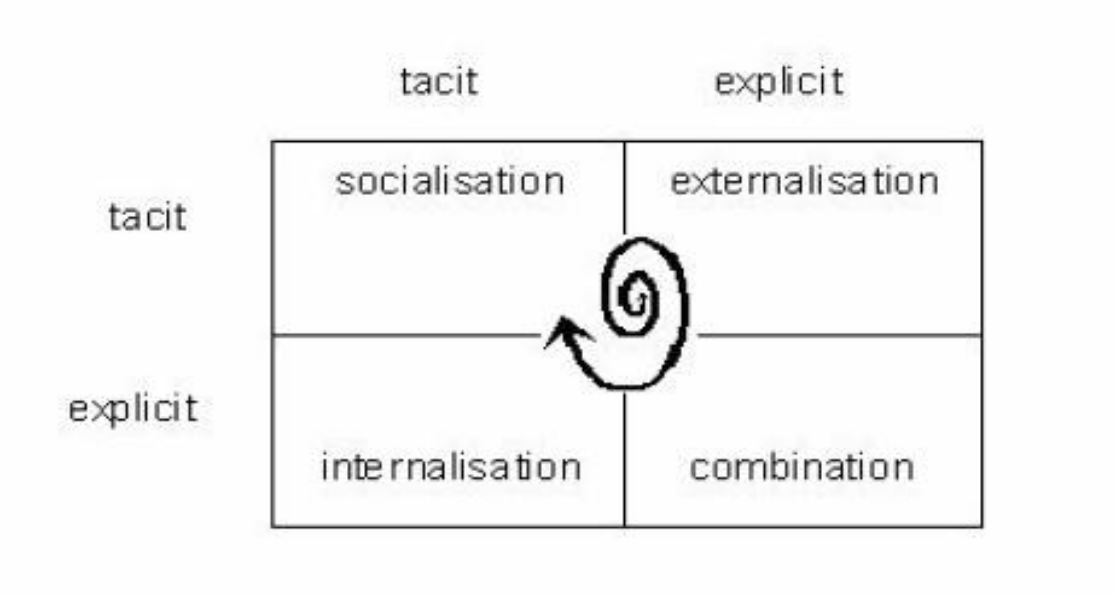
Knowledge creation process & Innovation in Egyptian Banking Sector

Nasser Easa
University of Stirling- Business & Marketing Division
Stirling- UK, FK9 4LA
Email: n.f.easa@stir.ac.uk

1- Concept of Knowledge creation process in organisation

In 1995, Nonaka and Takeuchi proposed a model for creating knowledge in organizations. They argued that the success of many Japanese firms depends on their ability to create new organisational knowledge through a cyclic model of continuous interactions and transformation of tacit and explicit knowledge on three levels: individuals, groups and organizations. This occurs through the four processes of socialisation, externalisation, combination, and internalisation, as depicted in their SECI model. This model has become widely accepted by scholars and widely quoted in approaches to classifying, creating, documenting, sharing and transferring and knowledge, from a (knowledge management) KM perspective, (Haggie and Kingston, 2003; Aurum et al., 2008). The following figure describes the four processes of SECI model.

Figure 1: Nonaka and Takeuchi's Model of Knowledge Creation Process



Source: Nonaka and Takeuchi (1995, p.62).

Socialization process converts tacit knowledge into new tacit knowledge through shared experience and this takes place through every social and cultural process linked to ongoing organizational activities (Martin-de-Castro et al., 2008). Socialisation typically occurs in a traditional apprenticeship rather than from written manuals or textbooks. Although it may also occur in informal social meetings outside of the workplace, where tacit knowledge such as world

views, mental models and mutual trust can be created and shared and beyond organizational boundaries through the interaction with customers and suppliers (Nonaka et al., 2000).

Externalization process articulates tacit knowledge into explicit knowledge, which happens when the firm expresses formally its internal rules of functioning or when it explicitly sets organizational goals and is captured by writing it down or on computer. When tacit knowledge is made explicit, knowledge is crystallized thus allowing it to be shared by others and to become the basis of new knowledge (Nonaka, et al., 2000).

Combination process converts explicit knowledge into more systematic sets of explicit knowledge. Explicit knowledge is collected from inside or outside the organization and then combined, edited or processed to form new knowledge while combination is the process of converting said explicit knowledge into more complex and systematic sets of explicit knowledge. The new explicit knowledge is then disseminated among the members of the organization and creative use of computerised communication networks and databases can facilitate this mode of knowledge conversion. When the auditor of a company collects information from throughout the organisation and puts it together in a context to make a financial report, that report is new knowledge in the sense that it synthesises knowledge from many different sources in one context (Nonaka et al., 2000).

Internalization process embodies explicit knowledge into tacit knowledge, suggesting that we internalize the explicit knowledge to our tacit knowledge. By internalising any creation of explicit knowledge is shared throughout an organisation and converted into tacit knowledge by individuals. Internalisation is closely related to `learning by doing', for example, training programmes can help trainees to understand an organization and themselves or reading documents or manuals about their jobs and the organisation, trainees can internalise the explicit knowledge written in such documents to enrich their tacit knowledge base. This tacit knowledge accumulated at the individual level can then set off a new spiral of knowledge creation when it is shared with others through socialisation (Nonaka et al., 2000).

2- Literature review and research questions

2.1The applicability of SECI model in business and culture contexts

The literature review pointed out successful applications of SECI model within different business context. In this sense, Rodringues et al. (2006) approved the use of the SECI model across the IT sector. Besides, Martin-de-Castro et al. (2008) investigated the use of the SECI model in some knowledge intensive firms in USA and Spain. Examples of these firms were computer and electronic product manufacturing, internet publishing and broadcasting, telecommunications, and internet service providers, web search portals, and data processing services. In construction organisations, suggestions were made to support the use of SECI, the socialisation process in particular, and the vital implication of SECI to underlined mechanisms for innovation (Eliufoo, 2008). Furthermore, using the SECI model in the multi-organisational projects was approved to create a shared multi organisational context to facilitate knowledge capture, sharing and value creation (Rice and Rice, 2005). Also, SECI has been used within Cuban higher education system and as a road-mapping technique for technology-enhanced professional training (Kamtsiou et al., 2006; Cabrera, 2008).

From the above discussion, it has been noted that there are considerable empirical studies conducted to prove the validly of SECI in different kinds of organisations or sectors. However, as far as the author is aware, no studies have used this model in banks or investigated the validity of implementing this model in banks. Banking is a business of information and knowledge, not

just a business of money and the last open frontier for banks to create competitive advantage may very well reside in their ability to leverage knowledge (Lamb, 2001; Chatzoglou and Vraimaki, 2009). Globalisation of financial markets is forcing bankers to become more efficient in managing knowledge in their banking operations, to preserve and leverage knowledge, and disseminate new knowledge and innovation. Due to the importance of the banking sector in the global economy and because of the dynamic changes in its environment, experts argue that managing knowledge within this industry has the same importance relative other industries e.g. Ali and Ahmed (2006). From general prospective of knowledge management (KM), literature pointed out that applying creating and managing knowledge in banking is important to enhance customer loyalty and experience, maximize profit by risk management and leverage intellectual assets by human capital management: ((Ribiere and Chou, 2001; Calabrese and Remshard, 2006; Mizintseva and Gerbina, 2009; Shih and Lin, 2010**)**.

The talking about KM in banks in general started with the World Bank in 1996 and with several developed countries' banks such as: UK, USA, Japan, Spain, Portuguese, Canada, and Germany by the beginning of 21th century, and it is still the major concern of a lot of banks. However, a limited research on knowledge management in banks in developing countries was identified. To the best of the author's knowledge, there are just five studies, two of them were in Malaysia (Ali and Yusof, 2004; Ali and Ahmed, 2006), one was in Libya (Kridan and Goulding, 2006), one was in Jordan (Central Bank of Jordan, 2008), and the last one was in Lebanon (Karkoulian et al., 2008). These studies were just exploratory studies to increase awareness among employees and managers of the importance of adapting KM in their banks. Hence, there is a need for deeper studies to investigate KM and particularly Nonaka's model of organisational knowledge creation in banks in other developing countries. However, the universal applicability of this model in different cultural contexts was arguable by Glisby and Holden (2003), Weir and Hutchings (2005), Andreeva and Ikhilchik (2010) and Haag et al. (2010). Some of them suggested that all SECI modes are traditional Japanese values while the other suggested that not all SECI modes are traditional Japanese values. Therefore, it is concluded to conduct further studies concerning the national culture context in order to provide clear vision. Discussing the implication of SECI model in the Arab culture is important because this region compromises from considerable number of countries (23 countries) which are strongly shaped by the Islamic culture. Considering the Arab culture also is important because the findings of Weir and Hutchings (2005) regarding the Arab world were controversial, rather than their study could be the only study mentioned this region till now. To have representative sample of the whole Arab world, it would be valuable to examine the implication of SECI in Egypt, as the biggest Arabic country (85 millions people). Therefore, the following two question research question has to be addressed:

Q1: what are aspects of the SECI model in the Egyptian banking sector?
Q2: what is most important process of SECI within the Egyptian banking sector?

2.2 Knowledge creation and innovation

Knowledge creation and innovation are two different processes that have a strong but complex relationship. Continuous innovation requires a well-planned system of knowledge management (KM) and an appropriate organisational environment that enables a company to excel in technological, market and administrative knowledge creation (Popadiuk and Choo, 2006). In particular, the knowledge creation process is very important for innovation through supporting the selection and the implementation of new ideas, products or organisational developments, and

solving unexpected problems (Swan and Newell, 2000; Soo et al., 2004). Within this context, Teixeira (2000) highlighted the role of organisational knowledge to create innovative business opportunities. He argued that creating organisational knowledge can manage ambiguity and uncertainty within an organization. It can also help to understand customers' values and behaviour which could promote different types of innovation. By going through the SECI process in depth, Refaey (2002) demonstrated that just two processes of SECI (combination and externalisation) positively influence the innovation process in the Egyptian pharmaceutical sector. The study mentioned that the use of quality circles within this sector and the access of its databases enhance the development of new products.

Despite this, little was done in prior research to investigate the linkage between SECI and innovation, and studies did not go deeper in terms of the effect of each process (socialisation, externalisation, combination, and internalisation) on different kinds of innovation e.g. product and process innovation. Refaey (2002) was an exception; however, this was just one study and was conducted on the pharmaceutical sector, and, it is illogical to generalise these results to the banking sector (service). So, it still needs a deeper study to investigate this relation in general, and to highlight the impact of each process of SECI on both product and process innovation in the Egyptian banks, in particular. For this, other three questions have been addressed:

Q3: What are the aspects of innovation process within the Egyptian banking sector?
Q4: what is the effect of the SECI processes on innovation within the Egyptian banking sector?
Q5: what is the most important process of SECI to support innovation in Egyptian banking sector?

3. Methodology

3.1 Research methods

Both quantitative and qualitative methods were employed to achieve the research aims. In this term, the self administered questionnaires were concerned to investigate to what extend the Egyptian banks perform the SECI and innovation activities and the semi-structured face-to-face interview were concerned to provide more details about how the Egyptian banks perform these activities. The interview data aim to add further interpretation and meaning to the quantitative findings by discussing issues mentioned in the questionnaire in more detail. Predictive Analytics SoftWare (PASW) was used to analysis the quantitative data and content analysis technique was used for qualitative data.

3.2 Research population and sample

By the end of June 2009, the Egyptian banking industry has comprised 39 banks under the supervision of Central Bank of Egypt (CBE). This number included 37 commercial banks of which three banks are public, 27 private banks and seven off-share banks. In addition to two public specialised banks, those provide mid and long term financing to agriculture and real estate sectors (Central Bank of Egypt, 2009). The three commercial public banks have the large share of the Egyptian banking financial indicators. For example, these three banks accounted for 46% of the Egyptian banking sector's total deposits and 38% of the total loans in 2008/2009 (CAMPAS, 2010). The sample comprised two kinds of commercial banks, namely public and private banks. The study excluded both the offshore and specialised banks. Offshore banks were excluded as they follow their home country's rules relative to the Egyptian rules. The specialised banks were excluded because they do not provide banking services but they provide mid and

long term loans to the agriculture and real estate sectors. A total of 450 questionnaires were distributed to 12 banks (the three public and 9 private banks). A total of 237 questionnaires were returned (a 52.7% response rate). Twenty-seven of these were excluded due to incomplete answers.. Of the sample here, 210 responses were valid. In addition, 26 semi-structured face-to-face interviews were conduced in these banks.

4- Discussion of findings

4-1 Quantitative data

The questionnaire quality was investigated by employing validity and reliability tests. They pointed out that all the research variables were well factored and reliable. With the first step of data analysis, the analysis of descriptive statistics highlighted a high degree of agreement of respondents regarding the questionnaire's items. It is obvious that there is a high percentage of agreement for both the SECI variable and innovation. This is because the banking sector is normally working in a highly competitive environment and all banks follow policies to improve their operations and to increase their market share. This could suggest that the Egyptian banks follow promised policies in terms of the SECI processes and innovation. The factor analysis pointed that internalisation is the most important process of SECI in Egyptian banking as it has the highest eigenvalue relative to other factors followed by combination, externalisation, and finally socialisation. The results of the multiple regression test indicated that the SECI processes whether separate or as a whole, positively influenced the innovation process within Egyptian banks and also indicated that the internalisation process had the most influence on innovation, followed by the combination, externalisation and socialisation processes, respectively; also the integration between all four SECI processes was highly effective in supporting innovation.

4-2 Qualitative data:

The interview data aims to add further interpretation and meaning to the quantitative findings by discussing issues mentioned in the questionnaire in more detail. The following is the findings of these interviews.

4.2.1 The use of SECI in banks by Egyptian banking

The following table illustrates the major aspects of SECI process within Egyptian banking sector

Table 1: Aspects of SECI processes within Egyptian banking

	Tacit	**Explicit**
Tacit	**Socilisation** Face-face discussions through: - Formal and informal meetings. - Seminars, workshops and training programs. - Social activities outside workplace. - Personnel rotation across departments. - Daily deal with customers. - Dealing with the partners and government representatives.	**Externalisation** Documenting tacit knowledge through: - Issuing useful reports about the relevant externals - Using expert advice for setting the training program topics , - Asking staff to write reports about the results of their negotiation with customers - Documenting the findings of meetings, seminars, workshops and training programs.
Explicit	**Internalisation** Conversing explicit knowledge into tacit knowledge through: - Encouraging staff to study related courses. - Free access for outcomes of training programs, seminars, meetings and databases - Arranging meetings to explain the content of related reports and documents.	**Combination** Transferring the explicit knowledge to more proper form through: - Using the updated instructions and reports to update their databases - Circulating all these updates to all staff via emails and the periodic reports/bulletins. - Translating the relevant managerial and banking consultants/studies issued by the foreign experts.

4.2.1/1 Socialisation

It was clear that interviewees suggested some limitations that minimized the benefit of socialisation process within banks. For example, some negative feedbacks were given regarding the benefits of sharing knowledge with the academic experts and the benefits form applying personnel rotation policy especially for the important jobs and for the hard workers staff. It was also apparent that the benefit of sharing knowledge between staff each other and customers during the social meetings was limited due to the limited number of these meetings, may be one or two times a year especially in Ramadan and to the limited number of staff and customers who are invited to these meetings. All of these negative feedbacks could be considered to interpret why the factor analysis marked socilaisation as the lowest important process among whole SECI processes in banks.

4.2.1/2 Externalisation

There were some limitations that minimized the benefit of externalisation process within banks. Externalization process was not available either for the external training programmes and

seminars/workshops or for individual customers. For external events, the benefits of discussions conducted in these events are limited to the staff who attended these events not for all staff, and similarly the benefits of discussions with individual customers are limited to the tellers not all staff. By ignoring the documentation of these discussions banks missed the chance to circulate valuable knowledge for all staff and reduced the benefit of externalisation process in general. All these negative findings could be considered to interpret why the factor analysis marked externalisation as the second rank before socialisation in terms of the lowest important process among all SECI processes in banks.

4.2.1/3 Combination

Although banks neither formulate reports and instructions issued by the head offices and CBE nor issue any reports about their competitors' publications, they got substantial benefits from the other combination mechanisms. Such these mechanisms were the continuous updating of their databases/websites based on the related instructions, reports and publications and circulating these updates for all staff via emails and periodic reports/bulletins. Therefore, these findings appreciate the importance of combination process with Egyptian banks and are considered to interpret why the factor analysis ranked combination after internalisation in terms of the highest important process among all SECI processes in banks

4.2.1/4 Internalisation

The results highlighted that banks in Egypt strongly supported considerable amount of internalisation mechanisms such as allowing staff to access outcomes of training programmes/seminars and bank's databases and arranging meeting to explain the content of related reports and documents. Banks also supported staff to attend the more practical courses and accordingly give them the chance to get the hard or electronic materials of these courses. Although this support was not fully for the more academic (postgraduate) courses, interviewees still informally commence these courses and get good knowledge from the material of these courses. These findings strongly show the importance of internalisation process within Egyptian banks and are considered to interpret why the factor analysis showed that internalisation is the most important process of SECI in banks.

4.2.2 The aspects of innovation in the Egyptian banking

Regarding the product innovation, the interviewees referred to customers and competitors and staff as main sources for generating new ideas and they highlighted how the bank' management deal with these ideas. Next, they presented some examples of recent banking products and services such as Master and Visa cards, retail banking, corporate banking, SME banking and Islamic banking. Interviewees also highlighted that process innovation was represented in producing administrative and technological innovations which strongly enhanced Egyptian banks to develop their processes and to be customer oriented. In general, it was clear that IT technology strongly supported all SECI and innovation processes. IT technology supported SECI through the internet, the intranet, personal emails and electronic materials and databases. Also this technology enabled banks to produce new products/services for customers ATM cards, internet cards, electronic branches and signatures and online banking service. IT technology enabled banks to develop their processes through applying advanced banking software/systems such as Temenos, Globus, Alex-cube and Tokay.

4.2.3 The relationship between SECI and Innovation

The regression findings also showed that the SECI processes, whether they are separate or as a whole, positively influenced the innovation process within Egyptian banks. These findings considered that the effect of SECI on innovation is reflected in the process of generating ideas related to services, products and processes. They added that their role is confined to producing new ideas and the top management is the body in charge of implementing these ideas after conducting further analysis. The following part discusses the relationship between each of SECI processes and the innovation process in more detail.

4.2.3/1 Socialisation and innovation

The interviewees explained that the discussions between each other and with their managers held through workshops, training programmes or in the bank hall, or through the social events such as Ramadan breakfast gatherings that give the chance for all bank staff to share their knowledge all help to solve problems and to improve their bank's processes and services. They also explained that their discussions with their colleagues from other banks through the external training programmes and workshops gave them the chance to know the updates in these banks. This helped them to build new notions that could be related to their bank's products, services and processes. Similarly, interviewees confirmed that the discussions conducted between them and the internal and external experts provided them with the experience of how to deal with different situations with an open mind and how to introduce constructive ideas to develop the bank performance. Finally, they opined that their discussions with customers through the daily dealing and the social meetings, such as Ramadan breakfast, allow them to share their suggestions for developing bank performance.

4.2.3/2 Externalisation and innovation

The interviewees confirmed that documenting the findings of discussions with the internal and external bodies is the basis of generating ideas. These documents provide the necessary data and information that enhance building new ideas and were considered as valuable memory that enable the staff to recall anything from the past. Documents were also considered as the indicator of the last innovations and the start point of producing something new.

Externalisation can act as a kind of independent path for employees influence in the face of their lack of power generally in the banks. Employees informally use the documented knowledge as a guide to achieve their job professionally.

4.2.3/3 Combination and innovation

The interviewees considered the importance of reforming the related reports and publications is necessary to complete the daily work and to update their knowledge. They opined that updating knowledge is the first step in innovation as it is difficult to depend on the old reports in order to generate new ideas. They also highlighted that the reports issued about the competitors' performance are used as basis to develop their bank's products and processes.

4.2.3/4 Internalisation and innovation

The interviewees explained that reading the training group and seminar findings or the postgraduate materials provided them with new knowledge and gave them the chance to be aware of the scientific and professional updates. This helps them to develop their skills and to look to the problems based on philosophy and open minded points of view that enable them to produce innovative solutions. The interviewees also mentioned that discharging the published reports about competitors is a good chance to know how they think and what they produce and accordingly suggest new ideas and products. They also mentioned that the easy access of their

banks' databases enabled them to be aware of all related issues and accordingly to produce valuable ideas to improve their banks' performance.

Although both quantitative and qualitative findings confirmed that each SECI process positively affects the innovation process, the findings highlighted that the effect share of each process is different. The multiple regression tests showed that socialisation process had the lowest effect on innovation (7.2%). This findings were confirmed when the factor analysis marked that socialisation process had the lowest share of importance among all SECI processes and when the interviewees suggested some important limitations that considerably minimised the importance of this process in banks as mentioned earlier. Examples of these limitations were the bias of applying personnel rotation policy, the limited number of social meetings and the lack of more academic training programmes value. Regression tests also marked the externalisation process as the second rank before socialisation in terms of the lowest important process of SECI and accordingly in terms of the lowest influence share on innovation (8.5%). In line with these findings, the interviewees mentioned that externalisation process was available neither for discussions of the external training programmes and seminars nor for the individual customers' suggestions and accordingly these limitations minimised the benefit of this process. In contrast, the quantitative findings highlighted that both internalisation and combination were the most important processes of SECI and accordingly they had higher effect on innovation (32% and 25% respectively). In line with these findings the interviewees appreciated their banks effort regarding these processes and just asked for more formal support to commence the postgraduate degrees and for more interpretation for the CBE's instructions to maximise the benefits of these processes.

Sample of References

Ahmed, B.K. & Jack, S.G. 2006, "A case study on knowledge management implementation in the banking sector", *VINE*, vol. 36, no. 2, pp. 211-222.

Ali, H. & Ahmed, N. 2006, "Knowledge management in Malaysian banks: anew paradigm", *Journal of Knowledge Management Practice*, vol. 7, no. 3.

Ali, H. & Yusof, Z. 2004, "Knowledge management in Malaysian banks: a study of causes and effects", *Information Development*, vol. 20, no. 3, pp. 161-168.

Andreeva, T. & Ikhilchik, I. 2010, "Applicability of the SECI model of knowledge creation in Russian Cultural context: Theoretical analysis ", *Knowledge and Process Management*, , pp. 1-11.

Aurum, A., Daneshgar, F. & Ward, J. 2008, "Investigating knowledge management practices in software development organizations– An Australian experience", *Information and Software Technology*, vol. 50, no. 6, pp. 511-533.

Cabera, L. 2008, "Knowledge creation and knowledge creator within the Cuban higher education system", *The International Journal of Cuban Studies*, vol. 1, no. 1.

Calabrese, F. A. & Remshard, J. Ann 2006, "Knowledge organization in the Twenty-first century: a suggested systems approach to a KM solution for improving an internet bank's customer response", *The Journal of Information and Knowledge Management systems,* vol. 36, no. 2, pp. 125-135.

Central Bank of Egypt 2009, *The monthly statistical bulletin N. 148*, Central Bank of Egypt, Egypt.

Central Agency for Public Mobilisation and Statistics (CAMPAS) 2010, *Economic bulletin for commercial banks*, CAMPAS, Egypt.

Central Bank of Egypt 2009, "Economic review: 2007/2008", *Economic review*, [Online], vol. 48, no. 3. Available from: www.cbe.org.eg.

Central Bank of Jordan 2008, , *Knowledge management in central bank of Jordan* [Homepage of Central bank of Jordan], [Online]. Available: www.cbj.gov.jo/.

Chong, S.C., Wong, K.Y. & Lin, B.S. 2006, "Criteria for measuring KM performance outcomes in organisations", *Industrial Management & Data System,* vol. 106, no. 7, pp. 917-936.

Egypt State Information Service 2008, "Chapter 6: Economic development and investment" in *Book 2008* Egypt State Information Service, Egypt.

Eliufoo, H. 2008, "Knowledge creation in construction organisation: a case approach", *The Learning Organization,* vol. 15, no. 4, pp. 309-325.

Gleot, M. & Terziovski, M. 2004, "Exploring the relationship between knowledge management practices and innovation performance", *Journal of Manufacturing Technology Management,* vol. 15, no. 5, pp. 402-409.

Glisby, M. & Holden, N. 2003, "Contextual constraints in knowledge management theory: the cultural embeddedness of Nonaka's knowledge –creation company", *Knowledge and Process management,* vol. 10, no. 1, pp. 29-36.

Haag, M., Duan, Y. & Mathews, B. 2010, "The impact of culture on the application of the SECI model" in *Cultural Implications of Knowledge Sharing, Management and Transfer: Identifying Competitive Advantage*, ed. D. Harorimana, Hershey, PA: Information Science Reference, , pp. 26-47.

Haggie, K. & Kingston, J. 2003, "Choosing your knowledge strategy'", *Journal of Knowledge Management Practice.*

Hyun-Soo Lee & Yung-Ho Suh 2003, "Knowledge conversion with information technology of Korean companies", *Business Process Management Journal,* vol. 9, no. 3, pp. 317-336.

Kamtsiou, V., Naeve, A., Stergioulas, L.K. & Koskinen, T. 2006, "Roadmapping as a knowledge creation process: The prolearn roadmap", *Journal of Universal Management,* vol. 1, no. 3, pp. 163-173.

Karkoulian, S., Halawi, L.A. & McCarthy, R.V. 2008, "Knowledge management formal and informal mentoring: An empirical investigation in Lebanese banks", *Learning Organization, The,* vol. 15, no. 5, pp. 409-420.

Lamb, E.C. 2001, "Knowledge management: how to mine the information treasures inside your bank. A tale of measuring and managing the potential within", *Community Banker,* vol. 10, no. 9, pp. 24-36.

Li, Y., Huang, J. & Tsai, M. 2009, "Entrepreneurial orientation and firm performance: The role of knowledge creation process", *Industrial Marketing Management,* vol. 38, no. 4, pp. 440-449.

Martín-de-Castro, G., López-Sáez, P. & Navas-López, J.E. 2008, "Processes of knowledge creation in knowledge-intensive firms: Empirical evidence from Boston's Route 128 and Spain", *Technovation,* vol. 28, no. 4, pp. 222-230.

Mizintseva, M. & Gerbina, T. 2009, "Knowledge management practice: application in commercial banks (a review)", *Scientific and Technical Information Processing,* vol. 36, no. 6, pp. 309-318.

Nonaka, I. & Takeuchi, H. 1995, *The knowledge – Creation Company: How Japanese Companies Create the Dynamics of Innovation,* Oxford University Press, New York.

Nonaka, I., Toyama, R. & Hirata, T. 2000, "SECI, ba and leadership: a unified model of dynamic knowledge creation", *Long Range Planning,* vol. 33, pp. 5-34.

Nonaka, I., Toyama, R. & Voelpel, S. 2006, "Organizational knowledge creation theory: Evolutionary paths and future advances", *Organizational studies,* vol. 27, no. 8, pp. 1179-1208.

Nunnally, J. 1978, *Psychometric Theory,* McGraw-Hill, New York.

Popadiuk, S. & Choo, C. 2006, "Innovation and knowledge creation: how are these concepts related?", International *Journal of Information Management,* vol. 26, no. 4, pp. 302-312.

Refaey, M. 2002, "Knowledge management: evaluating the role of socialization, externalization, internalization and combination processes and its effect on the innovation Process- a field study on the pharmaceutical sector in Egypt", *Commercial Studies & Researches Journal, Faculty of Commerce-Banha (Egypt),* vol. 2, pp. 30-53.

Ribiere, V. & Chou, C. 2001, "Knowledge management in the banking industry", *2nd European Conference on Knowledge Management (ECKM)* Bled, Slovenia, pp. 1-21.

Rice, J. & Rice, B. 2005, "The applicability of the SECI model to multi- organisational endeavours: an international review", *International Journal of Organisational Behaviour*, vol. 8, no. 8, pp. 671-682.

Rodrigues, L.L.R., Gayathri, R.S. & Rao, S. 2006, "Empirical study based evaluation of KM models in the IT sectors: implications for quality outcomes", *Journal of Knowledge Management Practice*, vol. 7, no. 3.

Shih, K., Chang, C. & Lin, B. 2010, "Assessing knowledge creation and intellectual capital in banking industry", *Journal of Intellectual Capital*, vol. 11, no. 1, pp. 74-89.

Soo, C.W., Midgley, D. & Devinney, T.M. 2002, "The process of knowledge creation in organizations", *Organization Science*, pp. 1-42.

Swan, J. & Newell, S. 2000, "Linking knowledge management and innovation", *European Conference on Information Systems*, ed. 598, Vienna, pp. 591.

Teixeira, J. 2000, "Applying design knowledge to create innovative business opportunities", *Institute of Design - Illinois Institute of Technology*, .

Tsai, M. & Li, Y. 2007, "Knowledge creation process in new venture strategy and performance", *Journal of Business Research*, vol. 60, pp. 371-381.

Weir, D. & Hutchings, K. 2005, "Cultural embeddedness and contextual constraints: knowledge sharing in Chinese and Arab cultures", *Knowledge and Process management*, vol. 12, no. 2, pp. 89-98.

Wu, C. 2008, "Knowledge creation in a supply chain", *Supply Chain Management: An international Journal*, vol. 13, no. 3, pp. 241-250.