1,357 billion of inhabitants, the most populous country in the world (World Bank, 2015). The country has a high human development index (position 91) (UNDP, 2014), and a GDP per capita in the year of analysis (2011) around US$11477 (UNDP, 2015). In this way, its GDP growth since the year 2000 has been always positive fluctuating between 7 and 15 per cent (see Figure 1). Following IMF (2014), predictions show that China will maintain a sustainability growth, less every time; in the year 2019, predictions estimate a GDP growth around 6 per cent.

3 METHODOLOGY

3.1 Data Collection

Data has been collected in China between December 2011 and February 2013 by The World Bank. A total of 2,700 privately-owned and 148 state-owned were successfully interviewed over this period referring to the last complete fiscal year (2011). Following the information about the data, the sample for China was selected using stratified random sampling in order to make sure that the final total sample includes establishments from all different sectors and obtains unbiased estimates for different subdivisions of the whole population. The data included questionnaire-based responses on data in the following areas: general information from recipients, infrastructure and services, sales and supplies, innovation and degree of competition, land and permits, crime, finance, business development services, business-government relations, labour business environment and performance.

Database has been obtained from Microdata Library, a service established by Enterprise Surveys (from World Bank) to provide information about people living in developing countries, their institutions, their environment, their communities and the operation of their economies (World Bank, 2015).

Enterprises belong to the following industries: food, textiles, garments, chemicals, plastics & rubber, non metallic mineral products, basic metals, fabricated metal products, machinery and equipment, electronics, transport machines, retail, wholesale, information technology (IT), hotel and restaurants (section H), services of motor vehicles, construction (section F), transport (section I) and other manufacturing. In addition sample includes some 100 per cent state owned enterprises.

Authors have succeeded to database in April 2015, where the last data updated from China was 2011.

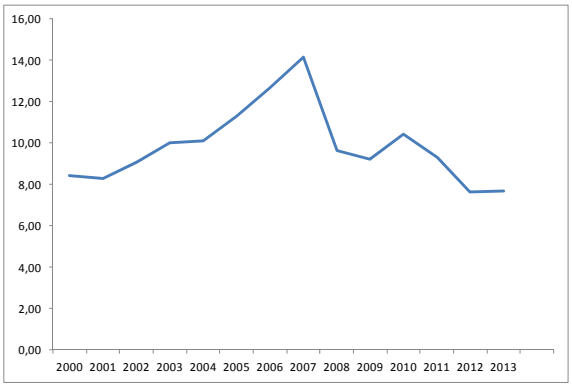

Figure 1: China´s GDP growth.

(Source: compiled by authors. Data extracted from World Bank Database, 2015).

3.2 Statistical Technique

First, in order to realize a comparison between the behaviour of innovative and non-innovative enterprises linked to knowledge management, those firms considered as innovative have been selected. For this aim, innovative enterprises are considered those companies that have introduced new products or services in the last three years.

In the second step, we have used ANOVA technique in order to know if there are any differences between industries in Chinese innovative enterprises related to innovation results. For ANOVA analysis a result variable known as the "Percentage of the establishment´s total annual sales was accounted for by products or services that were introduced in the last three years" has been chosen.

ANOVA technique is a statistical method used with the aim of compare some groups regarding a quantitative variable. In this way the method is used to analyze if there is any difference between groups (or not) (Hair et al., 1995).

Before the application of ANOVA, the Levene´s test has been calculated to assess the equality of variances for a variable calculated for two or more groups (see Table 1). In this way, significance is less than 0,05 thus null hypothesis is rejected that is to say variances between variables are different.

As a consequence in ANOVA post-hoc comparisons are performance using T2 of

Table 1: Levene´s test.

Levene´s test	d.f1	d.f2	Significance
2,279	19	1272	0,001

Tamhane´s test (see Table 2). Significance is more than 0,05 therefore there are not differences between industries in innovative enterprises related to the knowledge results measured.

Table 2: ANOVA test.

	Sum of squares	d.f.	Mean square	F	Sig.
Between groups	7510,775	19	395,304	0,980	0,482
Within groups	512866,015	1272	403,197		
Total	520376,789	1291			

In the last step, after the ANOVA analysis, an analysis about how Chinese innovative enterprises managing their knowledge is presented using descriptive analysis and comparing the situation of innovative and non-innovative firms.

3.3 Description of Variables

In the first step, where enterprises are considered as innovative are identified, a dichotomous variable is used from the following question: *"In the last three years, has this establishment introduced any new products or services?"*. Respondents could choose between *"Yes"* (innovative enterprises) and *"No"* (non-innovative enterprises).

Besides this the paper have analyzed if there are any different between innovation results comparing the Chinese industries. For this comparison a scale variable is used extracted from the following question in the questionnaire: *"In the fiscal year 2011, what percent of this establishment´s total annual sales was accounted for by products or services that were introduced in the last three years?"*.

In the descriptive analysis, the last step, variables related to the knowledge management process in Chinese enterprises with the aim of draw Chinese situation are selected. These variables have been categorized as knowledge sharing and knowledge creation (see Appendix).

4 RESULTS AND DISCUSSION

Around 47 per cent of Chinese enterprises have introduced at least a new product or service in the last three years. In this paper, these companies are known as "innovative enterprises" while those companies that they have not introduced new products or services in the last three years are known as "non-innovative enterprises". ANOVA´s test shows that there are not any differences between industries regarding the results (see Table 2), but there are some industries with a high level of innovative enterprises. In this way enterprises belong to electronics, wholesale and IT have a percentage over the average (53,1 per cent, 62,9 per cent and 58,1 per cent respectively) while for instance companies from transport or other manufacturing have a percentage of enterprises introducing new products or services in the last three years less than the average (20 per cent and 35,6 per cent respectively).

The majority of innovative enterprises are located in a main business city (around 92 per cent of them) and the years of experience working in this sector the top manager have are about 17. Currently they use cell phones for the operations of the establishment and also they use them for inter-organizational relationships and transactions. By contrast only 85,5 per cent of non innovative enterprises are located in a main business city, although their top managers have an average of experience very similar to innovative and they also realize a heavy use of cell phones (see Table 3).

Research and development (R&D) activities keep in mind, especially those related to internal generation. Accordingly around 68 per cent of innovative enterprises have spent on R&D in the last three years but only about 20 per cent have spent on R&D contracted with other companies. Regarding the new products or services, more than 77 per cent have been developed using internal R&D while only 36,4 per cent of them have used external support. At the same time, regarding the new process a 78,6 per cent have been developed inside and just 39 per cent have used external resources. On the contrary the situation of non innovative enterprises is very different, because they present lower percentages than innovative. For instance only a 18,34 per cent of them invest in R&D activities.

Linked to Internet, about 91 per cent of enterprises use e-mail in order to communicate with clients and suppliers regularly, and they also use it for inter-organizational relationships and transactions (91,7 per cent). In addition more than 70 per cent of firms use Internet connection to develop ideas on new products and services, and around a 78 per cent of them has their own website. In comparison, the percentage of non innovative enterprises using e-mail to interact with clients and

supplier is only 82,3 and for inter-organizational relationships a 68,54 per cent. In addition only around a 40 per cent of enterprises use internet to develop new ideas.

Table 3: Comparison between innovative and non-innovative enterprises.

	Innovative	Non-innovative
KNOW_SHA1	17	16,06
KNOW_SHA2	91,8	82,3
KNOW_SHA3	77,6	67,7
KNOW_SHA4	70,9	40,8
KNOW_SHA5	99,8	98,9
KNOW_SHA6	99,1	97,1
KNOW_SHA7	91,7	68,5
KNOW_SHA8	80,2	58,2
KNOW_SHA9	61,5	33,6
KNOW_SHA10	77,3	53,8
KNOW_SHA11	36,4	19,9
KNOW_SHA12	78,6	58,7
KNOW_SHA13	39,2	25
KNOW_SHA14	82,1	61,2
KNOW_SHA15	33,2	22,3
KNOW_SHA16	45,9	27,3
KNOW_SHA17	50,4	30,4
KNOW_SHA18	79,4	63,6
KNOW_SHA19	35,2	29,7
KNOW_SHA20	42,3	26,8
KNOW_SHA21	41,4	26,7
KNOW_SHA22	68,1	18,4
KNOW_SHA23	20,9	-
KNOW_SHA24	63,74	57,55
KNOW_SHA25	88,11	94,43
KNOW_SHA26	75,22	75,37
KM_CREA2	23,65	-
KM_CREA3	89,6	39
KM_CREA4	69,7	29,8
KM_CREA5	63,6	31,6
KM_CREA6	82,2	59,8
KM_CREA7	82,7	26,5
KM_CREA8	72,2	29,6
KM_CREA9	83,9	66,2
KM_CREA10	77	51,4

The majority of enterprises also use specific software in order to share data like for example enterprise resource planning (ERP) systems or customer relationship management (CRM) systems. In this way, a 61,5 per cent of firms use this type of software and more than 80 per cent of them use online web-based systems for inter-organizational relationships and transactions. By contrast the use of these software in non innovative enterprises is smaller (33,6 per cent and 58,2 per cent respectively).

In the last three years a 89,6 per cent of enterprises have introduced new technology and equipment for product or process improvements, around 70 per cent of them have introduce new quality control procedure in production operations, about 63 per cent introduce new managerial processes, more than 82 per cent have provided technology training for staff, a 82,7 per cent have introduced new product or new service, more than 72 per cent have added new features to existing products or services, a 83,9 per cent have taken measures to reduce production cost and a 77 per cent have taken actions to improve production flexibility.

Regarding the new products or services, more than 82 per cent of enterprises developed them in house, around 50 per cent introduced their own version of a product already supplied by another firm, a 45,9 per cent developed them cooperating with their clients and only a 33 per cent of enterprises developed the ideas collaborating with suppliers.

Regarding the new process, more a 79,4 per cent of enterprises developed them in house, around 41 per cent introduced their own version of a product already supplied by another firm, a 42,3 per cent developed them cooperating with their clients and only a 35 per cent of enterprises developed the ideas collaborating with suppliers.

In innovative enterprises more than 63 per cent of full time workers have finished the secondary school while this figure is 57,55 in the case of non innovative enterprises. Both of production and non production employees receive formal training (88,11 per cent and 78,22 per cent in the case of enterprises categorized as innovative and 94,93 per cent and 75,77 per cent in the case of enterprises categorized as non innovative).

However, the situation related to training employees between innovative and non-innovative Chinese enterprises is different. The percentage of full-time permanent production workers receiving formal training is around 88 per cent in innovative enterprises, and around 94 per cent in non-innovative enterprises. The percentage of full-time permanent non-production workers receiving formal training is 78,22 per cent in the case of innovative firms, and 75,77 per cent in the case of non innovative firms. In this way, it seems innovative enterprises do not bet more than others related to this variable. Finally the years of experience that top managers have also are the same in both categories: 17 years in innovative enterprises and around 16 years in non-innovative enterprises.

With general character innovative enterprises realize a heavy use of information and

communication technologies (ICT) as for instance computers, internet or software. As a result customer and partner relations, marketing and sales, production and operations and product and service enhancement have been beneficiary by these technologies because firms use them a lot in support of the activities (see Figure 2).

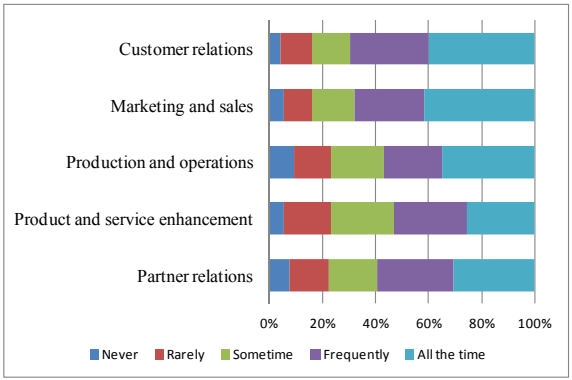

Figure 2: ICT used to support the following processes.

(Source: compiled by authors. Data extracted from World Bank Database, 2015).

In addition ICT have been used in order to realize innovative activities like take actions to improve production flexibility, take measures to reduce production cost, add new features to existing products or services, introduce new product or new service, provide technology training for staff, introduce new managerial processes, introduce new quality control procedure in production or operations and introduce new technology and equipments for product or process improvements (see Figure 3).

In summary, nearly half of Chinese enterprises are considered as innovative, that is to say, they have introduced a new product or a new service in the last three years. These innovative enterprises carry out more measures related to knowledge management than non-innovative firms.

In general, Chinese innovative enterprises realize a high use of the new technologies, both communication and develop new ideas. In this sense, the majority of them have specific software to manage information within the company and to promote inter-organizational communication. Almost all the firms use cell phones, fax and Internet connection to communicate with clients, suppliers and other people linked to the organization. In addition Internet connection is used to develop new ideas as new processes, products, services or managerial processes, between others.

Finally, innovative enterprises pays attention to R&D activity, specially that R&D generated using

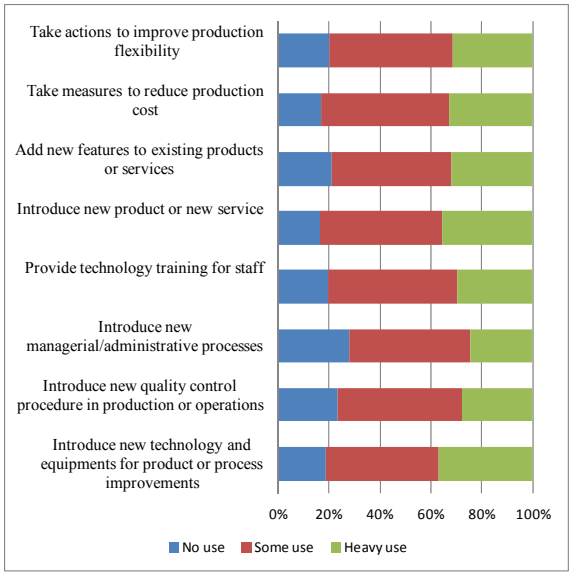

Figure 3: ICT used to support the following processes.

(Source: compiled by authors. Data extracted from World Bank Database, 2015).

internal resources where the investment is high. However external R&D investment is less than internal. In any case, innovative enterprises invest more than non-innovative enterprises in R&D (both internal and external resources).

These results are along the same lines explained in the previous section, theoretical framework, where authors highlighting the relationship between knowledge sharing and knowledge creation (for instance, Nonaka, 1991). Accordingly Chinese innovative enterprises bet on knowledge sharing measures using ICTs and, as consequently, they achieve knowledge creation introducing new products and services.

5 CONCLUSIONS

The extraordinary growth of China, considered at present time as the first global power in the world, identifies this country and their enterprises as interesting cases of study. Besides this, an analysis about Chinese enterprises, started from a point of view based on how they manage their knowledge, is presented.

Accordingly, we have identified that almost the half of Chinese enterprises are considered as innovative, and these innovative firms realize active measures related to knowledge management. This means that they use new technologies regularly in order to communicate with people related to the

organization, and also to develop new ideas within the organization. As a result a significant percentage of their total annual sales is derived from their innovation activity.

This result is interesting for different people. On one hand, a vision of China is offered. In this way, Chinese Government could be used our paper in order to know how their enterprises manage their knowledge. Accordingly, they could motivate to non-innovative enterprises to incorporate actively knowledge management process. On the other hand, paper could be useful to Chinese enterprises. They could know how they are categorized (innovative or non-innovative enterprises) and then they could take decisions if they need increase knowledge management. In addition this paper could be useful to scholars and people interested on knowledge management in enterprises, because the paper shows an example about enterprises in the first global power.

The analysis has some limitations. First, the year analyzed (2011), although is the most updated year, is past. It could be interesting realize again the analysis with a year more recent. On the other hand, descriptive analysis supposes a first step, but it need to be completed with other statistical techniques. Finally the innovative enterprises selection is conditioned by database, where the variable used is the most suitable standard but it is not the best because it is biased by the fact that success/failure attached to this product or service is not considered.

Then in the future this database could be used to other analysis like, for example, regressions or similar in order to analyze what variables affect knowledge performance. In addition a comparison between different years it could be interesting in order to know the changes within the country.

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REFERENCES

Addleson, M., 1999. What is a good organization?: Learning organizations, community and the rhetoric of the 'Bottom Line'. *European Journal of Work and Organizational Psychology 9*(2), 233-252.

Akhavan, P., Ramezan, M., Jafar, Y.M., Mehralian, G., 2014. Exploring the relationship between ethics, knowledge creation and organizational performance. *VINE* 44(1), 42-58.

Amar, A.D., Juneja, J.A., 2008. A descriptive model of innovation and creativity in organizations: A synthesis of research and practice. *Knowledge Management Research & Practice* 6, 298-311.

Amayah, A.T., 2013. Determinants of knowledge sharing in a public sector organization. *Journal of Knowledge Management* 17, 454-471.

Boisot, M.H., 1998. *Knowledge assets: Securing competitive advantage in the information economy*, Oxford University Press. New York.

Chow, W.S., Chan, L.S., 2008. Social network, social trust and shared goals in organizational knowledge sharing. *Information & Management* 45(7), 458-465.

Crepon, B., Duguet, E., Mairesse, J., 1998. Research, innovation and productivity: An econometric analysis at the firm level. *Economics of Innovation and New Technology 7,* 115-158.

Cummings, J.N., 2004. Work groups, structural diversity and knowledge sharing in a global organization. *Management Science 50*(3), 352-364.

Edvardsson, I.R., 2009. Is Knowledge Management losing ground? Developments among Icelandic SMEs. *Knowledge Management Research and Practice 7*, 91-99.

Ford, D., Myrden, S.E., Jones, T.D., 2015. Understanding "disengagement from knowledge sharing" engagement theory versus adaptive cost theory. *Journal of Knowledge Management* 19, 476-496.

Fullwood, R., Rowley, J., Delbridge, R., 2013. Knowledge sharing amongst academics in UK Universities. *Journal of Knowledge Management 17,* 123-136.

Hair, J.F., Anderson, R.E., Tatham, R., Black, W., 1995. *Multivariate data analysis,* Prentice Hall. Englewood Cliffs, NJ.

International Monetary Fund (IMF), 2014. People´s Republic of China. *IFM Country Report No. 14/235.*

International Monetary Fund (IMF), 2015. http://www.imf.org/external/index.htm (accesed 7 may 2015).

Kebede, G., 2010. Knowledge management: An information management perspective. *International Journal of Information Science 30,* 416-424.

Lancioni, R.A., Chandran, R., 2009. Managing knowledge in industrial markets: New dimensions and challenges. *Industrial Marketing Management 38*(2), 148-151.

Liao, S.-H., Fei, W.-C., Liu, C.-T., 2008. Relationships between knowledge inertia, organizational learning and organization innovation. *Technovation 28,* 183-195.

McEvily, S.K., Das, S., McCabe, K., 2000. Avoiding competence substitution thorugh knowledge sharing. *Academic Management Review* 25, 2294-311.

O´Neill, J., 2001. Building better global economic BRICs. *Global Economics Paper No: 66,* Goldman Sachs.

Nonaka, I., 1991. The knowledge creating company. *Harvard Business Review* Nov-Dec, 96-104.

Nonaka, I., Takeuchi, H., 1995. *The knowledge creating company: How Japanese companies create the*

dynamics of innovation, Oxford University Press. New York.

Pemberton, J.D., Stonehouse, G.H., 2000. Organizational learning and knowledge assets-An essential partnership. *The Learning Organization 7*(4), 184-194.

Plessis, M., 2007. The role of knowledge management in innovation. *Journal of Knowledge Mangement 11*(4), 20-29.

Reid, S., 2014. Knowledge influencers: leaders influencing knowledge creation and mobilization. *Journal of Educational Administration* 52, 332-357.

Renzl, B., 2008. Trust in management and knowledge sharing: The mediating effects of fear and knowledge documentation. *Omega 36,* 206-220.

Roper, S., Du, J., Love, J.H., 2008. Modelling the innovation value chain. *Research Policy 37,* 961-977.

Rosenberg, N., 1990. Why do firms do basic research (with their own money)?. *Research Policy 19*(2), 165-174.

Sakaiya, T., 1991. *The knowledge value revolution or a History of the future,* Kodansha International. Tokyo, Japan.

UNDP United Nations Development Programme, 2014. *Sustaining human progress: Reducing vulnerabilities and building resilience*.

UNDP United Nations Development Programme, 2015. http://hdr.undp.org/en/countries/profiles/CHN (accesed 9 may 2015).

World Bank, 2015. http://www.worldbank.org/ (accesed 14 may 2015).

Zyngier, S., Venkitachalam, K., 2011. Knowledge management governance-A strategic driver. *Knowledge Management Research & Practice 9,* 136-150.

APPENDIX

(1) Knowledge sharing variables:

KM_IN1: This establishment spend on research and development activities within the establishment in the last three years.

KM_IN2: This establishment spend on research and development activities contracted with other companies.

KNOW_SHA1: Years of experience working in the sector the top manager has.

KNOW_SHA2: This establishment use e-mail to communicate with clients or suppliers.

KNOW_SHA3: This establishment use its own website.

KNOW_SHA4: In this establishment Internet´s connection is used to do research and develop ideas on new products and services.

KNOW_SHA5: This establishment currently use cell phones for the operations.

KNOW_SHA6: This establishment use phone and fax for inter-organizational relationships and transactions.

KNOW_SHA7: This establishment use e-mail for inter-organizational relationships and transactions.

KNOW_SHA8: This establishment use online web-based systems for inter-organizational relationships and transactions.

KNOW_SHA9: This establishment use specific software for inter-organizational relationships and transactions.

KNOW_SHA10: This establishment introduced new products or services using internal R&D.

KNOW_SHA11: This establishment introduced new products or services using external sources.

KNOW_SHA12: This establishment introduced new process using internal R&D.

KNOW_SHA13: This establishment introduced new process using external sources.

KNOW_SHA14: This establishment introduced new products or services adapted in house.

KNOW_SHA15: This establishment introduced new products or services cooperating with suppliers.

KNOW_SHA16: This establishment introduced new products or services cooperating with client firms.

KNOW_SHA17: This establishment introduced new products or services already supplied by another firm.

KNOW_SHA18: This establishment introduced new process adapted in house.

KNOW_SHA19: This establishment introduced new process cooperating with suppliers.

KNOW_SHA20: This establishment introduced new process cooperating with client firms.

KNOW_SHA21: This establishment introduced new process already supplied by another firm.

KNOW_SHA22: This establishment spend on research and development activities within the establishment in the last three years.

KNOW_SHA23: This establishment spend on research and development activities contracted with other companies.

KNOW_SHA24: Percentage of full-time permanent workers who completed secondary school.

KNOW_SHA25: Percentage of production full-time permanent employees trained.

KNOW_SHA26: Percentage of non production full-time permanent employees trained.

(2) Knowledge Creation Variables:

KM_CREA1: This establishment has introduced new products or services in the last three years.

KM_CREA2: Percentage of these establishment´s total annual sales was accounted for by products or services that were introduced in the last three years.

KM_CREA3: Enterprises committed to introduce new technology and equipments for product or process improvements.

KM_CREA4: Enterprises committed to introduce new quality control procedure in production or operations.

KM_CREA5: Enterprises committed to introduce new managerial processes.

KM_CREA6: Enterprises committed to provide technology training for staff.

KM_CREA7: Enterprises committed to introduce new product or new service.

KM_CREA8: Enterprises committed to add new features to existing products or services.

KM_CREA9: Enterprises committed to take measures to reduce production cost.

KM_CREA10: Enterprises committed to take actions to improve production flexibility.