



**UNIVERSITY OF
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**KNOWLEDGE MANAGEMENT AND THE SECI
MODEL: A STUDY OF INNOVATION IN THE
EGYPTIAN BANKING SECTOR**

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Declaration

This thesis is submitted in fulfilment of requirements for the degree of Doctor of Philosophy in Stirling Management School at the University of Stirling, Scotland, United Kingdom. I declare that this thesis is based on my own original work except for quotations and citations which I have duly acknowledged. I also declare that this thesis has not been previously or concurrently submitted, either in whole or in part, for any other qualification at the University of Stirling or other institutions. I am responsible for any errors and omissions present in the thesis.

Signed
Nasser Easa

February 2012

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Abstract

The emergence of knowledge management (KM) as a practical business discipline is connected to the growing realisation that knowledge is an essential resource for organisations to retain sustainable competitive advantages. The SECI model, proposed by Nonaka and Takeuchi (1995) best embraces the nature of KM and of knowledge conversion. This model uses four processes of knowledge conversion: socialisation, externalisation, combination and internalisation to create knowledge in organisations. A review of the relevant literature, however, suggests that the application of the SECI model is suffering from a lack of research in banking, even though this is a knowledge-intensive industry. Since the model was driven from Japanese values, the applicability of the model in different cultural contexts is also arguable.

This study aims to examine the use of the SECI model in Egyptian banks and its effect on the innovation process. To examine the model in a different cultural context, Egypt as the biggest Arab country was a suitable research site. Both quantitative and qualitative methods were employed to achieve the research aims. The qualitative data were used to triangulate the quantitative data by detailing the SECI conversion process, and its relation to innovation. Two hundred and ten self-administered questionnaires were used to investigate to what extent Egyptian banks perform the SECI and innovation activities, and 26 semi-structured face-to-face interviews provided details about how the Egyptian banks perform these activities. The survey data were analysed by using Predictive Analytic SoftWare (PASW). Different types of statistical applications were used, namely factor

analysis, Cronbach' alpha, descriptive analysis, multiple regression, *t*-test and one-way ANOVA. Content analysis was used to analyse the interview data were by looking for noticeable patterns to be connected to the research framework.

The findings indicate that the SECI processes were used for knowledge creation in Egyptian banks. However, some self-imposed limitations minimised the benefits of the socialisation and externalisation processes in creating and sharing knowledge. In contrast, internalisation and combination faced fewer limitations, revealing that Egyptian banks focus more on formal rather than informal knowledge. Therefore, the study supports the view of the model as being universal, but the use of each process is subject to the cultural context, leadership support, and types of task. The findings also suggest that the SECI processes - whether separate or as a whole - positively influence the innovation process by increasing the generation of ideas for banking services, products and processes. The internalisation process had the most positive influence on innovation, followed by the combination, externalisation and socialisation processes respectively. Many of the product and process innovations in the last few years were due to the introduction of new technologies.

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Chapter 1

Introduction

1.1 Background of the study

The rapid development of information technologies and communication networks has advanced the importance of knowledge in economic development (Beijerse, 2000; Carrion, et al., 2004; Tseng, 2010). Knowledge has been recognised as an essential resource for an organisation to retain/develop sustainable competitive advantages (Drucker, 1993; Wiig, 1997). Knowledge, like many variable and ambiguous ideas, contains a variety of emphases and themes including formal-informal, internal-external, personal-organisational, tacit-explicit, and human- or technology-oriented. It can be also seen from economical, technology or organisational perspectives (Earl, 2001; Wiig, 1997). Therefore, trying to establish an effective approach to managing knowledge can be difficult for organisations in terms of what types of knowledge are available and how far knowledge can be accessed and shared. The notion of knowledge management (KM) has attracted a wide range of researchers and has been investigated both theoretically (Bose, 2004; Davenport and Prusak, 2000; Hansen et al., 1999; Nonaka, 1994; Wiig, 1997) and practically (Choi and Lee, 2003; Chong et al., 2007; Martin-de-Castro et al., 2007; Oliver and Kandadi, 2006; Smith, 2004).

Theory and practice have centred on the uses KM as the basis of innovation (Batiz-Lazo and Woldesenbet, 2004; Drucker, 1993; Markatou, 2010; Nonaka and Takeuchi, 1995). When knowledge is transferred among groups within the organisation, existing ideas from

one group may appear novel to another, and vice versa, resulting in potentially new products/services or solutions (Dougherty et al., 2002; Hargadon and Sutton, 1997). KM helps also to decrease the resistance to change problems which are the main barriers to the innovation process (Scarborough (2003). Innovation gives companies a competitive advantage by increasing and sustaining a high performance, and by attracting new customers and retaining the existing ones (Cooper, 1998; Gopalakrishnan and Damanpour, 1997). It is reported that successful companies produce 75% of their revenues from new products or services that did not exist five years ago (Smith, 2006). Therefore, it is a major concern for both academics and businesses (Xu et al., 2010) to turn the available knowledge into innovations and to market them successfully.

Taking the organisational approach of KM as the main focus, Ikujiro Nonaka is one of the leading management scholars to make an impact on KM (Earl, 2001). Arguably the model that best embraces the nature of KM is one that Nonaka and Takeuchi (1995) proposed as the SECI (socialisation, externalisation, combination, and internalisation) model. This model of tacit and explicit knowledge conversion was built on Polanyi's (1966) work on "personal knowledge", which suggested that knowledge resides chiefly in the minds of individuals. The model focuses on transferring the personal knowledge into organisational forms by connecting it to an organisation's knowledge system, and is considered to be the central model of organisational knowledge creation in part because it brings together a wide range of KM processes such as generating, codifying, transferring and utilising knowledge (Aurum et al., 2008; Grant and Grant, 2008; Haggie and Kingston, 2003; Mikic et al., 2009; Rice and Rice, 2005). Other influential KM models were produced by

Davenport and Prusak (2000), Bose (2004) and Hansen et al. (1999), but they lack certain knowledge processes available in the SECI model. Therefore, due to its comprehensiveness the SECI model was chosen for this study.

1.2 Focus of the Study

The application of the SECI model has been empirically tested in different business contexts such as the IT sector as well as the manufacturing, high-tech and service sectors (Cabrera, 2008; Eliufoo, 2008; Kamtsiou et al., 2006; Li et al., 2008; Lopez-Saez et al., 2010; Martin-de-Castro et al., 2008). All these studies suggested that the integration of all the SECI processes improved the general performance in organisations. Unfortunately, these studies did not show the application of each SECI process in specific business contexts and particularly not in banking which has a huge influence on the global economy.

Banking is also a major knowledge-intensive industry as it has a relatively large share of jobs where employees report complex tasks, problem-solving, learning new things on the job and computer and internet use, and a relatively low share of people reporting monotonous work (Miles, 2011). Therefore, banks need to become efficient in KM to preserve and leverage knowledge in banking operations (Chatzoglou and Vraimaki, 2009; Lamb, 2001; Mizintseva and Gerbina, 2009). Banks have a strong relationship with customers and a huge customer base through their extensive branch networks. If banks wish to offer appropriate products and services, they need to acquire customer knowledge and develop their services and products to meet customer expectations. Therefore, the proficiency of acquiring and utilising knowledge is the engine driving the ability of banks

to produce value for customers (Ping and Kebao, 2010; Ribiere and Chou, 2001; Shih and Lin, 2010).

The few studies available indicated that SECI processes were applied differently in different banks. The role of SECI processes in global banks was different from one country to another (Ali and Ahmed, 2006; Kubo et al., 2001, Mizintseva and Gerbina, 2009). For example, it was found that Tiger and Camel banks in Malaysia focused more on the externalisation process, while Michiko and Tokyo Mitsubishi banks in Japan focus more on the socialisation process. It was therefore necessary to initiate a comprehensive study to provide a clearer understanding of the aspects of each SECI process in banks.

As well as the industry or sector focus, there are issues about the applicability of the SECI model in different cultural contexts. Since the use of the SECI model in banks was based on a Japanese cultural context, it was decided to investigate the implications/application of the SECI model in the Arab world, a region comprised of 23 countries which are strongly shaped by Islamic culture, where little research has been done so far. Egypt, as the biggest Arabic country by population, was a suitable site for this research. The first aim of this study is to contribute to the debate of the universal application of the SECI model in different business and cultural contexts by investigating the use of the SECI model and processes in the Egyptian banking industry.

Studies looking at knowledge creation processes suggested that all SECI processes strongly support innovation (Bueno et al., 2008; Darroch and McNaughton, 2002; Lee and Choi, 2003 Richtner and Ahlstrom, 2010; Xu et al., 2010). However, studies investigating the

relationship between each process of SECI indicated that not all had the same effect on innovation and that some might even have had a negative effect (Ng et al., 2011; Refaey, 2002; Schulze and Hoegl, 2008). It was also suggested that innovations in developing countries could be novel for those countries and/or for the region but not necessarily for the whole world. Therefore, it was decided to first explore the nature of the innovation process in the Egyptian banking sector, and then to investigate the relationship between each process of SECI and innovation.

The following research questions will be addressed in order to achieve the research aims:

- How is the SECI model and processes applied in the Egyptian banking industry?
- What is the nature of the innovation process in the Egyptian banking industry?
- What is the effect of the SECI model on innovation within the Egyptian banking industry?

1.3 Structure of the study

This thesis comprises eight chapters. Following this Introduction, **Chapter 2** provides a review of the literature on the concepts of knowledge and knowledge management and their application in the SECI model. In this chapter the difference between data, information and knowledge, and knowledge types and dimensions is discussed first, followed by an overview of knowledge management concepts, processes and their importance for organisations. Finally, the chapter presents the SECI model and provides a critical analysis of the model.

Chapter 3 provides a review of the literature on the application of the KM and SECI model in relation to innovation and banking. The chapter consists of two main sections. The first section is a discussion of the concept of innovation, types of innovation, product and process innovation, and the relationship between KM and innovation in general, and SECI and innovation in particular. The second section provides a framework for the research on knowledge management in the banking industry, including the World Bank and several banks in developed and developing countries, and comments on the use of the SECI model in this industry.

Chapter 4 explains the research questions, construction of variables and research methodology. The research questions and hypotheses are presented based on gaps that exist in the literature such as the application of the SECI model in the banking industry and its relation to innovation, especially in developing countries. Then, the research variables and their measurement are discussed, followed by research strategies and methods of data collection. The chapter justifies a mixed approach (quantitative and qualitative) to exploring the SECI model and innovation in the Egyptian banking industry, and how the qualitative data (interviews) will be used to detail and triangulate quantitative data (survey). The remaining sections in this chapter focus on the process of collecting and analysing data including the pilot testing, justification of the quality of research instruments, sampling process and explanation of quantitative and qualitative data analysis techniques used, followed by details of the research community.

Chapter 5 presents the results of the quantitative data collected from 210 respondents in twelve Egyptian commercial banks, including all the three public banks and nine private. In line with the large share of public banks in relation to banking activities and their wide spread across the country, the sample was structured to get one-third of respondents from these three banks and the rest from the nine private banks. Respondents' profiles show also that the majority were males and graduates or post-graduates, while all groups were well represented in terms of years of experience and job position. To consider the data for statistical analysis, the chapter discusses the preparation process, then the coding and labelling of data into a Predictive Analytics SoftWare (PASW) format. By ensuring the validity and reliability of the survey through factor analysis and Cronbach's alpha test, the proper statistical techniques e.g. frequency and percentage distributions and multiple regression are used to analyse the data. The frequency and percentage distribution are used to explore the SECI model and innovation, and regression is used to investigate the linkages between them. Finally, both independent *t*-test and one-way ANOVA test are used to examine the differences between the respondents' demographic groups.

Chapter 6 discusses the qualitative data collected from 26 interviews. It aims to add further interpretation and meaning to the quantitative findings by describing ways in which the SECI conversion processes, product and process innovations, and the effect of the SECI model on innovation were either limited or sustained. In this chapter, triangulation between quantitative and qualitative data is done. Findings of the factor analysis, frequency distributions and interviews are together connected to explore the application of each SECI process and product-process innovation in the Egyptian banks. Next, findings of multiple

regression are connected to interview findings to investigate the linkage between the SECI model and innovation.

Chapter 7 aims to ascertain how the research findings can contribute to KM, the SECI model and the innovation debate. The findings are discussed and compared to the literature to provide effective working patterns of the SECI model in banks. These findings are discussed in relation to the SECI framework and its application in different cultural and business contexts. The role of leadership in applying this model for enhancing innovation is explained. Related issues to innovation are also raised e.g. novelty of innovation and its relation to technology in developing countries.

Chapter 8 discusses the theoretical and practical implications of this study, together with its strengths, limitations and challenges and offers suggestions for further study. The chapter contributes, for example, to the debate and literature around the SECI model by suggesting that the SECI model of knowledge conversion is a universal model, but the use of each process is subject to the cultural context, leadership support, and types of task. Contributions are made with regard to the key resource of knowledge creation and the spiral process of knowledge conversion. The chapter also provides some practical implications of using the model to enhance innovation in developing countries, especially in banking. On the basis of research limitations and challenges, suggestions for further work have been made.

Chapter 2

Knowledge, Knowledge Management and the SECI Model

Knowledge has been recognised as an essential resource for an organisation to retain sustainable competitive advantages (Drucker, 1993; Wiig, 1997). The growing importance of knowledge has encouraged managers to pay greater attention to managing this knowledge effectively (Choi et al., 2006). The emergence of knowledge management as a practical business discipline may be connected with Nonaka's SECI model of knowledge conversion that built on Polanyi's ideas of personal knowledge being organisational and practical (Mikic et al., 2009). The SECI model suggests that organisational knowledge can be created by amplifying the individual knowledge to be a part of the knowledge network of the organisation by converting the tacit knowledge into explicit and moving knowledge from the individual to the group, organisational and inter-organisational levels (Nonaka and Takeuchi, 1995). By considering people, processes and technology to convert knowledge across these four levels, this is arguably a highly integrative KM approach bringing together a wide range of knowledge processes e.g. generating, codifying, transferring and utilising knowledge (Aurum et al., 2008).

This chapter provides an overview of the concepts of knowledge and knowledge management and their application in the SECI model. A variety of academic databases and sources were used to review the relevant literature such as Emerald, Google Scholar, Science Direct, Business Source Premier and Institute for Scientific Information (ISI) Web

of Knowledge. In the chapter the difference between data, information and knowledge, and knowledge types and dimensions is discussed first, followed by an overview of knowledge management concepts, processes and their importance for organisations. Finally, the chapter highlights the SECI model and provides a critical analysis of the model.

2.1 Data, information and knowledge

Before discussing wider issues related to knowledge, it is important first to distinguish between data, information and knowledge concepts. The three concepts are interrelated and can be arranged on a single continuum depending on the extent to which they reflect human involvement with, and processing of, the reality at hand (Tsoukas and Vladimirou, 2001). This means that data require minimal human judgment, whereas knowledge requires maximum judgment. Judgement arises from the self-conscious desire to reorder, rearrange and redesign what is known and thus create new angles of vision or new knowledge for a particular purpose (Pham, 2008). The generally accepted view treats data as perhaps a row of numbers whereas information is data in context; knowledge is information that is accumulated and organised in a meaningful way (Zack, 1999).

In this regard, Wallace (2007) referred to data as facts about the state of the world, to information as data that are endowed with meaning and purpose, and to knowledge as information that is connected to relationships. Data refer to the events that people notice, while information provides meaning by evaluating data in an interpretive framework. Knowledge involves the experience that enables people through available data and information to be aware of some things, to know how to do things or to cause things to

happen. Knowledge makes both data and information manageable (Beijerse, 2000; Fuller, 2002; Grant and Grant, 2008; Hicks et al., 2007; Nonaka et al., 2000; Sanchez, 2003). Therefore, Davenport and Prusak (1998, p. 5) defined knowledge as “a fluid mix of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information”.

In this sense, the distinction between data, information and knowledge in business is also often made. Sanchez (2003, p.5) stated that data are regarded as representations of events that people notice and bring to the attention of other people in the organisation, and information is the meaning that is imputed to those data. Meaning is driven through comparison of data, and knowledge is a set of beliefs about causal relationships in an organisation. In organisations, knowledge often becomes embedded not only in documents and repositories but also in organisational routines, processes, practices and norms (Wallace, 2007).

In summary, data might include statistics, lists of items, and personal details. When data are organised in a logical, cohesive format/context for a specific purpose, they become information. When information is analysed, processed, and placed in context, it becomes knowledge. Knowledge involves making inferences and recognising unusual patterns, hidden trends, and exceptions in the data and information. It is an elusive and complex process that requires an individual to make value judgments based on prior experiences and understanding of patterns (Gandh, 2004). However, the hierarchical linkage may also be

reversed if knowledge is to be converted into practical forms. Thus Tian et al. (2009) and Tuomi (1999) suggest that the hierarchy from data to information to knowledge could also form a spiral/cyclic mode. They argue that when knowledge is articulated, verbalised and structured, it becomes information which, when assigned a fixed representation and standard interpretation, becomes data. Similarly, Alavi and Leidner (2001) suggest that information is converted to knowledge once it is processed in the minds of individuals, and knowledge becomes information once it is articulated and presented in the form of texts, graphics, or other symbolic forms.

2.2 Types of knowledge

There are different types of knowledge. A simple way to distinguish these types is by using the basic categories namely declarative or descriptive, procedural, and causal or reasoning (Holsapple, 2003; Zack, 1999). Declarative or descriptive knowledge describes an object, a concept that has a past, present, future or a hypothetical situation. This kind of knowledge can exist in the form of data and information. However, it can be interpreted as exceeding the limits of data and information, becoming knowledge in the light of other descriptive forms e.g. forecasting or setting goals. The second type, procedural knowledge, shows how something occurs or performs. It consists of a systematic method or technique or step-by-step explanation or instruction. Examples of these are strategic plans, training modules and methods and procedures. The final type is the causal or reasoning knowledge. This type of knowledge enables a higher level of cognitive functioning which involves giving an explanation or justification of why some event has occurred or when a particular situation

exists. This is based on logic, correlation, analogy and causality. Some examples of causal knowledge are an organisation's rules, policies, and forms of regulation.

In another context, knowledge can also be organisational or personal (Dulipovici and Baskerville, 2007; Leiter et al., 2007). Organisational knowledge is “the capacity members of an organisation have developed to draw distinctions in the process of carrying out their work, in particular concrete contexts, by enacting sets of generalisations whose application depends on historically evolved collective understandings” (Tsoukas and Vladimirou, 2001, p. 973). Personal knowledge is “the individual capacity to draw distinctions, within a domain of action, based on an appreciation of context or theory, or both” (Tsoukas and Vladimirou, 2001, p. 979). So, knowledge in general can be perceived as the product of the dynamic and continual relationship between “human agency”, practices of knowing and the organisational context (Konstantinou, 2008). In organisations, knowledge can also be internal or external (Earl, 2001; Frenz and Ietto-Gillies, 2009; Menon, 2003). Internal knowledge is obtained from internal sources such as: employees, R&D department, sales department, and production department. External knowledge is obtained from external bodies such as: experts, customers, suppliers and other organisations/institutions (Frenz and Ietto-Gillies, 2009; Lopez-Saez et al., 2010).

In this sense, the knowledge base of an organisation cannot simply be described as formal knowledge that can be found in contexts, training programmes, dealing with customers or formal information. It is also informal, tacit and taken for granted (Garvey and Williamson, 2002; Tsoukas and Vladimirou, 2001). Informal knowledge is personal and reflects

the education level, experience, and tacit understanding of individuals. It includes what its members have come to know in their jobs, what they have come to appreciate and understand about each other's strengths and weaknesses. It covers their attitudes towards their work and their willingness to work with and for one another (Tsoukas and Vladimirou, 2001). Informal knowledge can be developed and shared if there is trust, commitment, respect and loyalty between employees (Garvey and Williamson, 2002, p. 19). Therefore, organisations should support the social communities to build up these ethics (Tsoukas and Vladimirou 2001, p. 991).

With the variety of knowledge types, however, all these types are rooted and reside in the human mind, both tacit and explicit (Polanyi, 1966). Both components are fundamental, essential, and inseparable within the overall process of knowing (Brown and Duguid, 2001; Choi and Lee, 2003; Earl, 2001; Easterby-Smith and Lyles, 2003; Hansen et al., 1999; Laudon and Laudon, 2004; Nonaka and Takeuchi, 1995). Tacit knowledge is defined as knowledge that is “personal, context-specific, and therefore hard to formalise and communicate”, while explicit knowledge is defined as “knowledge that is transmittable in formal, systematic language” (Nonaka and Takeuchi, 1995, p. 59).

In practice, tacit knowledge is an intangible concept related to an individual's actions and experiences such as the ideas, values, expertise or emotions that he/she embraces (Nonaka and Konno, 1998). Therefore, tacit knowledge may best be transferred through interpersonal means and non-structured processes (Pham, 2008). In contrast, explicit knowledge is a tangible concept which can be documented and distributed to others such as

guidelines, reports, procedures, strategies and databases (Nonaka and Konno, 1998). Explicit knowledge is articulated and stored in certain media (Greiner et al., 2007). This suggests that explicit knowledge can be transferred through more technology-driven, structured processes such as information systems (Martensson, 2000). In brief, “informal internal knowledge, often called tacit knowledge, resides in the minds of the individual employees but has not been documented in structured form”, but “structured internal knowledge is often called explicit knowledge, such as product manuals or research reports” (Laudon and Laudon, 2004, p. 316).

With regard to the characteristics of tacit and explicit knowledge, both forms of knowledge could be regarded as separate and distinct. However, Brown and Duguid (2001) argue that there is hardly any practical distinction between tacit and explicit knowledge since they reflect dimensions of knowledge, rather than distinguishable types of knowledge. Polanyi (1966, p. 7) argued that “a sharp division between tacit and explicit knowledge does not existall knowledge is either tacit or rooted in tacit knowledge”. He pointed out that “we can know more than we can tell and we can tell nothing without relying upon our awareness of things we may be able to tell” (p. 16). Some writers reject Polanyi’s view by arguing that knowledge can be more or less tacit or it can be more or less explicit, but may not be fully explicit or fully tacit (Tsoukas, 1996; Winter, 1987). Tsoukas (2003) also argued that explicit knowledge is grounded in a tacit component and vice versa. This suggests that both tacit and explicit knowledge are complementary, as in the creative actions of people that interact with and influence one another (Johnson et al., 2002).

In summary, knowledge can initially be seen as rooted in the human mind and can be considered as a mix of experience, values and contextual information (Davenport and Prusak, 1998; Polanyi, 1966). It can also be viewed from different perspectives such as economical, technological or organisational (Earl, 2001; Wiig, 1997). In this study, knowledge has been seen primarily from the organisational perspective that aims to amplify individual knowledge to be a part of the knowledge network of the organisation (Nonaka and Takeuchi, 1995). In this sense, knowledge often becomes embedded in organisational artefacts such as documents and databases and also in wider organisational processes and practices (Gherardi, 2006; Wallace, 2007). To get most benefit from its overall store of knowledge an organisation should consider all of these knowledge sources as complementary (Johnson et al., 2002). However, knowledge also has to be understood as highly variable and ambiguous and to contain a variety of emphases and themes (Earl, 2001; Laudon and Laudon, 2004; Nonaka and Konno, 1998; Tsoukas and Vladimirou, 2001). Because of this variability combining and transferring knowledge is likely to be a complex process and subject to many constraints. The willingness to share knowledge may be challenged by different organisational structures and cultures and may need to be supported by specific knowledge strategies and efforts from management (Petrescu et al., 2010).

2.3 Knowledge management

Drucker (1993, p. 54) maintains that “knowledge has become the key economic resource and the dominant – and perhaps even the only source of competitive advantage”. The rapid development of information and communication technologies and networks has also advanced the importance of knowledge in economic development (Beijerse, 2000; Carrion, et al., 2004; Tseng, 2010). Therefore, organisations have to manage their knowledge in order to increase efficiency and effectiveness and to achieve competitive advantage (Holt et al., 2007; Singh et al., 2006). However, the above discussion showed that knowledge is a complex and uncertain concept. All types of knowledge are related to individuals’ actions and experiences which are normally different. Thus managing knowledge is going to be problematic and difficult to achieve.

Not all knowledge may be codified or transferred easily, therefore the capture of knowledge through action is more valuable (Dougherty, 2004). “Knowledge is embedded in ongoing practice, so capturing it requires the practices themselves to be organised somehow” (Dougherty, 2004, P. 35). Practice refers to how people actually get work done and their ability to put “know-what” into practice. Practice-based knowledge is produced continuously in situated action, as people draw on their physical presence in a social setting, on their cultural background and experience, and on sentient and sensory information. It is collective, since no person can know all the heuristics or principles involved, or possess all necessary experience. To manage practice-based knowledge, therefore, it is necessary to focus on the actual activities of work, to enable the situated activities through which people accomplish tasks, to foster skills of knowing and to

legitimise engaged participation in the practice (Wenger et al., 2002). In recent years, communities of practice (CoPs) have widely been recognised as a situated activity during which to acquire knowledge (Lin and Lee, 2012). Communities of practice are groups of people “who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger et al., 2002, p. 4). The rise of CoPs is in part due to the need to facilitate the dissemination of knowledge that does not transfer easily, through shared practice rather than through the codification of knowledge (Amin and Roberts, 2008).

2.3.1 KM perspectives

Research into knowledge management has grown rapidly in recent years (Bjornson, 2007; Darroch, 2005). According to Wiig (1997), the historic developments of economic activities, culminating in the information revolution and the revaluation of the importance of knowledge have led to today’s importance of KM. He pointed out that the need to focus on managing knowledge results from both economic and market-driven requirements created by customer demands and international competition. The idea of knowledge management has become important due to an increased awareness of the importance of knowledge for the organisation’s prosperity and survival, and the increased availability of IT to store, distribute and manage knowledge. In particular, the “knowledge-based view” of a company proposes knowledge as the key source for competitive advantage (Easterby-Smith and Prieto, 2008). Practically, knowledge management is seen as central to innovation and improvement that help organisations to compete (Alavi and Leidner, 2001; Earl, 2001).

Many organisations across the world have realised the significance of knowledge and imparted a strategic focus towards its effective management. For instance, Louis Gerstner, the chairman of IBM, stated that “the age-old levers of competition-labour, capital, and land are being supplemented by knowledge, and the most successful companies will be those that exploit knowledge about customer behaviour, markets, economies, and technology faster and more effectively than their competitors” (Oliver and Kandadi, 2006, p. 10). Bose (2004, p. 459) stated that “many organisations have embarked on programmes of KM in the last few years: a total of 80% of Fortune 500 Companies have KM staff; from 1997-2000, the Ford Motor Company saved \$914 million, mainly due to effective KM programmes; Chevron has saved \$650 million since 1991, while Texas Instruments has saved \$1 billion since it launched KM programmes in the mid-1990s”. The task of KM is never-ending as the external environment is always changing and companies need to change their market focus, strategies, technologies and management approaches (Kruger, 2008).

The broad stream of research on knowledge management has certainly increased the general understanding of the nature of knowledge in organisational contexts (Kalling, 2003). Ikujiro Nonaka and Thomas Davenport are the best known authors on the topic of KM (Choo, 2003) amongst the many management scholars and writers who were making an impact on KM (Earl, 2001). According to the Google scholar webpage on July 13, 2011, the two highest books cited in the KM academic literature are: *The Knowledge Creating Company* by Nonaka and Takeuchi (1995), which was cited 22452 times, and *Working*

Knowledge by Davenport and Prusak (2000), which was cited 9067 times. Both books offer a comprehensive framework on how organisations should manage their knowledge (Choo, 2003).

Nonaka and Takeuchi (1995) in particular are among the most influential authors building on Polanyi's work (Wallace, 2007). Nonaka and Takeuchi claim that the basis of organisational knowledge creation is the conversion of tacit knowledge into explicit knowledge and back again. They suggest that the production of new knowledge involves "a process that 'organisationally' amplifies the knowledge created by individuals and crystallises it as a part of the knowledge network of the organisation" (p. 59). Two sets of activities drive the process of knowledge amplification: converting tacit knowledge into explicit knowledge; and moving knowledge from the individual level to the group, organisational, and inter-organisational levels. Their model of organisational knowledge creation will be discussed in detail in the next section.

Davenport and Prusak (2000) argue that any organisation that wants to excel at managing knowledge will need to perform three KM processes well: generation, codification, and transfer of knowledge, (the next section will explain in greater detail that these processes are also included in Nonaka's model of knowledge conversion). **Knowledge generation** refers to activities that increase the stock of organisational knowledge. Five modes of knowledge generation are discussed: acquisition; dedicating resources; fusion; adaptation; and building knowledge networks. Organisations may acquire knowledge by hiring individuals, buying another organisation, or renting/leasing external knowledge. They may

also dedicate resources to the generation of knowledge by establishing units that undertake research and development. Knowledge generation normally occurs when individuals and groups with different specialisations and perspectives are fused to work on a problem or project. Knowledge generation is the result of organisations adapting to significant competitive, economic, or technological changes; the most important adaptive resources are employees who can acquire new knowledge quickly and who have the openness to learn new skills. Knowledge is also generated in informal networks of people in an organisation who share common work interests, face common work problems, and who are motivated to exchange their knowledge.

Davenport and Prusak (2000, p. 68) stated that the idea of **knowledge codification** “is to put organisational knowledge into a form that makes it accessible to those who need it. An example of this is the legal system in which laws and decisions that act as precedents are codified in many texts”. Knowledge codification turns knowledge into a code which makes it organised, explicit, transferable and easy to understand. Computer technology, e.g. Microsoft office or CD/DVD based systems can help to codify and transfer knowledge into written or recorded forms. Davenport and Prusak offer four principles that should guide the knowledge codification in organisations:

- Managers must decide what business goals the codified knowledge will serve.
- Managers must be able to identify knowledge existing in various forms appropriate to reaching these goals.
- Managers must evaluate knowledge for usefulness and appropriateness for codification.

- Codifiers must identify an appropriate medium for codification and distribution.

Davenport and Prusak point out that the codification of tacit knowledge is generally limited to locating someone with the knowledge, pointing the seeker to it, and encouraging them to interact. For example, a knowledge map (a directory or database) can be constructed to point to knowledge but does not contain it. Trying to turn knowledge into a “code” can sometimes defeat the purpose of communicating it. The challenge is to codify knowledge and still leave its distinctive attributes intact, putting in place codification structures that can change as rapidly and flexibly as the knowledge itself.

Regarding the **knowledge transfer** process, Davenport and Prusak (2000) argue that sharing and trading of knowledge occurs mainly through personal conversations, so places such as water coolers, talk rooms, knowledge fairs, and open forums become important venues for sharing formal and informal knowledge. They also suggest job rotation as another example of knowledge transfer. For example, in Japan it is common to rotate engineering executives into manufacturing and vice-versa so that managers have an understanding of the entire process of product development and production. Organisations essentially behave as knowledge markets, although cultural factors can slow down or even prevent the transfer of knowledge as well as omit some knowledge. Managers can encourage employees to transfer knowledge by building trust, commitment and loyalty to each other. Besides face-to-face interaction, electronic communication such as video conferencing is also useful to transfer knowledge. The terms of knowledge sharing and transfer have been used interchangeably in the literature of knowledge management (Antonova and Csepregi, 2011; Jonsson, 2008; Paulin and Suneson, 2011). “Many authors

and researchers have failed to provide a clear-cut definition for knowledge transfer and, at times, it has been discussed together with the term ‘knowledge sharing’ ” (Liyanage et al., 2009, p. 122).

Supporting the Davenport and Prusak view, Bose (2004) suggested six steps to represent the cyclical model of KM processes: creating knowledge; capturing knowledge; refining knowledge; storing/codifying knowledge; keeping knowledge updated and disseminating knowledge. Hansen et al. (1999) summarised these processes into two main strategies: a codification strategy, which aims to systematise and store the knowledge of a company and make it available to all staff; and a personalisation strategy which aims to support the flow of individuals’ knowledge in a company. However, it will be argued that the Nonaka’s model, as will be discussed in Section 2.7, contains the majority of KM perspectives mentioned by these scholars.

2.3.2 KM definition

KM has been researched from a human and technology perspective (Buono and Poulfelt, 2005; Easterby-Smith and Prieto, 2008). The human perspective focuses on the sense-making behaviours of individuals, on social relations and cultural factors when handling organisational knowledge, and frequently touches on fundamental questions about the organisation. The technology side focuses on the information processing and business information systems which are designed to manage knowledge. Key knowledge management technologies include IT infrastructures, data warehouses and virtual centres of expertise. Swan et al. (1999) argue that organisations that focus too much on IT to create a

network structure may limit the potential to encourage knowledge sharing across social communities. While IT is useful to provide a network to encourage sharing, face-to-face interaction is important for sharing tacit knowledge. Therefore, Swan et al. (1999, p. 262) suggest that organisations should focus more on encouraging active networking among dispersed communities, rather than relying on IT networks, because “IT-based tools and systems of KM create the structural networks but do not necessarily encourage the social networking processes so necessary for communication and sense making.....Technology can provide the network of links between geographically dispersed groups and individuals that enables effective knowledge sharing. However, knowledge is constructed from and through social relationships and interactions” (Swan et al., 1999, pp. 264, 272). However, human and technological perspectives are also seen to be complementary, giving rise to an integrated view which some authors have named “socio-technical” (Pan and Scarborough, 1999). This integrated perspective describes the organisation from both the technological and human views suggesting that IT and social factors are independent but interacting components (Easterby-Smith and Prieto, 2008).

In a broader sense, knowledge management is the fusion of people, processes and IT to produce radical and fundamentally new ways to create, share and retain knowledge (Bose, 2002). It is the people who create, share, and use knowledge, and who collectively comprise the organisational culture that nurtures and stimulates knowledge sharing. The success of KM initiatives depends upon people’s willingness to share knowledge. People normally talk to their co-workers before accessing a database or calling technical support staff when they need knowledge. Organisations must create an atmosphere that encourages

sharing knowledge. Processes are the methods to acquire, create, organise, share and transfer knowledge. Organisations have to:

- Perform knowledge audits to determine and locate the needed knowledge
- Collect best practice and lessons learned to share knowledge
- Encourage learning to facilitate the transfer and use of knowledge.

IT is the mechanism that stores and provides access to data, information, and knowledge created by people in various locations. Networks and telecommunications technology (e.g. emails, Lotus Notes and intranets) provide the means for people to gather, organise, store, and access explicit knowledge. This technology also enables people to share their tacit knowledge without being face to face. It increases the accessibility of knowledge, reduces the time and effort involved in sharing and facilitates the interaction with customers and staff.

Theoretical insights into how knowledge might be managed are available from several perspectives such as: economics, information technology, and organisations (Earl, 2001; Wiig, 1997). Thus KM is defined differently depending on which standpoint is taken. From an economic perspective, Davenport et al. (1998) describe knowledge management as an intellectual asset. From an IT perspective, Zack (1999, p. 46) defines knowledge management as “a managerial activity to develop new applications of information technology to support the digital capture, storage, retrieval and distribution of an organisation’s explicitly documented knowledge”. From an organisational perspective, Davenport and Prusak (1998) define knowledge management as a method that simplifies

the process of sharing, distributing, creating, capturing and understanding of a company's knowledge. In agreement with the last approach, Laudon and Laudon (2004, p. 315) characterised knowledge management as "the set of processes developed in an organisation to create, gather, store, transfer and apply knowledge". Also, Darroch and McNaughton (2002, p. 211) stated that "knowledge management is the management function that creates or locates knowledge, manages the flow of knowledge within the organisation and ensures that the knowledge is used effectively and efficiently for the long-term benefit of the organisation".

Therefore, taking the organisational approach as the main focus, definitions of knowledge management provide a picture of a process concerned with generating, sharing, capturing, codifying and storing, disseminating and using knowledge. Knowledge management occurs on individual, team, organisational and inter-organisational levels and brings together people, processes, culture and technology to fulfil its purpose. Arguably the model that best embraces the nature of KM is one that Nonaka and Takeuchi (1995) proposed as the SECI model. This model of tacit and explicit knowledge conversion can be considered as the central model of organisational knowledge creation and also assumed to bring together a wide range of KM processes such as generating, codifying, transferring and utilising knowledge. The conversion processes of the SECI model occur across all four levels: individual, group, organisational and inter-organisational by using people, processes and technology. However, the other KM models of Davenport and Prusak (2000), Bose (2004) and Hansen et al. (1999) do not encompass all of the knowledge conversion modes which are mentioned in the SECI model.

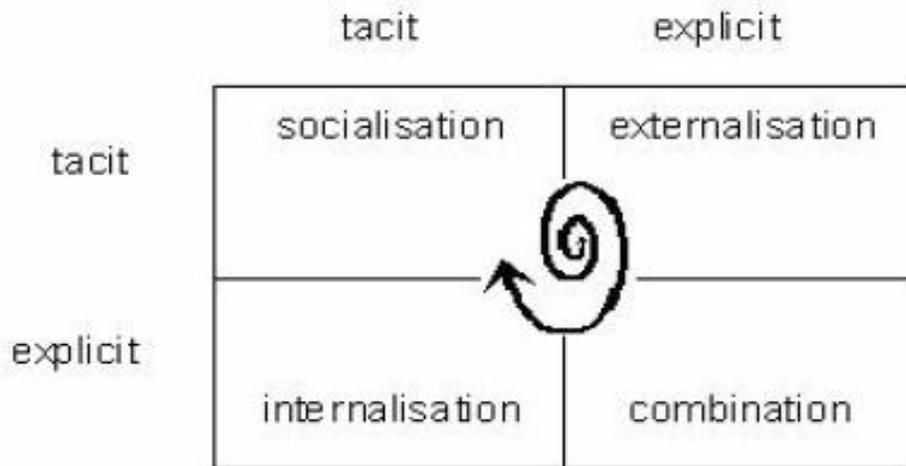
2.4 The SECI model of knowledge conversion

Nonaka and Takeuchi (1995) proposed the SECI (socialisation, externalisation, combination, and internalisation) model of knowledge conversion to describe the process of interactions between explicit and tacit knowledge. This model emerged in 1993, when Nonaka distributed 105 questionnaires to middle managers in different Japanese manufacturing companies such as Honda, Canon, Mazda, and Matsushita in order to explore how knowledge is created and can be converted (Nonaka, 1994). The factor analysis of the data suggested four modes of knowledge conversion based on the transformation of tacit and explicit knowledge. Nonaka labelled the mode of converting tacit knowledge into tacit as the socialisation process, the mode of converting tacit knowledge into explicit as externalisation process, the mode of converting explicit knowledge into explicit as combination process, and the mode of converting explicit knowledge into tacit as internalisation process (Nonaka, 1994).

Nonaka (1994) argued that new knowledge is essentially created in the transformation between tacit knowledge and explicit knowledge. And Nonaka and Takeuchi, (1995, p. 62) considered the SECI model as “the engine of knowledge creation” and argued that many Japanese companies used this model successfully to create new organisational knowledge. The model has a highly integrative KM approach, bringing together a wide range of knowledge processes including generating, codifying, storing, sharing and utilising knowledge (Aurum et al., 2008; Grant and Grant, 2008; Haggie and Kingston, 2003; Mikic et al., 2009). The SECI model represents a fusion of people, processes and IT (Alhawary

and Alnajjar, 2008; Bose, 2002; Nonaka and Konno, 1998; Smith, 2001). The following figure describes the four processes of the SECI model.

Figure 2-1: Nonaka’s model of knowledge conversion modes



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

The **socialisation** process converts existing tacit knowledge into new tacit knowledge through shared experiences which takes place through everyday social interaction and cultural processes linked to ongoing organisational activities (Martin-de-Castro et al., 2008). This connects it to theories of group processes and organisational culture (Nonaka and Takeuchi, 1995). Socialisation typically occurs in traditional apprenticeship type learning rather than through written manuals or textbooks and often takes place in informal social meetings outside the workplace, where tacit knowledge such as world views, mental models and mutual trust can be created and shared during interaction (Nonaka et al., 2000). “Interactions with customers before product/service development and after market introduction are, in fact, a never-ending process of sharing tacit knowledge and sharing ideas for improvement” (Nonaka and Takeuchi, 1995, p. 64).

The **externalisation** process articulates tacit knowledge into explicit knowledge, which happens when the firm expresses formally its internal rules of functioning or when it explicitly sets written organisational goals (Nonaka et al., 2000). Nonaka and Takeuchi (1995, p. 66) assumed that “among the four modes of knowledge conversion, externalisation holds the key to knowledge creation, because it creates new explicit concepts from tacit knowledge”. When tacit knowledge is made explicit, knowledge is “crystallised” allowing it to be shared with others and to become the basis of new knowledge such as concepts, images and written documents (Nonaka and Toyama, 2003). Documenting the outcomes of dialogue is an effective method to articulate one’s tacit knowledge and converting it into explicit knowledge. Reporting the outcomes of discussions during the training programmes/workshops between trainees each other and with their trainers, is an example of documenting dialogue. By documenting dialogue, contradictions between one’s tacit knowledge and the structure, or contradictions of tacit knowledge between individuals are made explicit and synthesised. Reporting employees’ discussions with internal and external bodies e.g. customers and experts is a clear example of documenting dialogue. The sequential use of metaphors is a basic method of externalising tacit knowledge. Metaphors assist individuals in explaining tacit concepts that are difficult to articulate by imaging this knowledge symbolically (Nonaka and Takeuchi, 1995). For example, during the development of Honda cars “the project leader Hiroo Watanabe and his team used a metaphor of ‘Automobile Evolution’. His team viewed the automobile as an organism and sought its ultimate form” (Nonaka and Takeuchi, 1995, p. 65).

The **combination** process converts already explicit knowledge into more systematic sets of knowledge. Through combination, explicit knowledge is collected from inside or outside the organisation and then combined and edited. The new explicit knowledge is then disseminated among the members of the organisation. Creative use of computerised communication networks and databases can facilitate this mode of knowledge conversion. In addition, the synthesis of knowledge may itself form new knowledge when, for example, the auditor of a company collects information from various departments and puts it together in a financial report. That report is now new knowledge in the sense that it is synthesized knowledge from various sources (Nonaka et al., 2000). In brief, the “reconfiguration of existing information through sorting, adding, combining and categorising of explicit knowledge (as conducted in computer databases) can lead to new knowledge” (Nonaka and Takeuchi, 1995, p. 67).

The **internalisation** process recycles explicit knowledge back into tacit knowledge, suggesting that we internalise explicit knowledge. Through internalisation, explicit knowledge is shared throughout the organisation and converted into tacit knowledge by individuals. Internalisation is closely related to “learning by doing” and/or organisational learning (Nonaka and Takeuchi, 1995). For example, training programmes can help trainees to learn new skills and understand more about their organisation and themselves. By reading documents or manuals about their jobs and the organisation, trainees can also internalise the explicit knowledge written in such documents to enrich their tacit knowledge base. In brief, “for explicit knowledge to become tacit, it helps if knowledge is verbalised or diagrammed into documents or manuals. Documentation helps individuals

internalise what they experienced, thus enriching their tacit knowledge. In addition, documents or manuals facilitate the transfer of explicit knowledge to other people, thereby helping them experience the experiences of others indirectly” (Nonaka and Takeuchi, 1995, p. 69).

As shown in Figure 2-1, Nonaka and his associates further suggested that the movement through the four processes of SECI forms a “spiral” by expanding horizontally and vertically across organisations (Nonaka et al., 2000; Nonaka and Toyama, 2003). They assert that the spiral starts with a socialisation phase, in which tacit knowledge of individuals is exchanged. This is followed by an externalisation phase, in which new tacit knowledge is translated into explicit knowledge. This explicit knowledge is pooled with existing explicit knowledge in the combination phase. The turn of the spiral concludes with the internalisation phase, in which this new explicit knowledge is absorbed by individuals and enriches their tacit knowledge base. Then the tacit knowledge is exchanged again, and the knowledge creation process continues along the spiral (Andreeva and Ikhilchik, 2011). Therefore, Nonaka et al. (2002, p. 12) concluded that “organisational knowledge creation is a never-ending process that upgrades itself continuously”.

2.5 The SECI model and organisational knowledge creation

Knowledge creation is basically “a process that produces new knowledge by accumulating and integrated existing knowledge” (Kao et al., 2011, p. 1037). Nonaka and Takeuchi (1995, p. 56) concluded therefore that the key to knowledge creation is the mobilisation and conversion of the tacit knowledge of individuals. Organisational knowledge creation is

defined as the process of making available and amplifying knowledge created by individuals as well as connecting it to an organisation's explicit knowledge system (Nonaka et al., 2006, p. 1180). Thus, Nonaka and Takeuchi (1995, p.57) argue that organisational knowledge is created by the interaction between tacit and explicit knowledge on the four levels of: individual, group, organisational, and inter-organisational, which represents the core of the SECI model. Accordingly, they consider the SECI model as the "engine" of the organisational knowledge creation process.

In SECI, individual knowledge is created by personal experiences through relationships with other individuals or generally with the external environment. Group knowledge is usually created through the combination of knowledge from individuals and from higher level systems represented at the organisational and inter-organisational levels. The organisation as a system is composed of several subsystems, groups or teams, which in turn are composed of several elements or individuals. At the organisational level, knowledge is captured internally from the organisation's individuals and groups (Gracia-Muina et al., 2002). Moreover, knowledge is also transferred beyond organisational boundaries, and knowledge from different organisations can be combined to create new knowledge (Nonaka et al., 2000). An organisation captures new knowledge at the inter-organisational level through continuous interaction with the environment represented by several bodies such as customers, suppliers, and the government.

Nonaka and Konno (1998) suggest that the shift from one level of knowledge creation to another goes through each of the four basic SECI processes. Socialisation is the process of

creating individual knowledge through the direct interaction between individuals, and with external bodies. Externalisation is a way to develop group knowledge from the individual knowledge of its members as well as create organisational knowledge by documenting tacit individual and group knowledge. Combination is a process that allows organisations to constitute a body of knowledge from knowledge owned by different groups and inter-organisational knowledge. Internalisation is the way by which organisational knowledge can be converted back into individual knowledge (Muina et al., 2002).

However, creating knowledge during the socialisation and externalisation processes can be problematic. According to Kao et al. (2011, p. 1041), socialisation and externalisation are important processes to express knowledge, however if people only conveniently provide and/or receive knowledge, this process does not ensure knowledge creation. They argue that successful knowledge creation occurs at the stage of combination and internalisation when the receiver combines and internalises the explicitly received knowledge, and finally generates new knowledge. Therefore, the knowledge creation process can not only depend on the characteristics of the individual, but has to rely on an environment that helps to stimulate creative intention to ensure success. To support dynamic organisational knowledge creation, Nonaka et al. (2000), Nonaka et al. (2003) and von Krogh et al. (2012) argue that the SECI processes of knowledge conversion needs platforms or areas in which knowledge is created; knowledge assets existing in an organisation; and a leadership that supports these knowledge creation constructs.

Nonaka and Konno (1998) state that the knowledge-creating process is “context-specific” in terms of time, space, and in relationship with others. Creating knowledge needs a place where information is given meaning through interpretation. To include the concept for such places specific to knowledge creation, they introduce the concept of *Ba* (which roughly means place). *Ba* is defined as a shared context in motion, in which knowledge is shared, created, and utilised. It can emerge in individuals, working groups, project teams, informal circles, temporary meetings, virtual space such as e-mail groups, and at the front-line with a customer (Nonaka et al., 2000). In other words, it is a concept that unifies physical space such as an office, virtual spaces such as books, manuals, memos, e-mails or teleconferences, and mental space such as shared experiences, ideas and ideals (Choo and Neto, 2010). In knowledge creation, especially in socialisation and externalisation, it is important for participants to share time and space through direct experience. So, a close physical interaction is important in sharing context and forming a common language among participants (Nonaka and Konno, 1998).

The SECI process emerges in *Ba* and is moderated by available knowledge assets which refer to the organisation-specific resources that are indispensable in creating value for the organisation. Knowledge assets are outputs, inputs, and moderating factors of the knowledge creation process (Nonaka et al., 2000, p. 21). For example, trust among organisational members evolves as an output of the knowledge creation process, and at the same time moderates how *Ba* functions as a platform for that process (von Krogh et al., 2012).

Leadership also provides important direction to the dynamic and emergent processes of knowledge creation (Nonaka et al., 2000; von Krogh et al., 2012). Creating and understanding the vision of the company, understanding the knowledge assets of the company, facilitating and utilising *Ba* effectively, supporting the direct contact and collaboration between employees, and managing the knowledge spiral are important roles that managers have to play (Nonaka et al., 2000; von Krogh et al., 2012). In particular, an organisation needs a “knowledge vision” that synchronises the entire organisation to create knowledge dynamically and continuously. The knowledge vision defines what kind of knowledge the company should create in what domain. It is top management's role to articulate the knowledge vision and communicate it throughout (and outside) the company. Based on the knowledge vision of the company, top management should develop and promote the sharing of knowledge assets. It is also important to have knowledge producers to enable the company to create and exploit its knowledge. Based on the knowledge vision, leaders have to build, connect and energise *Ba*. Leaders and knowledge producers can build *Ba* by providing physical space such as meeting rooms, virtual space such as a computer network, or mental space such as common goals. Leaders also have to choose the right mix of people to participate and promote their interaction (Nonaka et al., 2000).

2.6 The SECI model as an integrative KM approach

As mentioned earlier by Nonaka and his colleagues, the SECI model is considered as the engine of organisational knowledge creation. In knowledge management activities, Martin-de-Castro et al. (2008, p. 228) suggested that externalisation and internalisation represent pure knowledge creation while, combination and socialisation are pure knowledge transfer

of explicit and tacit knowledge, respectively. However, the model is also accepted as a highly integrative KM approach bringing together a wide range of knowledge processes of generating, codifying, storing, sharing and utilising knowledge (Aurum et al., 2008; Grant and Grant, 2008; Haggie and Kingston, 2003; Mikic et al., 2009).

Knowledge generation, for example, can occur by acquiring new tacit knowledge through different socialisation mechanisms (tacit-tacit) e.g. face-to-face interaction, training programmes, job rotation. Knowledge generation can also occur by acquiring new explicit knowledge through different internalisation mechanisms (explicit-tacit) e.g. access to databases, job descriptions and catalogues of using machines. Knowledge codification aims at capturing tacit knowledge and articulates it into explicit knowledge in the form of written documents, which refers to the externalisation process of SECI (tacit-explicit) (Hansen et al., 1999; Jashapara, 2011). Editing and storing internal and external explicit knowledge in databases refers to the combination process (explicit-explicit). Knowledge transfer/sharing can be achieved also through the SECI processes. Sharing tacit knowledge normally occurs through face-to-face communication which is one of the socialisation mechanisms, while sharing explicit knowledge through interactive networks based on the intranet or emails are also types of combination mechanisms (Haag et al., 2010; Kohlbacher and Krahe, 2007; Salis and Williams, 2010). Finally, the use of knowledge in helping employees to perform their work could be considered as one mechanism of the internalisation process of SECI (Murray and Myers, 1997). However, the other KM models of Davenport and Prusak (2000), Bose (2004) and Hansen et al. (1999) do not encompass

all of these knowledge processes which were mentioned in the SECI model. Therefore, the comprehensive aspects of the SECI model are the main reason of using it in this study.

Like KM, the SECI model is a fusion of people, process and IT. Both tacit and explicit knowledge are rooted in the human mind (Nonaka and Konno, 1998; Polanyi, 1966) and it is people who create and transfer knowledge between each other. People codify and combine knowledge, and make it available for access. The SECI model is also technology oriented. IT facilitates conversations between individuals and helps to articulate the tacit knowledge into explicit through emails, the intranet network and systems like Microsoft Office. Data mining tools and Microsoft Office can be used to edit existing explicit knowledge and to store it in databases. Internet and knowledge portal technology also help staff to access the organisation's databases (Alhawary and Alnajjar, 2008; Smith, 2001). The SECI processes work through organisational processes such as: offering training programmes, creating communities of practice and encouraging knowledge sharing and providing time and space for practicing knowledge activities (Bose, 2002).

By describing knowledge in organisations, Nonaka and Takeuchi (1995) were among the most influential authors to build on Polanyi's work (Konstantinou, 2008). This was another reason explaining why Nonaka's SECI model has become widely accepted by scholars (Grant and Grant, 2008; Rice and Rice, 2005). Rice and Rice (p. 673) affirmed that "The SECI model met with broad acceptance, especially among management practitioners, due to its intuitive logic and clear delineation of knowledge types between tacit and explicit knowledge - utilising this knowledge delineation first espoused in

management theory by Polanyi (1958). The model and its derivatives also incorporate elements of information systems, organisational learning and micro-level organisational behaviour”. Grant and Grant (p. 577) stated that “the importance of Nonaka's work is evidenced by its dominance as, by far, the most referenced material in the KM field and by the number of practitioner projects implementing elements of the model. Further, while a variety of other knowledge classification systems have been proposed, variations on Nonaka's interpretation of Polanyi's original tacit/explicit knowledge concept dominate in the literature - both academic and practitioner”.

2.7 A critical analysis of SECI

By adopting Polanyi's concepts of tacit and explicit knowledge, Nonaka and Takeuchi (1995) developed their SECI model (Gourlay, 2006; Grant and Grant, 2008; Rice and Rice, 2005; Tong and Mitra, 2009). They built on Polanyi's ideas of personal knowledge being organisational and practical (Nonaka and Takeuchi, 1995). However, the SECI model has faced some criticisms in management and organisational studies (Gourlay, 2006; Mikic et al., 2009). Johnson et al. (2002) suggest that tacit and explicit knowledge should be regarded as being complementary rather than contradictory. Knowledge is neither completely and fully tacit nor completely and fully explicit (Haag et al., 2010). However in the SECI model, Nonaka and Takeuchi (1995) tend to regard tacit and explicit knowledge as separate categories and mutually exclusive, not complementary entities (Levina, 1999).

Nonaka and Takeuchi (1995, p. 66) also stated that “externalisation holds the key to knowledge creation, because it creates new, explicit concepts from tacit knowledge”. This

knowledge conversion process emphasises the capture of personal knowledge by the organisation. However, according to Tong and Mitra (2009, p. 50), the SECI model ignores the suggestion that ‘‘we can know more than we can tell’’, stated by Polanyi (1966, p. 16), and ‘‘we always tell more than we can write down’’, stated by Snowden (2003, p. 24). This suggests that converting tacit into explicit knowledge has limitations because some tacit knowledge, even if crucial, cannot be made explicit (Gourlay, 2006; Mikic et al., 2009). For example, ‘‘forms of life’’ by and through which we conduct our social practices (e.g. how to keep your balance during cycling) cannot be made explicit, and thus remain a tacit component (Gourlay, 2006). Haag et al. (2010) argue that if some tacit knowledge cannot be articulated, then it cannot be made explicit. Because of these limits a limitation on the effectiveness of the externalisation process can be expected.

In line with this argument, Kao et al. (2011), as mentioned before, suggested that combination and internalisation are more important processes to create knowledge in organisations relative to the socialisation and externalisation processes. Nonaka and Takeuchi (1995, p. 56) stated that ‘‘the key to knowledge creation lies in the mobilisation and conversion of tacit knowledge’’. But tacit knowledge is generated by individuals by converting explicit knowledge into tacit through the internalisation process (Gourlay, 2006). Then, this tacit knowledge can be shared with others through socialisation processes and made explicit again through the externalisation process. This explicit knowledge is sorted and synthesised through the combination process. Thus, the internalisation process is the basis for creating new organisational knowledge. Gourlay (2006) suggests that explicit knowledge should be sorted and synthesised before converting it into tacit knowledge.

Therefore, he agrees with Kao et al. (2011) that combination and internalisation processes are important sources of organisational knowledge creation.

The empirical grounding of the SECI model has also been evaluated in the literature (Gourlay, 2006). To test the validity of the SECI model, Nonaka and his colleagues only surveyed a sample of senior managers and ignored the other staff. Organisational knowledge, however, is created not only through senior managers but also through employees at the all managerial levels (top, middle and line). Therefore more empirical studies of the SECI model considering a representative sample of all staff and managerial levels in organisations would provide a better understanding. To overcome this criticism the SECI model has been empirically tested in different business contexts such as the pharmaceutical sector (Refaey, 2002); the IT sector (Rodrigues et al., 2006); the manufacturing, high-tech and service sectors (Li et al., 2008; Tsai and Li, 2007); the construction sector (Eliufoo, 2008); multi-organisational projects (Rice and Rice, 2005); and education and training systems (Cabrera, 2008; Kamtsiou et al., 2006; Noordin and Hassan, 2006). Besides, Martin-de-Castro et al. (2008) and Lopez-Saez et al. (2010) investigated the use of the SECI model in several knowledge intensive firms. 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. All these studies suggest that the use of this model is important to support general performance in organisations.

The universal application of the SECI model in different cultural contexts is also criticised (Bratianu, 2010; Li and Gao, 2003; Nold III, 2011). Glisby and Holden (2003) noted that each of the four modes of SECI is strongly interpreted in reference to their embeddedness in traditional Japanese values and management practices and they concluded that the applicability of this model may not be universal. Haag et al. (2010) argued that Japanese companies focus more on tacit knowledge which is related to the socialisation mode, whereas western companies focus more on explicit knowledge which is related to the combination mode.

Weir and Hutchings (2005) and Andreeva and Ikhilchik (2011) concurred with Glisby and Holden's study by suggesting that not all SECI processes are applicable across different cultures. In the Arab world, Weir and Hutchings suggested that networking is a traditional and wide-spread practice and thus they conclude that socialisation works quite effectively. However, they suggested that the concepts of externalisation, combination and internalisation are not widely used in the Arab context. For externalisation, Arabs tend to prefer to keep their own knowledge until there is an absolute need for disclosure. For combination, the change in documentation context should be approved by different management levels in long procedures. This complex routine in the Arab world limits the effective sorting and translating of knowledge. For internalisation, in the Arab world the segments of work and private life are not kept completely separate and, as such, internalisation is affected by confidence in knowledge being directly related to confidence in individuals who hold that knowledge (Weir and Hutchings, 2005). So trust is very important and highly personalised.

In the case of China, Weir and Hutchings (2005) suggest that the socialisation and externalisation modes are widely represented because the Chinese are highly networked, hold tacit knowledge within these networks and are prepared to make this knowledge explicit only within the context of these pre-existing relationships. However, as the focus is more on sharing knowledge inside departments rather than between departments or the organisation, the combination of tacit knowledge is not straightforward, while learning-by-doing as a key to internalisation is also problematic because of individuals' fears of admitting mistakes (Weir and Hutchings, 2005).

In Russia, Andreeva and Ikhilchik (2011) argued that all of the SECI modes are not widely represented. They pointed out that the socialisation mode is limited because Russians' willingness to share knowledge, both internally and externally, seems not to be common. They also claimed that there is a limitation on the externalisation process, which is mainly relevant to group orientation, as Russians are more individualistic. The combination process is also limited because there is a lack of free access of employees to corporate information in Russian companies, which are known for their obsession with secrecy of any kind of information related to their business. Internalisation is not widely applicable either, because the fear of mistakes is another aspect of Russian employees. Therefore, taking responsibility does not work well in many Russian companies (Andreeva and Ikhilchik, 2011).

Martin-de-Castro et al. (2008, p. 225) argue that countries that focus more on explicit knowledge, such as Spain and the USA, see the "knowledge creation process as a set of

activities that allows firms to obtain and apply explicit knowledge”. Therefore, they conclude that the combination process of SECI is the main source of knowledge creation. Haag et al. (2010) agree with Martian-de Castro et al. by arguing that Japanese companies focus more on tacit knowledge which is related to the socialisation mode, whereas the western companies focus more on explicit knowledge which is related to combination mode.

2.8 Conclusion

To sum up, the above argument suggests that an awareness of culture and its impact on knowledge creation and the application of the SECI model will enrich the insights of an organisation into their knowledge creation and the processes involved in it (Bryceson, 2007; Haag et al., 2010). Haag et al. (2010) argue that the SECI model is not universal but culturally situated because it stems from a particular context (Japan) and its processes are strongly influenced and shaped by culture and values. In particular, they considered two of Hofstede’s cultural value dimensions to investigate SECI from the perspective of national culture. The first dimension is individualism/collectivism which has been widely used and applied in research to date (Haag et al., 2010). Hofstede and Hofstede (2005, p. 76) define individualism as “pertaining to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family”. On the other hand, collectivism “pertains to societies in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people’s lifetime continue to protect them in exchange for unquestioning loyalty” (Hofstede and Hofstede, 2005, p. 76).

In addition to individualism/collectivism, the power distance dimension is another important aspect of cross-cultural differences at a national level. Power distance is defined as “the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally” (Hofstede and Hofstede, 2005, p. 46). Haag et al. (2010) suggested that these cultural dimensions strongly influence the socialisation process of SECI. They explained that cultures with high collectivism are more socialised because the socialisation mode is closely connected with group processes. In contrast, cultures that score low on power distance are more likely to support an open and non-threatening environment for brainstorming than cultures that score high on power distance (Hofstede and Hofstede, 2005; Haag, et al., 2010). Nonaka and his associates themselves maintained that “in knowledge creation, one cannot be free from context. Social, cultural and historical contexts are important for individuals, as such contexts provide the basis for one to interpret information to create meanings” (Nonaka et al., 2000, p. 14).

Culture, however, is a complex notion, has several dimensions and is also something which is often resilient to change (Groschl and Doherty, 2006). Culture may refer to national cultures, industry cultures, occupational cultures, corporate cultures, and organisational structures and managerial practices, each of which forms distinctive patterns of behaviour in a social unit. All of these dimensions can be interrelated, interdependent, or contradictory, making the management of knowledge in an organisation problematic (Denton, 2004).

In addition, Hofstede's cultural dimensions should be used with caution. Hofstede's model has been extensively used and applied in international management and he has been considered one of the most influential authors on the subject of national culture (Chiang, 2005). Despite its popularity, many methodological and theoretical criticisms surround his work. Certain methodological concerns include the generalisability of his findings especially at the societal level. As McSweeney (2002) argues, the generalisability argument stems from the fact that survey respondents were confined with samples from a single organisation, IBM, and a narrow occupational range of sales and marketing staff. However, this critique serves as a warning not to confuse Hofstede's scores with the cultural constructs for which they are only approximate measures. Hofstede's scores can only be a very rough indication of tendencies in the rich variety of cultural values (Williamson, 2002).

On theoretical grounds, McSweeney (2002) also suggested that Hofstede, in reaching his findings, has assumed his results and Hofstede's logic is therefore circular. He argued Hofstede could not have controlled organisational and occupational culture when measuring national culture, because national, organisational and occupational cultures are not discrete, independent phenomena. However, Williamson (2002) was in disagreement with McSweeney's critique by maintaining that circularity does not necessarily invalidate logic in other paradigms, in which internal consistency and contextual relationships may be more important than the linearity of logic.

McSweeney claims that Hofstede's cultural dimensions are too simplistic to capture the richness of national cultures because they are largely independent, whereas cultural dimensions may interact. Hofstede's dimensions may be seen as manifestations of national culture, rather than as direct measures of national cultures. Williamson (2002, p. 1386) agreed with that but stressed that these dimensions still embrace a variety of values that tend to distinguish people from different countries.

Nevertheless, McSweeney's critique raises important warnings for those who would follow Hofstede's research or use his model. McSweeney's critique illustrates the confusion that can arise from a lack of clarity about the paradigm from which cultural research is debated. "To reject totally Hofstede's or similar functionalist models of national culture, before more satisfactory models have been developed, would be to throw away valuable insight. Hofstede has named and described attributes of national culture that may be either used to describe social phenomenon or put up as a comparative yardstick for other cultural attributes" (Williamson, 2002, p. 1391).

Chapter 3

The Application of KM and the SECI Model to Innovation and the Banking Industry

As we have been already seen, the transformation of valuable knowledge into added value is the core of innovation which is widely proclaimed as being of vital importance to be successful and maintain a competitive advantage (Batiz-Lazo and Woldesenbet, 2006; Drucker, 1993). It is reported that successful companies produce 75% of their revenues from new products or services that did not exist five years ago (Smith, 2006). Therefore, the ability to compete through effective knowledge management and innovation is highly valued by organisations (Markatou, 2011; Nonaka and Takeuchi, 1995). Banking as one of the major knowledge-intensive industries needs to become efficient in managing knowledge in its operations in this way. The industry has to preserve and leverage knowledge and create and disseminate new knowledge and innovations. As has been argued in the previous chapter the SECI model best embraces the nature of KM, and this chapter discusses first the research done on KM in general and SECI in particular on innovation, next it provides a framework for research done on knowledge management in the banking industry, and comments on the use of the SECI model in this industry.

The chapter consists of two main sections. The first section is a discussion about the concept of innovation, types of innovation, product and process innovation, and the relationship between KM and innovation in general, and SECI and innovation in particular.

The second section provides a framework for the research done on knowledge management in the banking industry, and comments on the use of the SECI model in this industry. It starts with explaining the importance of managing banking knowledge. Next, it discusses the published studies investigating the application of KM in the World Bank and in banks of developed and developing countries.

3.1 Knowledge management and innovation

Knowledge and innovation together are considered as crucial sources for sustaining the competitive advantage of a company (Markatou, 2011; Nonaka and Takeuchi, 1995). Academic publications that seek to link KM and innovation considerably increased during the past decades, as can be seen from the statistics of major databases such as the ProQuest database, Science Direct and ISI web of knowledge (Fagerberg et al., 2005; Scarbrough and Swan, 2001). How to turn available knowledge into profitable innovations and bring these to the market in a continuous manner has become a major concern for both industry and academics (Xu et al., 2010).

3.1.1 The concept of innovation

Innovation covers the whole organisation, from the conception of an idea to the introduction of a product or service to the market. Xu et al. (2010), for example, suggested five phases which exist in a continuous innovation process: idea generation, research and development, implementation (prototype and manufacturing), commercialisation (marketing, sales, diffusion), and internalisation (analysis, reflection, synthesis). Innovation is a process in which valuable ideas are transformed into new forms of added value for the

organisation, customers, employees and stakeholders. This transformation process is also a learning process for the organisation as a whole to safeguard continuity on the basis of innovation based in turn on creativity. Creativity is often seen as a personal asset. For organisational innovation, however, it is not enough that every employee as such wants to be creative. Creativity should be perceived as a collective process to raise the level of innovation potential of the organisation. This “fine-tuning” between individual and collective transformation is crucial for organisational innovation (Merx-Chermin and Nijhof, 2005).

Hobday (2005) stressed that innovation might be defined as a product or process new to the company, not simply to the world or the market. Similarly, Rogers (2003) and Assink (2006) described innovation as the adoption of ideas that are new to the adopting company or as the process of successfully creating something new that has significant value to the relevant unit of adoption. And Kaufmann (2004) too suggested that an idea deserved to be described as innovative if it is novel for the individual who produced it, without necessarily being novel for society as a whole. Thus if innovation was defined as the first commercial introduction of a product and process in the world, there would be very few achievements that might be described as “innovative” in developing countries (Khorakian, 2011). In developing countries, innovation tends to happen “behind the technology frontier” which is transmitted from developed countries (Hobday, 2005). For example, Batiz-Lazo and Woldeesenbet (2006) stated that ATMs (Automatic Teller Machine) were used in US and UK banks in the 1970s, while the majority of Egyptian banks started to use this technology in the last decade. Therefore, innovation is something new but not always in absolute

terms. Some ideas might be innovative in developing countries but would not be regarded as such in a developed economy. Therefore, this study adopts a definition of innovation as an activity that involves substantial novelty for the adopting company or country, but is not necessarily new to the world.

3.1.2 Types of innovation

Innovations have usually been categorised by researchers into three major contrasting types: product-process; radical-incremental; and technical-administrative (Cooper, 1998; Eris and Saatcioglu, 2006; Gopalakrishnan and Damanpour, 1997; Utterback, 1994).

3.1.2.1 Product and process innovation

A “product” is merchandise or a service offered to a customer and a “process” is the mode of production and delivery of the goods or services (Damanpour and Gopalakrishnan, 2001). Therefore, the distinction between product and process innovation relates to the areas and activities that an innovation affects (Gopalakrishnan and Damanpour, 1997). Product innovation reflects a change in the end product or service offered by the organisation, while process innovation represents changes in the way organisations produce end products or services (Utterback, 1994).

Product innovation implies introducing new products or services to create an external market or to satisfy user needs (Cooper, 1998, Ettlie and Reza, 1992; Utterback and Abernathy, 1975). In contrast, process innovation is the implementation of a new significantly improved production or delivery method, which includes changes in techniques, equipment and/or software (Bi et al., 2006; Tan and Nasurdin, 2010; Tidd et

al., 2005). It refers to the introduction of new elements (e.g. input material, work and information flow and task specifications) into the organisation's production process or service operations that are then used to enhance a product or service (Ettlie and Reza, 1992; Utterback and Abernathy, 1975).

In general, product innovation could be defined as “new products or services introduced to meet external user or market needs” while process innovation could be defined as new elements introduced into the organisation's operations to render an improved product or service (Batiz-Lazo and Woldesenbet, 2006, p. 404). Product innovations have a market focus and are primarily customer driven, while process innovations have an internal focus, seeking to develop new capabilities, competencies or routines and are often efficiency driven (Batiz-Lazo and Woldesenbet, 2006; Gopalakrishnan and Damanpour, 1997). Therefore, product innovations require that companies assimilate customer need patterns, as well as design and manufacture the product, whilst process innovations require companies to apply strategies and technologies to improve the efficiency of product development and commercialisation (Damanpour and Gopalakrishnan, 2001, p. 48).

Damanpour and Gopalakrishnan (2001) suggested that organisations emphasise the adoption of product innovations over process innovations. They argued that “First, while process innovations are related to the production and delivery of the outcome, product innovations are more observable because they are themselves the outcome. Second, product innovations are also seen as more significant because successful products command significant price premiums and because manufacturing costs, which can be

reduced by introducing process innovations, are small relative to revenues generated from successful products. Third, product innovation champions enjoy organisational attention and are often more centrally situated in the communication networks in the organisation” (pp. 48-49). Therefore, executives assume that advantages are more likely to come through the adoption of product innovations. They consider that product innovations are often based on technologies that can be protected by patents, while patents are usually ineffective to protect process innovations because they are primarily based on technologies that are readily available in the market place (Ettlie and Reza, 1992). Therefore, firms may prefer to invest predominantly in product innovations because such innovations have more advantages than process innovations (Teece, 1986).

However, Athey and Schmutzler (1995) argued that the returns to firms that implement innovation strategies combining product and process innovations are higher than to firms that follow more simple innovation strategies. Damanpour and Gopalakrishnan (2001, p. 48) also suggest that “product and process innovations affect each other: On the one hand, one may drive the other, and consequently, they may occur sequentially; on the other hand, they may complement each other and can occur simultaneously”. For example, product innovations may be introduced first to respond to a market need, while process innovations follow to support and facilitate the implementation of the product innovations (Damanpour and Gopalakrishnan, 2001, p. 50). However, product innovations mean that the organisation, first, must develop procedures and processes in order to enhance producing these innovations (Dougherty, 1999, Moore, 2004). Therefore, there are many overlaps between product and process innovation and it is difficult to ignore one of them.

3.1.2.2 Incremental and radical innovation

Researchers identify an innovation as either incremental or radical by determining the degree of change associated with it. Incremental innovations only call for a marginal departure from existing practices; they mainly reinforce the existing capabilities of organisations. Radical innovations, on the other hand, produce fundamental changes in the activities of an organisation or an industry and represent a clear departure from existing practices (Darroch, 2005; Gopalakrishnan and Damanpour, 1997; Hall and Andriani, 2002).

Incremental innovations “enhance and extend the underlying technology and thus reinforce the established technical order” (Tushman and Anderson, 1986, p. 441). They entail the introduction of an improved product, which in comparison with its predecessor has at least one additional attractive characteristic or has a better capability with the same characteristics (Ferguson and Ferguson, 1994). Assink (2006) and Cooper (1998) argue that since incremental innovation remains within the boundaries of the existing market, technology or processes of an organisation, it has low financial and market risks.

In contrast, radical innovations take place when a new market is opened up and the innovator starts to satisfy an unseen demand (Ferguson and Ferguson, 1994). This kind of innovation creates fundamental changes in the actions of the organisation or industry that deviate from existing activities (Gopalakrishnan and Damanpour, 1997). In radical innovation, first-time improvements or performance characteristics are obtained. It implies major changes in technology regarding materials and functions, newness to the market,

substantial cost and time (Keizer and Haman, 2007). Therefore, radical innovation has the highest technical and market risk (Branscomb and Auerswald, 2002). For this reason, radical innovation is adopted less frequently than incremental innovation (Damanpour, 1996). It was reported that radical innovation makes up only 6% to 10% of all innovation projects (Tidd et al., 2005).

3.1.2.3 Technological and administrative innovation

The distinction between administrative and technological innovations reflects a more general distinction between structure and technology. Technological innovations include products, processes and technologies used to manufacture products or render services directly related to the basic work activity of an organisation. Administrative innovations pertain to organisational structure, administrative processes and human resources that are indirectly related to the basic work activity of the organisation and more directly related to its management (Gopalakrishnan and Damanpour, 1997). In other words, the distinction between technological and administrative innovation involves a change in relation to the organisation's operating core (Cooper, 1998). Both kinds of innovation are related to the technical and administrative cores of the organisation (Gopalakrishnan and Damanpour, 1997, p. 19). Technological innovation involves the adoption of a new technology that directly influences the basic output processes, while administrative innovations include changes that affect the policies, allocation of resources, and other factors associated with the social structure of the organisation (Betz, 1993; Cooper, 1998).

In summary, innovation can be categorised into: product or process, according to the activities that an innovation affects; incremental or radical, according to the degree of change associate with the innovation; and technological or administrative, according to the changes related to the organisation's operation core. However, each kind of radical, incremental, technological or administrative innovation is generally considered to be related to a product or process. Radical innovation refers to major new products or processes (Bala-Subrahmanya, 2005), while incremental innovation refers to marginal improvements in the existing products or processes (Ferguson and Ferguson, 1994). A large number of changes termed as technological innovations also include both product innovations and process innovations, while administrative innovation relates mainly to process innovation (Damanpour, 1991; Utterback, 1994). Nieto (2004) explained that technological innovation involves a set of activities that contribute to the increase in the capacity to produce new goods and services (product innovations) or to implement new forms of production (process innovations). Therefore, the current study will concentrate on discussing the aspects of innovation based on product and process types which are highly integrated categories.

Product and process innovation can be found in both manufacturing and service industries (Damanpour and Gopalakrishnan, 2001). Johne and Storey (1998) defined a new product development within manufacturing industry as a development of tangible products which are new to the firm. Goffin and Pfeiffer (1999) indicated that there are two types of innovation within the manufacturing industry: new products, where companies develop ideas and turn these into products; and improvement of the manufacturing process,

referring to process innovation. Product and process innovations can also be identified in service industries, although services often have very different characteristics compared to production, e.g. services are intangible, perishable and heterogeneous (Song et al., 1999).

Oke (2007) distinguished two further types of innovation in the service sector: “service product innovation” and “service innovation”. The terms “service product innovations” and “product innovations”, and “service innovation and “process innovation” are interchangeable when explaining a particular set of innovations in service sectors (John and Storey, 1998; Oke, 2007). “Service product innovations” are associated with new developments in the core offering of service companies that tend to create new revenue streams (Oke, 2007).

Gadrey et al. (1995) defined “service innovations” as innovations in processes and innovations in the organisation for existing service products. Service innovations can, therefore, be described as new developments in activities undertaken to deliver core service products e.g. to make those core service products more attractive to consumers. Such developments tend to involve interaction with customers and can be associated with either new or existing service products. According to Oke (2007) service innovations are associated with improvements of organisational processes and variations in new ways of delivering products to customers. An example in the banking sector would be a service innovation to provide a faster process for the issue of credit cards.

To sum up, product and process innovation can be considered in both the manufacturing and service sectors. In the service sector, product innovations refer to service product innovation, while process innovations refer to service innovations.

3.1.3 The relationship between KM and innovation

The relationship between KM and innovation has been theoretically and practically investigated. Theoretical studies were undertaken by: Abou-zeid and Cheng (2004); Basadur and Gelade (2006); Carneiro (2000); du Plessis (2007); Johannessen et al. (1999); and Popdiuk and Choo (2006). Practical studies were undertaken by: Aramburu et al., (2006); Darroch and McNaughton (2002); Gloet and Terziovski (2004); Faniel and Majchrzak (2007); Nunes et al. (2005); Scarbrough (2003); Sorenson and Snis (2001); and Swan and Newell (2000). What many of those writers suggest is that the innovation process involves the transformation of valuable knowledge into added value for the organisation (Drucker, 1993; Merx-Chermin and Nijhof, 2005).

Previous research on innovation supports the relationship between KM and innovation (Cohen and Levinthal, 1990; Darroch and McNaughton, 2002; Dougherty et al., 2002; Hargadon and Sutton, 1997; Kamasak and Bulutlar, 2010; Nonaka and Takeuchi, 1995; Smith et al., 2005). For example, Dougherty et al. (2002) argued that innovation relies heavily on the creation of new knowledge in an organisation, which facilitates new solutions. Hargadon and Sutton (1997) suggested that the effective transfer of knowledge between individuals and groups is essential for solving problems. They further noted that when knowledge is transferred among groups within the organisation, existing ideas from

one group may appear novel to another, and vice versa, resulting in potentially new products or services. Other authors (Drucker, 1985; Storey and Kelly, 2002; Tsai, 2001) suggested that knowledge is the most essential element in innovation. In their studies, Storey and Kelly (2002) found that lack of knowledge could be the main barrier to innovation in the service industries. Tsai (2001) noted that “new knowledge is critical to developing new products or innovative ideas”. Scarborough (2003) opined that KM helps to decrease the resistance to change which is the main barrier of the innovation process. Overall, continuous collection and integration of new knowledge will lead to innovativeness (Kamasak and Bulutlar, 2010; Subramaniam and Youndt, 2005).

3.1.3.1 KM and the stages of innovation

Innovation can be understood as a process which has several stages/activities that are related to each other (Gopalakrishnan and Damanpour, 1997). One of the basic models which has been adopted by many firms in order to manage the process of innovation was introduced by Cooper (1990). This model suggested five sequential stages-gates for developing a project. According to Cooper (1990, p. 45), with an idea originating from basic research, customer-based techniques or creativity techniques are first subject to a preliminary assessment, then a detailed investigation. The actual development of the product and a marketing concept occurs in the third stage, followed by the validation stage through in-house product tests, customer field trials, test markets, and trial productions, and finally the stage of full production and market launch.

However, it has been argued that this model applies strictly to the physical design and development of a product, and it was designed only to deal with technical, but not business factors. It was also mentioned that the model still has a number of weaknesses such as being too bureaucratic and time consuming (Cooper, 1994; Oke, 2007). Therefore, a more adaptable version was introduced by Cooper (1994 and 2008), and different innovation models were also suggested (e.g. Goffin and Pfeiffer, 1999; Tidd et al., 2005). One model that attempt to consolidate the different stages of innovation mentioned in literature was introduced by Khorakian (2011, p. 39), suggesting five common stages of innovation: innovation creativity, selection, incubation, implementation and learning. At the creativity stage the company should scan the internal and external environment and consider any threatening signs and opportunities for change. Therefore this stage can be defined as the search for and identification of new ideas. Different factors such as customers' needs, competitors and R&D etc. can be sources of creativity for the firm. The selection stage is the process of choosing the best ideas for implementation from the various ideas generated. Firms at the incubation stage might take an idea and create a prototype to test it on a small scale in order to find any possible problems and solve them before progressing to the next stages. The implementation stage involves developing and transforming the small scale new product and launching it in the market. Finally, in the learning stage the impact of the implemented idea into a firm's innovation performance is realised.

In relation to knowledge management, the literature has underlined the influence of KM on different stages in the innovation process. Ruggles and Little (1997), Seidler-de Alwis and Hartmann (2008), and Basadur and Gelade (2006) argued that KM influences all

innovation stages. The whole innovation process is a series of learning cycles, hence KM activities, such as sharing lessons learned, can help push thinking beyond daily tasks in a way that spurs innovative creativity. Ideas are generated through the creation or combination of theoretical and practical knowledge. Once valuable ideas have been identified and explicitly selected, they need to be developed into an actual product or process. An effective knowledge codification mechanism means learning from past experience and enhances the development of these products/processes (Basadur and Gelade, 2006; Ruggles and Little, 1997; Seidler-de Alwis and Hartmann, 2008).

The pre-work and preparation done to examine how ideas fit in with the existing elements of an organisation also affect the implementation stage of KM. If the new product or process does not meet the needs of customers, any amount of marketing and implementation will not succeed. Success or failure can often be traced back to the initial market research and the acquisition of in-depth knowledge of users, and the subsequent customer relationship management. During the implementation stage, active KM techniques can support the dissemination and implantation of the product/process (Seidler-de Alwis and Hartmann, 2008).

The learning stage of innovation is a measure of the scope of impact of the implemented idea, and translates into the total value realised from the innovation. It takes the form of internal knowledge transfer about how well new processes are working and how they can be utilised in the organisation. It happens both formally and informally, so sharing knowledge through technical forums, conferences, meetings, seminars, and training

programmes helps to diffuse innovations. Finally, feedback on process and product innovations is often connected and a key element of KM is learning through the ongoing integration of experience into the existing knowledge base (Ruggles and Little, 1997; Seidler-de Alwis and Hartmann, 2004).

Swan and Newell (2000) and Swan (2007) argued that knowledge acquisition through external networks and sources of information keep organisations aware of new developments, which in turn help them to create new ideas. They also pointed out that the creation of knowledge through social communities creates new management practices, which in turn supports the selection and implementation processes of new ideas. The capture and storage of knowledge can be used as means of learning how to utilise innovations.

3.1.3.2 KM and types of innovation

In literature, the relationship between KM and different kinds of innovation was discussed. Darroch and McNaughton (2002) and Darroch (2005) suggested that radical innovations come mainly from sharing knowledge about technology, which completely agrees with the radical innovation concept presented earlier. They also noted that incremental innovations did not come from organisations that responded to market knowledge or had an effective marketing function, but from organisations that were sensitive to information about changes in the market place and responded to that knowledge technologically. Others, however, have suggested that technology factors are mainly reserved for radical innovations (Bala-Subrahmanya, 2005). Sorenson and Snis (2001) indicated that capturing

and codifying knowledge through information systems technology and sharing knowledge through social networks are important to achieve administrative innovations in organisations. Heffner and Sharif (2008) suggested that integrating knowledge with technology and other resources within organisations, and encouraging employees and managers to learn about technology, are important to support technological innovation.

The effect of KM on product innovation was also highlighted. Product innovation is the result of a constant interaction between the “in-house research” of the R&D department and the knowledge exchange with the firm’s environment. Knowledge exchange is vital for generating new ideas (Spithoven et al., 2010). Due to changing customer needs, extensive competition and rapid technological change, innovation is extremely dependent on the availability of internal and external knowledge (du Plessis, 2007). Feedback from customers, responses from competitors, best practice, errors and lessons learned from the innovation project will be collated in order to be transferred and assimilated by the stakeholders. This way, the capabilities of continuous innovation can be improved (Xu et al., 2010). This suggests that the exchange of internal knowledge only does not generate enough usable ideas for product innovation. Organisations are embedded in a social environment where human resources are instrumental to innovation and capable of using all information available to devise new products. Therefore, knowledge outside the firm needs to be absorbed into its knowledge base. This absorption of external knowledge will support the R&D department to generate new ideas (Spithoven et al., 2010).

Tan and Nasurdin (2010) conducted a quantitative study in the Malaysian manufacturing industry to examine the effect of KM (in terms of knowledge acquisition, knowledge sharing, and knowledge application) on product innovation and process innovation. The findings of this study showed that only knowledge acquisition was found to have a significant and positive relationship with product innovation. When companies are effective in their acquisition of knowledge, they are likely to increase their innovative capabilities, enabling them to generate new and unique products. In contrast, effective knowledge acquisition had no relationship with process innovation. One possible reason may be, because process innovation is more internally-focused in the manufacturing arena, managers need to continuously identify problems and their sources within the production process itself and knowledge acquired internally would enable them to improve the existing process efficiently. Knowledge acquisition entails more knowledge acquired from external sources, which may not be appropriate for process innovation. However, it is also suggested that companies that are effective in acquiring knowledge from the application of existing knowledge and/or new knowledge are likely to possess the capability to improve the production process, thereby, fostering process innovation (Bi et al., 2006).

Knowledge sharing effectiveness was found to be unrelated to product innovation and process innovation. This was not unexpected since Tan and Nasurdin (2010) argue that Malaysians are known to be relatively unassertive and to value humility. Thus, organisational members are more likely to be conservative in expressing their ideas and sharing their knowledge. However, these findings may be limited given the weight of opinion that stresses the importance of capturing and sharing valuable knowledge the

importance of developing products and problem solutions for process innovation (Chang and Lee, 2007; Darroch and McNaughton, 2002). Knowledge sharing was put forward as one of the major KM components impacting upon innovation within the organisation (Day, 1994; Grant, 1996; Teece, 1998). Lin (2007) pointed out that employees' willingness to share knowledge enhanced the innovation capability of organisations. He added that knowledge sharing enabled the implementation process of new ideas, processes, products, or services. Jantunen (2005) noted too that a positive knowledge sharing culture helped organisations to improve their innovation capability. For example, organisations can foster innovation by offering knowledge sharing mechanisms such as the allocation of a budget for providing adequate training for knowledge transfer, the linking of staff-turnover to the generation of new ideas, and the creation of teams.

Likewise, knowledge application effectiveness was found to have no relationship with either product or process innovation. One possible explanation for this unexpected finding may be that even though participating firms perceived their level of knowledge application to be slightly on the high side, the dynamic environment of the manufacturing sector created severe challenges and time pressures that limited the application of knowledge to innovative activities within the participating firms. However, these findings are also arguable because effective knowledge application creates value, since this process enables the firm to realise its current knowledge and whether there is a need for new knowledge. In this way, companies will be able to update core competence, leading to greater product innovation. The application of knowledge acquired from internal and external sources is

bound to create a platform for carrying out new production processes or improve existing ones (Chang and Li, 2007; du Plessis, 2007)

3.1.4 SECI and the innovation process

Knowledge creation has been shown both to be a key resource (Richtner and Ahlstrom, 2010; Teece, 1998) and a prerequisite for innovation (Darroch, 2005; Darroch and McNaughton, 2002; Nonaka and Takeuchi, 1995). As mentioned in Chapter 2, the SECI model of tacit and explicit knowledge conversion was considered as the central model of organisational knowledge creation and was also assumed to bring together a wide range of KM processes. When individuals interact and share tacit and explicit knowledge with each other, they learn and acquire new knowledge and accordingly improve their capacity to define a situation or problem, enabling them to apply their knowledge to problem solving and generating new ideas (Kamasak and Bulutlar, 2010; Swan and Newell, 2000; McAdam, 2003; Nonaka et al., 2006; Popadiuk and Choo, 2006; Soo et al., 2004). Nonaka (1991), Nonaka and Takeuchi (1995), Bueno et al. (2008) and Xu et al. (2010) suggest also that innovation is closely related to the concept of “knowledge creation”. As Ruggles and Little (1997) mentioned earlier, all innovation stages are based on a cyclic learning system. Similarly, through the processes of SECI, knowledge transforms between tacit and explicit dimensions in a dynamic interaction. Consequently, it is possible to affect the team learning process through the composition of team members (Bueno et al., 2008; Huang and Wang, 2002). Lee and Choi (2003) suggest that the four processes of SECI support the capability of creating valuable and useful products, services, ideas and procedures.

However, Refaey (2002), Schulze and Hoegl (2008) and Ng et al. (2011) disagree with this point of view and suggest that not all four processes of SECI have positive effects or the same amount of effect on organisations' abilities to generate novel ideas. In his study into the Egyptian pharmaceutical sector, Refaey (2002) suggested that there were only three processes of SECI (externalisation, internalisation and combination) which have large positive effects on the innovation process, while the influence of the socialisation process was low. Unfortunately, he did not provide any interpretation or details for these findings, but this is being investigated further in this research. In contrast, Schulze and Hoegl (2008) suggested that organisations should foster socialisation and internalisation and at the same time reduce the focus on combination and externalisation in order to generate novel ideas. They argued that socialisation is positively related to the generation of novel ideas. They are in agreement with Nonaka and Takeuchi (1995), Popadiuk and Choo (2006) and Peltokorpi et al. (2007) that the face-to-face interaction of individuals, especially with different backgrounds, gives rise to novel ideas.

In line with the suggestion of Refaey (2002) that externalisation positively affects innovation, Lin (2007) argued that transforming the individual knowledge into group and organisational knowledge through a form of "knowledge donating" improves the stock of knowledge available to the organisation and increases its ability to innovate. Kamasak and Bulutlar (2010), however, argue that this process could be used to improve the organisation's existing products, processes or services by means of "exploitative innovation" rather than to produce new items by means of "exploratory innovation". In contrast, Schulze and Hoegl (2008) suggested that there is a negative relationship between

externalisation and the generation of novel ideas. They claimed that people operating in a more formal system or people who are either not ready or generally not able to formulate their ideas, will rather utilise close analogies and come up with incremental innovation ideas. Thereby, the resources of those people are mistakenly directed towards the elaboration of incremental ideas.

Regarding combination, scholars suggested that novel product ideas involve the “unique” combination of existing knowledge domains or categories (Koberg et al., 2003; O’Connor and McDermott, 2004; Wielemaker et al., 2003). However, Schulze and Hoegl (2008) criticise these suggestions and support the notion that combination of existing explicit knowledge does not lead to truly novel product ideas. Instead, combination as a knowledge creation process hampers idea generation for new and different products. They argued that the idea generation process is initiated by referring to existing, rather than to imaginary product features, favouring incremental product ideas. For the generation of truly novel product ideas, organisations must actively create knowledge about alternative components, not only knowledge of new combinations of existing components/ ideas. But Schulze and Hoegl (2008) were in agreement with Dougherty (1992), Hargadon and Sutton (1997), Hatten and Rosenthal (2000), Helfat and Raubitschek (2003) and Koberg et al. (2003) that internalisation, as the absorption of existing knowledge to create new tacit knowledge, supports the generation of novel product ideas. They also maintained that experiencing by doing enhances the absorption of existing knowledge, which in turn enables individuals to create new knowledge and hence novel ideas.

Handzic and Chaimungkalanont (2004) were in agreement with Schulze and Hoegl (2008) that the informal interaction between individuals forms the basis of creativity. Their study showed a strong positive correlation between creativity and informal socialisation and a moderate positive correlation between creativity and formal socialisation. Handzic and Chaimungkalanont (2004) suggested that employees who share a common vision and empathise with each other are naturally intrinsically motivated – they do what they love and love what they do. Such employees inevitably show more creativity, thus promoting a deeper intrinsic interest and desire in specific ideas to be realised. However, informal “office water cooler” socialisation in the workplace has long been ignored as an important value creating process for a company (Yavuz and Heidelman, 1999). Therefore, organisations’ management should work on maximising the level of effective socialisation. In contrast, Handzic and Chaimungkalanont (2004) argued that the lower influence of formal socialisation may have the result that creativity blossoms in an open, almost chaotic climate, and that any degree of coercion often serves to constrict innovation rather than promote it. These opportunities for socialisation are artificially manufactured situations where employees have a chance to socialise. However, Handzic and Chaimungkalanont (2004) admitted that their quantitative study did not provide enough explanation and agreed to conduct further qualitative research to explore the exact reasons why socialisation tends to lead to a higher level of creativity.

Ng et al. (2011) employed a special technique to ascertain the relationship between SECI processes and product development performance. They looked at the published literature on the SECI model from one side, and on product development performance from the

other. Linking both sides illustrated that SECI processes play a relatively important role in product development performance. Ng et al. (2011) agree with Schulze and Hoegl (2008) that socialisation and internalisation mechanisms had a profound effect on product development performance due to their dominant and comprehensive literature support. However, since the failure rates in product development projects tend to be high, it is imperative for an organisation's management to ensure careful control of and attention to the SECI processes in the organisation (Bonner et al., 2002). In this case, the application of the SECI model would be an effective method to ensure tight control and monitoring of KM activities in the organisation (Ng et al., 2011).

Socialisation involves convenient and common methods of communication that connect people and their expertise in an organisation, while product development often involves teamwork from various functions of the organisation as well as all partners in the supply chain (Lawson et al., 2009; Lin, 2008; Martin-de-Castro et al., 2008; Oshri et al., 2007). Thus, Ng et al. (2011) considered this as evidence that socialisation plays a very important role in integrating functions and teams for improved product development performance.

Externalisation provides a more structured and tangible form of knowledge that is more useful at the conceptual stage of the product development (Martin-de-Castro et al., 2008; Li et al., 2009; Tsai and Li, 2007). Thus, Ng et al. (2011) argued that this process is relevant in a product development context because the risks and potential failures of the product need to be clearly understood from the beginning of the conceptual stage. However, due to the tight schedules in new product developments, externalisation often becomes a challenge

as the conceptual knowledge created is hard to maintain and often becomes rooted within peer-to-peer communications or manual compilations (Vaccaro et al., 2009).

The combination process helps to connect, reconfigure and organise the explicit knowledge from externalisation into a new and more structured form of explicit knowledge that has a higher possibility of materialising into actions and practices (Martin-de-Castro et al., 2008; Li et al., 2009). Ng et al. (2011) agree with Schmickle and Kieser (2008) that this process is useful for product development because it requires amalgamated knowledge from various consultants and experts to be combined and prearranged for the construction of a novel product. However, it still may not be certain whether knowledge combination directly leads to improved product development (Sapienza et al., 2004).

Finally, Ng et al. (2011) supported the opinion of Martin-de-Castro et al. (2008) and Li et al. (2009) that internalisation activities involve action oriented forms of operational knowledge that help facilitate the conversion of the organisation's explicit knowledge into team level tacit knowledge, which upholds new product development.

3.1.5 Conclusion: KM, SECI and innovation

The relationship between KM and innovation has been investigated theoretically and empirically. The empirical studies included several sectors and industries such as: private sector companies (Ruggles and Little, 1997), a Jet Propulsion Laboratory Centre managed by the National Aeronautics and Space Administration NASA (Majchrzak et al., 2004), 443 firms in New Zealand, excluding banks (Darroch and McNaughton, 2002; Darroch 2005), the IT sector (Scarborough, 2003), manufacturing industries (Swan and Newell,

2000; Sorenson and Snis, 2001; Gloet and Terziovski, 2004; Aramburu, et al., 2006; Faniel and Majchrzak, 2007) and small and medium sized knowledge-intensive enterprises (Nunes et al., 2005). However, no recent research attempted to explore this relationship in the banking sector, where knowledge and innovation are also necessary to sustain profitability and competitive advantages (Nonaka and Takeuchi, 1995).

The majority of the empirical studies employed a quantitative approach such as: Arambura et al. (2006); Darroch and McNaughton (2002); Gloet and Terziovski (2004); Handzic and Chaimungkalanont (2004); Kamasak and Bulutlar (2010); Refaey (2002); Schulze and Hoegl (2008); Spithoven et al. (2010); and Tan and Nasurdin (2010). While, these quantitative studies established a relatively clear picture of the relationship between KM and innovation, they are less adept at explaining the details behind this relationship. Therefore, further qualitative research needs to be conducted to explore the exact details of why and how KM affects innovation (Handzic and Chaimungkalanont, 2004).

The majority of these empirical studies also focused on developed countries to investigate the linkage between KM and innovation such as: Germany, Austria and Switzerland (Schulze and Hoegl, 2006), Belgium (Spithoven et al., 2010), New Zealand (Darroch and McNaughton, 2002), USA (Gloet and Terziovski, 2004), Turkey (Kamasak and Bulutlar, 2010), Netherlands (Merx-Chermin and Nijhof, 2005). By contrast, little research has been done relating to developing countries, although exceptions are Egypt (Refaey, 2002) and Malaysia (Tan and Nasurdin, 2010). Therefore, there is a need to focus more on the developing countries which consider KM and innovation as primary sources of economic

growth and industrial change (Markatou, 2011). Product and process innovations in developing countries could be novel for these countries themselves or for the region but not necessarily for the whole world. For example, producing new Islamic products or services could be novel for Islamic countries but not for others. Using new technology in business such as online banking could be new for some developing but not for developed countries. Therefore, it is valuable to explore the innovation aspects in these countries to see whether these innovations are novel for the country itself/its region or more widely.

The previous research investigated mainly the relationship between KM and different kinds of innovation such as: radical and incremental innovation (Darroch and McNaughton, 2002; Darroch, 2005), administrative innovation (Sorenson and Snis, 2001), technological innovation (Heffner and Sharif, 2008), and exploitative and exploratory innovation (Kamasak and Bulutlar, 2010). However, the investigations into this relationship between KM and product and process innovations have been limited and need more explanation. The studies of Spithoven et al. (2010) and Tan and Nasurdin (2010) are based on quantitative data and require further details. Therefore, there is a need to conduct further studies employing quantitative and qualitative techniques to provide more details and explanations of the relationship between KM and both product and process innovation.

Regarding SECI and innovation, studies that employed knowledge creation processes for innovation suggested “across the board” that the SECI processes together strongly support innovation. However, studies that investigated the relationship between each process of SECI indicated that not all processes had the same effect on innovation and some of them

even had negative effects. This difference was reflected in which sector the SECI model was tested. For example, in the Egyptian pharmaceutical sector it was found that externalisation, internalisation and combination, respectively, have large effects on innovation (Refaey, 2002), while in the manufacturing and communication sectors in Germany, Austria and Switzerland, it was found that socialisation and internalisation have positive effects on innovation, but externalisation and combination have negative effects (Schulze and Hoegl, 2008). In general, it was concluded that socialisation and internalisation have large effects on innovation (Ng et al., 2011).

However, It also has to be noted that the study of Ng et al. (2011) was theoretical and needs to be tested empirically and the study of Schulze and Hoegl (2008) employed quantitative methods, focusing more on the manufacturing industry in developed countries, but without providing enough explanations. The study of Refaey (2002), which was applied in Egypt, has also some limitations since it does not provide enough details for its findings. Therefore, there is a need to conduct more profound studies employing both quantitative and qualitative techniques with a focus on the service industry in developing countries.

3.2 Knowledge management in the banking industry

With regards to the importance of KM in business, Drucker (1988, p.8) pointed out that “to remain competitive, maybe even to survive, businesses will have to convert themselves into organisations of knowledgeable specialists”. Banking is customer focused, therefore banks need to acquire and utilise customer knowledge and develop their products and services to meet customer expectations (Ping and Kebao, 2010; Ribiere and Chou, 2001; Shih and Lin,

2010). Banking is mainly analytic work based on complex tasks, problem-solving, learning new things and computer and internet use, rather than routine (Miles, 2011). Therefore, banks need to leverage this knowledge in their operations (Chatzoglou and Vraimaki, 2009; Lamb, 2001; Mizintseva and Gerbina, 2009). The banking industry also plays an important role in the development of the national and global economy, since the economic borders between separate countries are losing importance. The globalisation of financial markets is forcing bankers to become more efficient in managing knowledge in their banking operations, to preserve and leverage knowledge and to create and disseminate new knowledge and innovations.

If we consider specific examples of product and process innovation in banks, product innovation includes new or improved mortgage products like interest only or other repayment options, credit card options like gold, silver, platinum, or blue cards or a corporate card, while process innovation includes providing a faster process for the issue of credit cards. Several studies investigated and described the development of product and process innovations in banks such as: Akamavi (2005); Batiz-Lazo and Wood (2002); Batiz-Lazo and Woldesenbet (2006); Damanpour and Gopalakrishnan (2001); Drew (1995); Frei et al. (1998); Lievens et al. (1999); Morgan et al. (1995); Oke (2007); Scarbough and Lannon (1989); Tylecote and Tarhan (2000); and Vermeulen and Dankabaar (2002). These studies gave numerous examples of product and process innovations which have been achieved in banks across the last two decades. Figure 3-1 provides examples of these innovations.

Figure 3-1: An example of product and process innovations in banks

Product innovations	Process innovations
ATMs (on bank premises)	Truncation of the check handling process
ATMs linked to statewide networks	Automated mortgage generation
Debit cards	Computerized loan document generation
Credit cards	On-line teller terminals
NOW/Super NOW accounts	Derivatives (swaps, options futures/forwards)
Zero balance disbursement accounts	Lobby automation (video banking)
Sweep (asset management) account	Automated voice response systems
Self-directed IRA accounts	High speed image processing of checks
Linked certificates of deposit	High speed image processing of office documents
Money market deposits	Automated check reconciliation systems

Source: Damanpour and Gopalakrishnan (2001, p. 53)

As a response to environmental changes affecting their industry, banks primarily introduced product innovations to gain or maintain their competitiveness, and introduced process innovations to gain the full benefit of the new products. The product innovations were introduced first in response to a market need, while process innovations followed to support and facilitate the implementation of the product innovations and to enhance their contributions (Damanpour and Gopalakrishnan, 2001).

3.2.1 Importance of managing banking knowledge

Due to the importance of the banking sector and its dynamic changes in the global economy, there is a need for banking managers to become efficient in managing knowledge in banking operations. They should be aware of new products and services to support the constantly changing needs of customers and the rapidly changing market which requires

the constant exchange and analysis of information from various sources, branches, and countries. As in many knowledge-intensive industries, the possibility to create competitive advantage is dependent on the ability to leverage knowledge (Chatzoglou and Vraimaki, 2009; Lamb, 2001; Mizintseva and Gerbina, 2009). This process of knowledge leveraging, which implies the improvement and amplification of knowledge, is very close to the SECI processes of knowledge creation through conversion.

Banking management should focus on capturing suitable information into its organisational knowledge to improve the quality of its operations, to sustain its profitability and accordingly enhance the rules for banking institutions in the economy (Alrawi and Elkhatib, 2009; Cebi et al., 2010; Kridan and Goulding, 2006). In particular, the literature points out that KM plays an important role in banking by supporting customer relation management (CRM), human capabilities and risk management (Chee et al., 2000; Mizintseva and Gerbina, 2009; Ribiere and Chou, 2001; Yamagata, 2002). To sustain banking profitability, banks need to manage customer relationships to strengthen trust and confidence which enhance customers' loyalty and experience (Chee et al., 2000; Mizintseva and Gerbina, 2009; Ribiere and Chou, 2001). This is particularly relevant to retail banks which have a very strong relationship to customers and a huge customer base in their extensive branch networks.

If banks wish to offer appropriate products and services to customers, they need to acquire customer knowledge and develop their services and products according to customer expectations. Acquiring customer knowledge can be achieved through the employees who

directly deal with customers and through data warehouses or information technology products, such as Automatic Teller Machines (ATMs), internet and e-finance (Ping and Kebao, 2010; Yamagata, 2002). Calabrese and Remshard (2006) also showed that internet banking is necessary to share customer specific knowledge and other valuable knowledge stored in e-mail records and databases and to understand and capture customer requests/complaints.

The proficiency of employees in acquiring and utilising knowledge to make strategic decisions is also essential in banking. The knowledge of employees and the utilisation of this knowledge are the engine behind the organisation's ability to produce customer value and bottom-line results (Ribiere and Chou, 2001; Shih and Lin, 2010). Yamagata (2002) argued that banks depend considerably on their employees, organisational structures and branches which interface with customers. Therefore, managing the employees' knowledge supports the professional capability of banks. At the same time, as financial products become more complex, it is difficult for each staff member to be completely familiar with every product. So banks need to train their sales staff to master the knowledge of their products in order to be able to offer the appropriate ones to customers (Ping and Kebao, 2010). It was also noted that building knowledge databases about customers is necessary for the risk assessment process of granting loans (Ribiere and Chou, 2001).

3.2.2 Implementation of KM in banks

Before applying KM, generally, an organisation should first create a knowledge sharing culture that enhances the willingness to share knowledge by building trust among staff and

by explaining the importance of knowledge sharing. People can resist sharing knowledge due to the belief that knowledge is power and that they might lose this power by sharing knowledge and also because of a lack of trust, lack of preexisting relationships, and lack of motivation (Ahmed et al., 2001; Goman, 2004; O' Dell and Grayson, 1998). The quality of information provided is dependent on the willingness to cooperate and to share knowledge (Barachini, 2009). To encourage knowledge sharing behaviour, an organisation should focus on fostering teamwork, training and development, technology and motivation (Barachini, 2009; Cabrera and Cabrera, 2005; Mizintseva and Gerbina, 2009).

KM in banks should be both human- and technology-oriented to practice/engage in effective knowledge transfer and to retain and repeatedly apply acquired corporate experience and knowledge (Ali and Ahmed, 2006; Maier and Remus, 2003; Mizintseva and Gerbina, 2009). This is similar to the socialisation and internalisation processes of SECI, where human-oriented KM is mainly based on personalising knowledge through improving communication, training of newly recruited staff, improving knowledge sharing and enhancing personnel development (Maier and Remus, 2003). Arranging knowledge sharing events such as training programmes, seminars, and social meetings are important in order to embrace a KM oriented culture (Ali and Ahmed, 2006). Therefore, human resource management is essential in insuring a successful implementation of KM in an organisation by encouraging team learning, coaching, mentoring, communities of practice, face-to-face conversations, internal promotion, job rotation, job autonomy, in-house training, fluid job descriptions, social networking, and monetary incentives (Cohen and Laporte, 2004; Kubo and Sake, 2002; Sqier and Snyman, 2004; Vencatachellum and Jeetach, 2008).

On the other hand, banks manage a vast data flow and a variety of information about clients and financial organisations, so it is impossible to manage and transfer this information without having IT systems that provide corporate and knowledge portals and instruments for organising joint work (Mizintseva and Gerbina, 2009). Technology-oriented KM basically aims to codify knowledge in order to turn implicit into explicit knowledge by documentation and retention of knowledge and acquisition of external knowledge (Maier and Remus, 2003). The externalisation and combination processes of SECI, which largely use technology in order to articulate the tacit knowledge into explicit and then editing and storing it, are clear examples of the KM technology-oriented approach. Several types of technological tools are required to allow knowledge sharing anytime and anywhere such as mobile technology, portable hardware and software, networks, emails, teleconferencing and intranets (Ali and Ahmed, 2006; Alrawi and Elkhatib, 2009; Vencatachellum and Jeetach, 2008).

The application of KM in banks started at the World Bank in 1996 and was followed by banks in several developed countries such as: UK, Spain, Portugal, Germany, USA, Japan, and Canada, at the beginning of the last decade. However, this was still limited. Indeed, a survey conducted by the International Data Corporation across 600 banks in Western Europe in 2000 found only 20% of them applied a KM process. Subsequently, the European banking sector spent \$155.4 million on KM systems in 2000 and planned to reach \$511.4 million by 2004 (Blesio and Molignani, 2000, cited in Ribiere and Chou, 2001). In the middle of the last decade, the application of KM started in some developing

countries' banks such as Malaysia, Libya, Mauritius, Tunisia, Lebanon and the United Arab Emirates.

KM topics in banks raised in the literature were varied. They included the KM culture, whether the KM approach was human or technology-oriented, and KM strategies with reference to codification and personalisation strategies. As mentioned in Chapter 2, Hansen et al. (1999) suggested that codification strategy aims to systematise and store the knowledge of a company and make it available to all staff; and personalisation strategy aims to support the flow of individuals' knowledge in a company. They stated that knowledge is codified using "a people-to-documents" approach while it is personalised through "dialogue between individuals" (p. 108). Since the codification strategy aims to transfer individuals' knowledge (tacit) into documented knowledge (explicit), it could be similar to the externalisation process of SECI. By the same token, since the personalisation strategy aims to share only tacit knowledge through dialogue, it could be similar to the socialisation process.

3.2.2.1 KM in the World Bank

The World Bank offered a good example of using both people and technology in order to be a knowledge-based organisation (Ali and Yusof, 2004; APQC, 2003). The notion of applying KM inside the World Bank started in 1996 when the incoming president announced that the "World Bank needs to be a knowledge bank to play a leading role in a new knowledge partnership" (Ramalingam, 2005). First, the managers circulated the idea and promoted the value of managing knowledge across the bank. Next, the World Bank

offered particular human and technological techniques to support knowledge creating and sharing activities such as building communities of practice called “thematic groups”, establishing helpdesk and advisory services, providing a dialogue space for professional conversations, establishing external access and outreach to clients, partners and stakeholders, and finally developing an online knowledge base (Cohen and Laporte, 2004; Denning, 1998).

The World Bank also launched 15 indigenous knowledge centres across Africa to support knowledge sharing in order to meet all the bank's clients' needs and to create learning officers concerned with human resource development activities (Cohen and Laporte, 2004; McGrath and King, 2004). To enhance all these activities, the bank established extensive external and internal networks, e.g. internet and extranet, web-based intranet, portals, email and database, teleconferencing, satellite broadcasting and cable TV to connect its employees and branches (Bouthillier and Shearer, 2002; APQC, 2003).

3.2.2.2 KM in developed countries' banks

In the UK, Chee et al. (2000) surveyed senior managers at 25 international organisations including four UK banks to find out where KM could add value. The findings indicated that KM is important to support CRM and the decision making process. The majority of respondents stressed that capturing and sharing knowledge can be human- and technology-oriented by linking people to people and by using supporting technologies such as the internet, intranet, human resource systems, search technologies, groupware and workflow

management systems. They indicated, however, that the problems of motivating employees to share their knowledge were a major barrier in managing knowledge in these banks.

In Japan, the Michiko Bank presents a good example of the KM human-oriented approach (Kubo et al., 2001). Knowledge was shared through social interaction processes, e.g. job rotation and in-house training and personal social networks, in which social networking, social inclusion and trust were of paramount importance. As job rotation was a common training practice, employees had the opportunity to work across various functions in the bank and keep the information network alive. New employees had to do two or three years of general training, where they were supervised by senior tutors as well as their heads of departments. In-house training created an informal atmosphere conducive to knowledge sharing of organisational culture as well as banking knowledge and the building of trust.

Knowledge sharing was also encouraged by harmonious relationships. Each department at the bank held regular social events in order to strengthen group bonding. The employees were required to abide strictly by the regular working hours and were encouraged to display their sense of belonging by staying longer. The Bank realised that the most valuable source of information was the internal social network. Therefore, internal knowledge sharing was strongly encouraged while sharing external knowledge was discouraged. This related not only to the bank's business relationships with outside suppliers and customers, but also to the transfer of information and sharing of knowledge with the branches (Kubo et al., 2001).

The Japanese Bank of Tokyo Mitsubishi Ltd. represents another Japanese example of human-oriented KM in banking (Mizintseva and Gerbina, 2009). The bank established a customer knowledge management project called the “Knowledge Market System” to transfer knowledge between its staff and customers. This system encouraged staff members to get involved in the community of retail and corporate customers in order to enhance knowledge transfer between staff and customers.

Yamagata (2002) investigated several Japanese City Banks such as Mizuho Financial Group, Sanwa Bank, Sumitomo-Mitsui Banking Co and Bank of Tokyo-Mitsubishi. He found that these banks were good at acquiring and transferring internal knowledge but largely ignored external knowledge. The Japanese employment system, which stresses life-long employment and the preference of internal promotion rather than external recruitment, is a major barrier to the acquisition of external knowledge. KM in these banks was also human-oriented through job rotation every three to four years, training programmes, and face to face communication.

In summary, these studies show that Japanese banks did not rely too much on technology to manage knowledge but were strongly human-oriented. They did also not pay much attention to external knowledge, but relied on internal knowledge which was shared in training programmes and job rotation and encouraged by social events.

In the USA, Yamagata (2002) investigated the features of KM in some large commercial banks such as Money Centre Banks and super-regional banks such as Chase Manhattan

Corporation, CitiGroup, Bank of America and Continental Bank. In contrast to the Japanese banks, US banks gave considerable attention to external knowledge as they mainly depended on hiring people from outside who had new knowledge regarding specific fields such IT and also hiring high school graduates offering the relevant training programmes. This difference is related to the fact that the USA is a country which accepts many immigrants and its banks can recruit excellent employees with fresh knowledge from different countries. However, the USA is also a country in which people change jobs easily and frequently. The high job turnover rate limits the acquisition and documentation of internal knowledge in US banks. The research of KM in US banks was extended by Smith (2004) who discussed the strategy of knowledge management followed by the Pittsburgh National Corporation (PNC) Bank. PNC depended on codification through transferring tacit knowledge into explicit knowledge and then storing it in huge databases. The bank also established intranet networks and made it available to access on the internet and the bank's web pages. All these facilities enhanced a knowledge sharing culture between staff, customers and the other relevant groups.

In Germany, Maier and Remus (2003) examined the application of KM in the transaction process inside one of the five largest German Universal banks (its name was not indicated in the study). Although the bank management not only considered processing knowledge as codified (explicit) knowledge, but also as tacit knowledge embedded in the heads of employees working in these processes, there was a strong focus on the codification process. There was less focus on the experts' tacit knowledge as neither their communities nor

networks were supported. This reveals that this bank focused more on the externalisation process rather than on the socialisation process to transfer knowledge.

Fourie et al. (2004) addressed KM instruments used by one German company that provided banking and insurance services for more than 255,000 customers through 200 head office employees. This company adopted several techniques for managing its knowledge, e.g. applying document management systems to help employees to find the relevant document easily, applying keywords and document descriptions, conducting regular seminars for training employees, and creating knowledge through direct communications with colleagues, managers and experts. Additionally, this company used some technical tools to share and disseminate knowledge such as Lotus Notes “info- tiles”, e-mail, intranet and internet.

As an example of the KM technology-oriented approach in banking, Mizintseva and Gerbina (2009) referred to the Lotus Notes information system, which was used by one German bank (its name was not indicated in the study) in 2004 to create local networks between its members. This system is ideal for transmitting messages, spreading news through “info-tile” updates for each department, applying for document circulation and organisation, and solving software and technical problems.

In Canada, Grant and Grant (2008) discussed the implementation of KM in the retail banking divisions within five big Canadian banks. Initially, there was agreement regarding the importance of employees’ competence and customer knowledge needed for KM. In

particular, there was a need for a knowledge sharing culture to motivate employee groups within the banks to interact with each other. The interaction between employees and outside customers was still in its infant stage due to a lack of rewards for creating or sharing knowledge. Furthermore, it was noted that all five banks supported business practices to fulfil KM. It was found that the knowledge protection process and cultural infrastructure were related to the organisational structures, knowledge conversion processes and technology systems. With all these incentives, however, there was no specific strategy that directed these practices to implement the KM process.

In line with searching for KM in Canadian banks, Carl Touchie “a managing director of decision support service at The Bank of Montreal (BMO)” declared that the bank adopted SAS software in 1996 to support the knowledge delivery process inside the bank. This process was based on providing and receiving information to customise the customer contact channel. BMO spent a considerable amount of money in 2000/2001 to be a leader in customer-centric knowledge based solutions. It changed its traditional knowledge discovery and knowledge sharing process to be more economical and faster (Ali and Ahmed, 2006).

In addition, Choo and Johnston (2004) highlighted that the Royal Bank of Canada (RBC) used a technological system to share knowledge called “FX Direct project”. The bank launched this system in May 1999 as an internet foreign exchange system and to connect the bank with its clients through internet channels by allowing for access to required information.

In Portugal, Curado (2008) tried to capture the perceptions of KM in nine Portuguese banks through employing a qualitative approach and considering two different KM strategies: exploitation and exploration. An exploitation strategy mainly focuses on managing the existing knowledge, while an exploration strategy focuses on creating new knowledge. The findings indicated that the expression “knowledge management” was widely known by the interviewees and generally associated with very positive attributes and also related to people in the organisation, their capabilities, competences and knowledge. The author suggested that KM is a developing area in Portuguese banks and that they focus more on leveraging, distributing and diffusing the existing knowledge (knowledge exploitation) rather than creating new knowledge (knowledge exploration). Portuguese banks used aspects related to technology e.g. information, diffusion channels, registration routines and internal systems, as well as aspects related to human resources e.g. training and team working.

In Turkey, Cebi et al. (2010) employed a quantitative empirical approach to explore the relationship between KM practices and organisational performance within the banking institutions. The study referred to KM practices through particular activities such as: identifying knowledge flow, developing a systematic structure to enable knowledge transfer between employees, forming information databases, accessing these databases easily, establishing a credit monitoring system to create new knowledge about the customer’s risk profile and to provide integrated information within the bank. Regression analysis indicated that these KM practices positively influenced the organisational performance (process, employee and market performance) of the Banking Institute.

However, these findings can be questioned since they were based only on statistical tests without providing any interpretation or details. The study did not indicate how the bank enhances its KM practices, whether by enhancing human or technology-oriented KM.

3.2.2.3 KM in developing countries' banks

The Asian Development Bank initiated a specific organisational unit in 2002 to manage its knowledge called the “knowledge committee”. This committee focused on using technology to enhance the flow of the knowledge process. They supported staff to access information easily by establishing a new intranet web and special databases for KM applications. The bank also expanded over 300 external networks with professional organisations worldwide and supported both distance learning and knowledge sharing by establishing a specific centre called the Centre of Learning, Information, Communication and Knowledge (CLICK). The bank effectively made use of simple aspects of a SECI model as it externalised its explicit knowledge by documentary forms, internalised the tacit knowledge of its staff by browsing its website and socialised knowledge by conducting relevant seminars and workshops. However, there was no evidence that the combination process was considered in the bank.

In Malaysia, Ali and Yusof (2004) designed a survey to explore the factors that encourage Malaysian commercial banks to adopt KM techniques. The findings suggested that enabling KM processes was very important to support CRM in banking and to allow both workers and customers to share their knowledge and also to discuss how to meet customers' expectations.

Ali and Ahmed (2006) described the KM processes in two Malaysian commercial banks and found that the use of KM by banks was still at the infant stage, although the concept of KM was well accepted in these banks. The authors concluded that Tiger Bank and Camel Bank were different in practicing KM as Tiger Bank focused on the codification strategy of KM while Camel Bank focused on the personalisation strategy. Based on the data provided by the authors, however, these findings are disputable. The data provided suggested that Tiger Bank focused on both codification and personalisation strategies whilst Camel bank focused only on a codification strategy. Tiger Bank codified knowledge by incorporating KM in the form of a webpage known as "TigerBank2u". It was a network through which the bank's employees shared knowledge electronically through emails and then passed it on to customers. "TigerBank2u" gives the employees and customers unlimited access to expertise, services and resources in Malaysia and worldwide through electronic forums, libraries and e-mail. The bank also personalised knowledge by encouraging face-to face communication between employees with each other, with customers and with knowledgeable experts.

In Camel Bank, the lack of training programmes related to IT skills was a major challenge for technical information exchange between its members of staff. The findings also indicated that both banks focused on codified knowledge through developing e-libraries in the form of distributed databases that could be accessed by everyone 24 hours a day. The libraries were developed and maintained by the employees, giving them an understanding of what the libraries represent, how they should be developed and the benefits that they could bring within the overall drive to improve services. This also indicates that Tiger

Bank was both human- and technology-oriented while Camel Bank was just technology-oriented. Ali and Ahmed (2006) concluded that banks should combine codification and personalisation strategies and should be both human- and technology-oriented.

Tan et al. (2010) surveyed 114 employees from eight banks in Malaysia to examine the impact of motivational factors, which included both intrinsic factors such as trust, learning, behaviour; and extrinsic factors such as organisation culture, reward system, IT; according to the knowledge sharing process in terms of the SECI model among bank employees. The study only provided quantitative findings based on a regression model without providing interpretation or detail regarding the effect of these motivational factors on each process of SECI. The findings indicated that all the motivational factors mentioned in the study positively affected the knowledge sharing process and that IT had the highest effect. The authors approved these findings and opined that IT was the most important factor to support knowledge sharing due to its increasing importance in capturing, sorting and transferring knowledge anytime, anywhere.

In Libya, Kridan and Goulding (2006) conducted 35 interviews in three Libyan banks (the Central Bank, a specialist bank in real estate and investment, and a commercial bank) to discover what Libyan banks understood by the term knowledge and KM. The findings indicated that even though a large majority (93%) of respondents stated that knowledge is the most valuable resource for banks, it was found that they had little awareness of KM concepts. More than 87% of respondents claimed that there were no KM activities in these

banks, and 69% of them suggested that Libyan banks cannot be transformed by KM systems due to the lack of infrastructure and organisational culture required.

In Lebanon, Karkoulian et al. (2008) pointed out the influence of informal and formal mentoring on the willingness to share information for professional workers. The mentoring process can be viewed as a meeting of different kinds of people in terms of the work experience. Formal mentoring could be conducted to make a successful relationship by providing support structures such as planned meetings, workshops and teamwork. Otherwise, informal mentoring can be conducted with little support or guidance from the organisation by means of unplanned meetings. By using quantitative data, the findings showed that both formal and informal mentoring in Lebanese banks enriched knowledge sharing and knowledge utilisation within the organisation through discussions and debates.

In Tunisia, Triki and Mjahed (2008) aimed to explain the process of customer knowledge transfer, by applying the SECI model to the complaint management process in a Tunisian bank (the name of bank was not mentioned in the study). The study indicated that using the SECI process in order to transfer customer knowledge during the complaint management process is pertinent. The socialisation process is concerned with collecting feedback from customers; the externalisation process is concerned with reporting and transmitting these complaints, focusing on codifying, configuring and analysing these complaints, and the internalisation process is concerned with the use of complaints information to influence future decisions.

However, the authors noted particular organisational barriers in this bank that considerably minimised the efficiency of using this model to transfer customer knowledge. The complaint management process was not supported by systems enabling local service organisations to be connected, there were no procedural manuals about complaint management which describe the experience of previous customers and proposed solutions and no external source of data was formally provided for staff use. It was also found that the customer service contact could not operate systematically to receive and optimise complaints and service requests efficiently and there was no central aggregation of complaints in the customer care domain. Finally, there was no system in place to encourage or reward staff to share their knowledge.

In Mauritius, Vencatachellum and Jeetach (2008) conducted quantitative research to investigate the awareness of the KM concept and KM strategies used by the commercial banking sector. It was noted that 40% of respondents indicated that leading banks in Mauritius mainly exchange knowledge “through the use of IT- from people to document” which refers to the codification strategy. However, the majority of respondents (80%) noted that the other banks mainly exchange knowledge “through one to one dialogue - from people to people” which refers to the socialisation strategy. Therefore, those banks were missing out on the opportunity to convert tacit knowledge into explicit knowledge, which means that the externalisation mode is not practiced within these banks.

In this study, Mauritian banks emphasised socialisation and internalisation as their main knowledge creation processes. Although the study provided several examples of

socialisation mechanisms used by these banks such as job training, teamwork, job rotation, one to one conversations, brainstorming sessions, training with internal and external experts, emails, intranet and telephone, the study did not provide any details regarding the internalisation process. It was also found that emphasising explicit knowledge, such as externalisation and combination, was not relevant for knowledge creation even though the codification strategy was a KM strategy pursued by the leading banks.

Although the majority of banks mainly depended on socialisation and internalisation which relates to the personalisation strategy, this was no guarantee of an efficient knowledge transfer process, since 90% of the banks did not have a reward strategy to promote knowledge sharing. This suggests that the Mauritian banks did not provide enough focus on the management of explicit knowledge through externalisation and combination. They also have problems with promoting a knowledge sharing culture in order to manage tacit knowledge effectively through socialisation and internalisation processes.

In the United Arab Emirates, Alrawi and Elkhatib (2009) aimed to explore how far banking managements in the UAE have adopted the concept of KM in their operations through investigating the concepts of the creation, sharing and acquisition of knowledge, based on a survey of 72 managers working in the banking sector in Abu Dhabi. Although those managers confirmed the importance of KM practices to provide new knowledge and to improve CRM, they suggested that KM practices in UAE banks are still in their infancy and are not very effective and banks need to build an organisational culture of trust which

will enhance knowledge sharing between employees and management and help to build long-term strategies based on that knowledge.

The available evidence is only in **the planning stage** in some banks rather than empirical studies of work activities. For example, the African Development Bank suggested, in 2008, four key steps to apply KM strategy within four years (2008-2012). The first is to build a “knowledge culture” within the bank, followed by building partnerships and increasing collaboration with relevant external institutions, universities and think-tanks in Africa. Next is to enhance knowledge dissemination and sharing to ensure that knowledge created and leveraged through partners reaches the end users/customers, and finally enhancing the application of knowledge to strengthen operational and developmental effectiveness.

Similarly the Central Bank of Jordan set up, in 2008, a work plan consisting of consequential episodes to implement KM processes in the bank. First, to create new culture to increase the awareness of KM importance between its staff. Second, to highlight the top management’s role to encourage the knowledge sharing process through training, seminars, workshops and teamwork. Third, to codify the current knowledge assets for both explicit and tacit knowledge and disseminate this knowledge through the intranet. Fourth, to prepare a “knowledge map” to facilitate the process of existing knowledge and finding both explicit and tacit gaps and setting up the necessity plans to fill these gaps. Fifth, to establish a generic plan to develop the bank’s services to get abreast of e-government requisites. And finally, to develop the internal and external communication system within the bank to enhance all kinds of interaction between all those who may be concerned.

The bank developed an infrastructure to fulfil these initiatives by providing a PC for each staff member and setting up IT training programmes for all of them. Also, the bank developed a knowledge storing system for all documents to enhance the knowledge sharing process (Central Bank of Jordan, 2008).

3.2.3 Conclusion: developed and developing countries' banks

As indicated by the above published studies, applying KM in the developed countries' banks started in the beginning of 2000s in different places such as UK (2000), Japan (2001, 2002, 2009), the USA (2002 and 2004), Germany (2003, 2004), Canada (2004), Portugal (2008) and Turkey (2010). It is significant that the external knowledge in the majority of Japanese banks, except the Japanese Bank of Tokyo Mitsubishi, is limited as opposed to the US banks, which largely depend on external knowledge. It was also found that Portuguese banks prefer to share their existing knowledge rather than creating new knowledge. It was noticed that Japanese banks are mostly human-oriented in terms of managing their knowledge and accordingly are largely dependent on the personalisation/socialisation process of KM such as face-to-face conversation, job training and job rotation. The majority of banks in Western developed countries such as the UK and USA, Canada and Germany, are both human- and technology-oriented in terms of managing knowledge. The German banks focused more on codifying/externalising knowledge rather than personalising/socialising knowledge. Finally, it was clear that banks in developed countries benefit from IT to capture, share or document knowledge through IT systems, banking software, internet, intranet, email and databases.

In 2002, the Asian Development Bank started to develop KM from where it spread out to different places such as Malaysia (2004, 2006 and 2010), Libya (2006), Lebanon, Tunis, Mauritius (2008) and finally to the United Arab Emirates (2009). The majority of KM studies in these countries were exploratory using quantitative data to investigate to what extent these banks were aware of the importance of KM and how they practiced KM. Such studies were conducted in Libya, The United Arab Emirates, Tunisia, Lebanon and Mauritius. The majority of banks in these developing countries are still in the infancy stage of applying KM and are mainly human-oriented. Regarding practicing SECI processes, and based on the similarity of concepts between Hansen's (1999) model of personalising and codifying knowledge and the socialisation and externalisation processes of Nonaka's model of SECI, it was found that the use of SECI processes is different between banks. In Malaysia, the internalisation and combination processes were not represented in the Tiger Bank, adding to these processes, the socialisation process was not represented in the Camel Bank. It was also found that the combination process was not used in the Asian Development Bank. In Mauritius, the externalisation and combination processes were not applied while in Tunisia, the whole of SECI was applicable in the supportive environment of a knowledge sharing culture and facilitating the internal and external connection mechanisms. Finally, the Central Bank of Jordan (2008) and the African Development Bank (2008) are still at the stage of designing a future plan in order to apply KM.

In general, it was noticed that little research has been done to investigate the use of SECI processes by banks. Little research has been also done to investigate KM strategies in banks with reference to personalisation and codification of Hansen's KM concept which

refers to the socialisation and externalisation processes of SECI. This reveals that the combination and internalisation processes in banks have not been enough researched. Therefore, there is a need to conduct a comprehensive study to investigate the use of the whole SECI model in banks to manage the internal and external banking knowledge and to investigate the role of people and IT technology to support these processes. It was also noticed that all studies conducted in developing banks depended on the quantitative data of statistical findings without providing enough interpretation. Therefore, comprehensive study should investigate in detail the aspects of SECI to provide clearer understanding. This study should not rely only on quantitative data but also research qualitative data to strengthen and provide more interpretation of findings.

Chapter 4

Research Questions - Construction of Variables and Research

Methodology

According to Sarantakos (2005), social research seeks to gather useful knowledge, and in order to achieve this, the research design, data collection and methods of analysis need to be carefully chosen, to answer the research questions and meet the research objectives. This chapter discusses the research questions and hypotheses as well as the research variables and their measurement, followed by research strategies and methods of data collection. The research questions and hypotheses are presented based on the gaps that existed in the literature such as the application of the SECI model in the banking industry and its relation to innovation, especially in developing countries. The chapter justifies a mixed approach (quantitative and qualitative) to explore the SECI model and innovation and the linkage between them.

In the research, these methods are applied in the research site of Egyptian banking. As we saw above, KM research on banking in developing, and in the Arab world, has been limited, and Egypt reports the most populous Arab country. As one of the major sectors contributing to the Egyptian economy, the Egyptian banking industry supports economic growth by increasing investments, offering strong capital inflows, supporting the stability in the foreign exchange market as well as the macroeconomic stability, and thereby improving income distribution and job creation which is one of the major challenges for developing economies (Egypt Economic Report, 2009; Egypt State Information Service,

2009). The qualitative data (interviews) will be used to detail and triangulate quantitative data (survey). The remaining sections in this chapter focus on the process of collecting and analysing data including the pilot testing, justification of the quality of research instruments, sampling process and explanation of quantitative and qualitative data analysis techniques used, followed by details of the research community.

4.1 Research questions

As mentioned in Chapter 2, the SECI model was empirically tested in different business contexts such as the pharmaceutical sector; the IT sector; the manufacturing, high-tech and service sectors; the construction sector; in multi-organisational projects; education and training systems; several knowledge intensive firms in Boston's Route 128 and Spain such as computer and electronic product manufacturing; internet publishing and broadcasting; telecommunications; internet service providers, web search portals, and data processing services (Cabrera, 2008; Eliufoo, 2008; Kamtsiou et al., 2006; Li et al., 2008; Lopez-Saez et al., 2010; Martin-de-Castro et al., 2008; Noordin and Hassan, 2006; Refaey, 2002; Rice and Rice, 2005; Rodingues et al., 2006; Tsai and Li, 2007). All of these studies suggested that the integration of all the SECI processes improve general performance in organisations. However, most of these studies did not show if specific processes of SECI fit a specific business context. The research of Martian-de-Castro et al. (2008) and Lopez-Saez et al. (2010) indicated that companies in Spain and the USA focused more on the combination process because of their focus on explicit knowledge. Eliufoo (2008) also mentioned some limitations of using all the SECI processes in four cases of construction organisations. Regarding socialisation, the practice of job training limited the face-to-face

discussion between staff. For externalisation, the codification of procedures, rules and checklists was limited. The lack of codification also decreased the benefits of the combination process of the re-configuration of existing organisational knowledge. For internalisation, learning by doing was limited in part due to the lack of job training.

Little research has been done so far to investigate the use of SECI processes by banks, though exceptions are The Asian Development Bank (2002), Vencatachellum and Jeetach, (2008) and Triki and Mjahed (2008). These few studies indicated that the use of SECI processes was different in different banks. In Malaysia, the internalisation and combination processes were not represented in the Tiger Bank; while the socialisation process was not represented in the Camel Bank and the combination process was not used in the Asian Development Bank. In Mauritius, the externalisation and combination processes were not used while in Tunisia, all of the SECI processes were applied in the supportive environment of a knowledge sharing culture which facilitated the internal and external connection mechanisms. Therefore, there is a need for a comprehensive study to provide a clearer understanding of the aspects of each process of SECI in banks.

As discussed in Chapter 2, the universal applicability of this model in different cultural contexts is arguable and not all SECI processes can be applied in the same cultural context. Therefore, studying the use of the SECI model in banks has to be done in a non-Japanese cultural context that produced this model. Discussing the implications of the SECI model in the Arab world is important, since this region comprises 23 countries which are strongly shaped by Islamic culture. Little research has been done so far to investigate the use of the

SECI model in Arab organisations, though Refaey (2002) and Triki and Mjahed (2008) are exceptions. An important basis for an investigation of the implications of the SECI model in the Arab world could be provided by Egypt, as the biggest Arabic country with a population of 85 million. Therefore, the following research question is addressed:

Q1: How is the SECI model and processes applied in the Egyptian banking industry?

As mentioned in Chapter 3, studies that employed knowledge creation processes suggested that all SECI processes strongly support innovation (Bueno et al., 2008; Darroch, 2005; Darroch and McNaughton, 2002; Huang and Wang, 2003; Lee and Choi, 2003; Nonaka and Takeuchi, 1995; Richtner and Ahlstrom, 2010; Teece, 1998; Xu et al., 2010). However, studies that investigated the relationship between each process of SECI indicated that not all processes had the same effect on innovation and some of them even had a negative effect (Ng et al., 2011; Refaey, 2002; Schulze and Hoegl, 2008).

In Chapter 3, it was also suggested that product and process innovations in developing countries could be novel for these countries themselves or for the region but not necessarily for the whole world. Therefore, it is valuable to explore first the process and product innovation aspects in the Egyptian banking sector, then to investigate the relationship between each process of SECI and innovation. Based on this argument, the following research questions are:

Q2: What is the nature of the innovation process in the Egyptian banking industry?

Q3: What is the effect of the SECI model on innovation within the Egyptian banking industry?

4.2 Research hypotheses

Knowledge management is an important resource for an organisation, in order to enhance its innovation capabilities and to retain sustainable competitive advantages. It is also an essential resource for banks to improve the quality of their operations, to sustain their profitability, and to enhance the rules. The SECI model is not only a model of organisational knowledge creation but is also accepted as a highly integrative KM approach bringing together a wide range of knowledge processes. Little research has been done so far to investigate the relationship between the SECI processes and innovation. Therefore, one purpose of this study is to examine the use of the SECI model by Egyptian banks and its effect on the innovation process.

The research questions above provide an overview of the aspects of each process of the SECI model and both product and process innovations in Egyptian banks, and from these the study will examine the effect of this model on innovation (Question 3) by testing relevant hypotheses. A hypothesis can be defined as a statement derived from a theory and positing possible relationships or associations among the phenomena being studied. These relationships suggest that when some attribute or quantity of one phenomenon exists, a specific attribute or quantity of another phenomenon is also likely to occur (Sirkin, 1995). If a hypothesis proposes that there is no relationship between two or more variables, it is called a null hypothesis; if a hypothesis proposes that there is a relationship between two or more variables, it is called an alternative (Miles, 2001). This study formulates its hypotheses as alternatives which propose an existing relationship between the independent variables (SECI processes) and the dependant variable (innovation). To formulate these

hypotheses, a one-tailed hypothesis is used which states that there is an effect which points in a particular direction (Miles, 2001).

Hypothesis 1

SECI processes positively influence the innovation process within Egyptian banks.

However, previous research indicated that not all the SECI processes had the same effect on innovation and the importance of each process might differ from business to business (Refaey, 2002; Schulze and Hoegl, 2008; Ng et al., 2011). Therefore, it is valuable to test which of SECI processes could maximise innovation in the Egyptian banking sector.

Hypothesis 2

Each of the SECI processes has a different contribution to the variance in innovation in Egyptian banks.

4.3 Measuring the research variables

As indicated above (Section 4.1), the research questions aim to explore the application of the four processes of SECI, and aspects of innovation in Egyptian banks, and then examine the effect of these processes on innovation. This means that in this research six variables are used: four variables for the SECI model (socialisation, externalisation, combination, and internalisation) and two for the types of innovation (product and process), and they are in need of being measured. These variables were discussed in Chapters 2 and 3 and will be measured as follows:

Socialisation is characterised by dialogue through which individual knowledge is converted into shared ideas and concepts (Rodrigues et al., 2006). Personal knowledge is exchanged by sharing experiences face-to-face (Rice and Rice, 2005). Some activities that encourage the socialisation process include the involvement in joint projects, job rotation, as well as formal meetings and training programmes (Li et al., 2008; Salmador and Bueno, 2007; Schulze and Hoegl, 2008; Tsai and Li, 2007). An organisation's involvement in joint projects with external bodies enhances the face-to-face discussions between its staff and these bodies. Personnel rotation across departments enables employees to share experiences with new colleagues. Meetings/seminars and training programmes increase the personal interaction between people to discuss suggestions, ideas or solutions. Martin-de-Castro et al. (2008) suggested that sharing knowledge could also occur through informal meetings between employees during break or during social activities outside the work place. They also highlighted the importance of inviting internal and external experts to share their knowledge with employees through face-to-face discussions.

Externalisation is defined as the conversion of tacit knowledge into documented knowledge (Nonaka and Takeuchi, 1995). Specific activities can help to externalise tacit knowledge such as the documentation of experiences shared during meetings and training programmes/seminars (Salmador and Bueno, 2007) and the documentation of findings of discussions and negotiations with external bodies e.g. customers, suppliers, competitors and partners (Schulze and Hoegl, 2008). Experts' tacit knowledge can be also externalised by asking them to participate in designing the training programmes/seminars topics and

contents (Li et al., 2009; Martian-de-Castro et al., 2008; Rice and Rice, 2005; Tsai and Li, 2007).

Combination is the aggregation of externalised knowledge into a usable and valuable framework (Rice and Rice, 2005) using activities such as: collecting and reformulating relevant reports and adding them to the organisation's databases (Schulze and Hoegl, 2008); sorting the existing files and knowledge into more accessible forms (Rice and Rice, 2005; Martin-de-Castro et al., 2008); and updating databases and networks regularly (Li et al., 2009; Martian-de-Castro et al., 2007 and 2008; Tsai and Li, 2007).

Internalisation is the conversion of explicit knowledge back into valuable tacit knowledge for individuals (Nonaka and Takeuchi, 1995; Rodrigues et al., 2006) using activities such as: creation of shared expertise and routines across organisational and inter-organisational boundaries (Rise and Rice, 2005); access to databases and reading relevant documents (Salmador and Bueno, 2007); and spending time to explain the content of relevant reports and documents (Martin-de-Castro et al., 2007 and 2008; Schulze and Hoegl, 2008). Martin-de-Castro et al. (2007) added that an organisation's perspectives and insights have to be shaped from the already available data and information. It is also important to highlight that some activities will fulfil more than one aspect of the SECI model. For instance, job training enables the sharing of experiences through face-to-face discussions between trainees, but it is also a mechanism of learning by doing to internalise knowledge (Tsai and Li, 2007; Li et al., 2009).

Product innovation, as we saw in Chapter 3, includes introducing new products, new technologies, or improvements to existing products (Cooper, 1998; Damanpour and Gopalakrishnan, 2001; Oke, 2007; The United Nations University Institute for New Technology, 2004; Tsai et al., 2008). It also includes new services or significant improvements in technical specifications, components and materials or software (Batiz-Lazo and Woldesenbet, 2004; Rogers, 1998; The Community Innovation Survey, 2006). The UK innovation survey (2001) considers that introducing non-traditional solutions to solve a problem is also a form of innovation. Examples of product innovations in the banking industry are:

- New forms of warranty, such as an extended warranty on new or used goods, or bundling warranties with other services, such as with credit cards, bank accounts or customer loyalty cards.
- New types of loans, for example variable rate loans with a fixed rate ceiling.
- The introduction of smart cards and multipurpose plastic cards.

Process innovation is the implementation of new or significantly improved production or service methods (Tsai et al., 2008). It includes significant and distinctive changes in techniques, equipment, workplaces, computer networks and software (Bi et al., 2006; The Community Innovation Survey, 2006). Process innovation also includes introducing changes in management routines, new marketing techniques, improvements in quality control, and introducing new processes or improving current processes (Tan and Nasuridin, 2010; The United Nations University Institute for New Technology, 2004; Tidd et al., 2005). Examples of process innovations in the banking industry are:

- Equipment required for new or improved products
- Digitisation of printing processes and portable scanners.
- New or significantly improved computer networks.
- New or improved software or routines for purchasing or accounting systems.
- Electronic clearing and ticketing systems.
- Automated voice-response systems.

The above research variables were measured by developing integrated scales. These scales are based on the activities mentioned and empirically tested in a range of literature. These activities were designed to measure these variables in different business contexts (manufacturing and service), therefore the researcher developed these activities to be suitable for the banking context. For example, the face-to-face discussions in manufacturing industries may occur relatively less during the job training which focuses on operating machines. However, in banking, as administrative work, job training is an effective mechanism of enhancing face-to-face communications. Job training in manufacturing industry is strongly related to the internalisation process, which is mainly based on learning by doing, rather than the socialisation process which depends on face-to-face discussions. Figure 4-1 sets out the research variables in this study and their scales.

Figure 4-1: Research variables scales

SECI processes	References
<p>Socialisation (tacit-tacit)</p>	
<p>Face-to-face discussion through:</p>	
<ul style="list-style-type: none"> - Rotation of personnel across departments. 	<p>Tsai and Li (2007), Salmador and Bueno (2007) and Li et al. (2009)</p>
<ul style="list-style-type: none"> -Involvement in joint projects with external bodies. 	<p>Tsia and Li (2007), Salmador and Bueno (2007) and Li et al. (2009)</p>
<ul style="list-style-type: none"> -Arranging meetings, seminars, and workshops. 	<p>Schulze and Hoegl (2008)</p>
<ul style="list-style-type: none"> -Arranging training programmes and conferences. 	<p>Schulze and Hoegl (2008)</p>
<ul style="list-style-type: none"> -Inviting qualified members and external experts to speak about their beliefs, values and culture. 	<p>Martin-de-Castro et al. (2008)</p>
<ul style="list-style-type: none"> -Providing common places for taking tea, coffee, having lunch or other activities. 	<p>Martin-de-Castro et al. (2008)</p>
<ul style="list-style-type: none"> -Encouraging social activities outside the work place. 	<p>Martin-de-Castro et al. (2008)</p>
<p>Externalisation (tacit-explicit)</p>	
<p>Documenting tacit knowledge through:</p>	
<ul style="list-style-type: none"> -Documenting staff points of view on projects and strategies 	<p>Rice and Rice (2005) and Schulze and Hoegl (2008)</p>
<ul style="list-style-type: none"> -Reporting results of negotiations with customers, suppliers, competitors and partners. 	<p>Schulze and Hoegl (2008)</p>
<ul style="list-style-type: none"> -Documenting the findings of meetings, seminars, workshops, conferences and training programmes. 	<p>Schulze and Hoegl (2008)</p>
<ul style="list-style-type: none"> -Issuing reports about customers, competitors and others based on accumulated experience. 	<p>Martin-de-Castro et al. (2008)</p>
<ul style="list-style-type: none"> -Participation of internal qualified members and external experts to set the training programmes and seminars topics. 	<p>Martin-de-Castro et al. (2008), Tsai and Li (2007) and Li et al. (2009)</p>
<ul style="list-style-type: none"> -Reporting the beliefs, values and culture of the internal qualified members and external experts. 	<p>Martin-de-Castro et al. (2008), Tsai and Li (2007) and Li et al. (2009)</p>
<p>Combination (explicit-explicit)</p>	
<p>Transferring the externalised knowledge into proper forms through:</p>	
<ul style="list-style-type: none"> -Classifying information mentioned in files, databases, networks and reports. 	<p>Rice and Rice (2005) and Martin-de-Castro et al. (2008)</p>
<ul style="list-style-type: none"> -Updating databases. 	<p>Tsai and Li (2007) and Li et al. (2009).</p>
<ul style="list-style-type: none"> -Considering the collected information to develop rules, reports and decisions. 	<p>Rice and Rice (2005)</p>
<ul style="list-style-type: none"> -Considering the documented information as the main way of communication. 	<p>Martin-de-Castro et al. (2008)</p>
<ul style="list-style-type: none"> -Collection and classifying reports issued by external agents e.g. customers, competitors, suppliers, partners or the government. 	<p>Schulze and Hoegl (2008)</p>
<ul style="list-style-type: none"> -Considering relevant published research and reports to develop policies and aims. 	<p>Schulze and Hoegl (2008)</p>

Internalisation (explicit-tacit)

Converting the sorted and combined knowledge into tacit knowledge through:

- Encouraging employees to join postgraduate courses e.g. Diploma, Master, or PhD. Rice and Rice (2005), Tsai and Li (2007) and Li et al. (2009)
- Assessing outcomes of training programmes, workshops, seminars, and conferences. Tsai and Li (2007) and Li et al. (2009)
- Accessing the organisation database and the internet to obtain required information. Tsai and Li (2007), Salmador and Bueno (2007) and Li et al. (2009).
- Arranging meetings to explain the content of related reports or documents. Schulze and Hoegl (2008)
- Arranging meetings to explain and analyse the relevant reports issued by customers, suppliers, competitors, partners or the government. Schulze and Hoegl (2008) and Martin-de-Castro et al. (2008)
- Depending on the available data and information to shape the organisational culture and point of view. Martin-de-Castro et al. (2008)

Innovation

Product innovation

- Producing new ideas that could help employees to achieve their roles or duties. Rogers (1998) and Tsai et al. (2008)
- Developing current services based on customers' needs and market trends. Rogers (1998) and Tsai et al. (2008), Cooper(1998) and Damanpour and Gopalakrishnan(2001)
- Applying new technologies and software to add new services and improve current services. The Community Innovation Survey (2006) and Batiz-Lazo and Woldesenbet (2006)
- Adopting new/ non-traditional solutions to solve problems UK Innovation Survey (2001)
- Producing new services to improve customers' access to goods or services. The Community Innovation Survey (2006)

Process innovation

- Significant changes in organisational structure and workplace. Tsai et al. (2008) and Bi et al. (2006)
- Adopting flexible management strategies to deal with unexpected changes. Tsai et al. (2008) and The Community Innovation Survey (2006)
- Adopting significant improvements in business practices and activities. UK Innovation Survey (2001) and The Community Innovation Survey (2006) and Tidd et al. (2005)
- Adopting distinctive strategies to manage processes, in comparison with competitors' strategies. Tsai et al. (2008) and The Community Innovation Survey (2006)
- Adopting new/non-traditional marketing strategies in advertisements, promotions, services and prices. The United Nations University Institute for New Technology (2004), Tsai et al. (2008) and Tan and Nasurdin, (2010)

These research variables and their scales (Figure 4.1) were the framework used to build the questionnaire structure and question items. The questionnaire addressed all of the six research variables by asking to what extent the banks perform the activities which were underlined in each research variable. Taking the first SECI variable, socialisation as an example, the questionnaire items ask to what extent Egyptian banks enhance face-to-face interaction between staff and their managers, and external bodies through following systematic plans to rotate their staff across departments. Questions also ask about supporting detailed face-to-face discussions of work issues, and involving staff in discussions with external bodies (Appendix 1).

4.4 Research strategy

Research comprises two elements: theoretical and empirical. Linking these two elements leads to two kinds of research strategies, deductive “theory–then-research” and inductive “research-then-theory” (Bryman and Bell, 2011; May, 2011). Both deductive and inductive strategies are accepted as appropriate business research strategies (Saunders et al., 2009).

A deductive strategy represents the commonest view of the nature of the relationship between theory and research (Bryman and Bell, 2011, p.11). It adopts a hypothesis–testing approach. In deductive research, theories are established which are then tested through empirical evidence (May, 2011). This strategy focuses on studying theories by reviewing the literature then it deduces hypotheses which are subjected to empirical study. The

findings will confirm or reject the hypotheses, and based on that, new theories are formed (Bryman and Bell, 2011, p.11; Saunders et al., 2009, p. 124).

An inductive strategy aims to get a close understanding of the research context to generate a theory. Theories are developed by determining the phenomenon's attributes and relevant data. In inductive research, research comes before theory and the researcher looks to discover a theoretical proposition (Bryman and Bell, 2011; May, 2011). The inductive strategy can be summarised in the following steps: observation-findings-theory (Bryman and Bell, 2011, p. 13; Saunders et al., 2009, p. 126). With an inductive stance, "theory is the outcome of research" (Bryman and Bell, 2011, p. 13).

After considering both deductive and inductive strategies, it was decided to use a deductive strategy to realise the goals of this research. The study does not aim to generate new theories but to revise an existing theory by studying the application of the SECI model in the Egyptian banking industry (Bryman and Bell, 2011). A deductive strategy will enhance the researcher's attempts to build a theoretical background for the SECI model and its applications to identify research gaps (see Chapters 2 and 3). Based on these gaps, the research questions and hypotheses are formed, and to test these hypotheses, data collection techniques and samples are identified. In Chapters 5, and 6, the collected data are analysed and the research hypotheses are tested. Chapter 7 is a discussion of the research findings. Then, the conclusion is suggested in Chapter 8.

4.5 Methods of data collection

Primary data can be collected through quantitative and/or qualitative methods (Bryman and Bell, 2011; Cooper and Schindler, 2008; Ghauri and Gronhaug, 2010; Johns and Lee-Ross, 1998; Render et al., 2011; Sarantakos, 2005). In this study quantitative results were supplemented by qualitative information in order to detail and triangulate the survey results by providing a contextual background. Due to sponsorship rules, the period of data collection in Egypt could not exceed three months, therefore both quantitative and qualitative data were collected during the same period between November 2009 and January 2010.

4.5.1 Quantitative method

The quantitative method of data collection is rooted in positivist methodological principles which are based on testing a theory of composed variables, measured and analysed using statistical procedures to determine whether the theory is accurate or not (Bryman and Bell, 2011, p. 27; Saunders et al., 2009, p. 119). Quantitative researchers place considerable emphasis on the tools of measurement e.g. questionnaires, and the relationship between variables using statistical data analysis (Easterby-Smith et al., 2008; Maylor and Blackmon, 2005; Sekaran and Bougie, 2010).

The questionnaire is among the most popular data collection methods in business studies. It is a method of data collection that utilises questions for recording the verbal behaviour of respondents (Easterby-Smith et al., 2008; Ghauri and Gronhaug, 2010; Sekaran and Bougie, 2010). This study used a questionnaire to test the research hypotheses by

identifying the independent (SECI processes) and dependant (product and process innovation) variables and analysing them using appropriate statistical techniques (Ghauri and Gronhaug, 2010). A self-administrated questionnaire was used, as it was cheaper, quicker and more convenient (Bryman and Bell, 2011, p. 232). The questionnaire was attached to a cover letter (Appendix 1) which explained the nature of the research, the importance of this research for the Egyptian banks, the assurance of confidentiality of the participants' responses and personal details, and the researcher's contact details if any questions arose (Saunders et al., 2009, p. 191).

The questionnaire was in three parts (Appendix 1). In parts one and two, closed questions were used to discover the extent of the activities performed by Egyptian banks in terms of the SECI processes and both product and process innovation. Part one was related to the SECI processes and divided into four sections to discover how often Egyptian banks performed socialisation activities (Section-A, seven items), externalisation (Section-B, six items), combination (Section-C, six items), and internalisation (Section-D, six items). Part two was divided into two sections to discover the extent these banks performed product innovation (Section-A, five items) and process innovation (Section-B, five items) activities. Both parts one and two used positive questions to measure the SECI processes and innovation. Part three asked for the personal details of the respondents, including the bank name, years of experience, gender, academic background, and job position. These questions were open-ended.

The Likert scale was used, as it is one of the most frequently encountered formats for measuring attitudes (Bryman and Bell, 2011; Litwin, 1995). This scale was used to record all answers relating to the SECI model variables of socialisation, externalisation, combination and internalisation and to both product and process innovation. The responses are arranged on a five point scale (strongly disagree- disagree- neutral- agree- strongly agree) (Brace, 2008; Floyd and Fowler, 2009; Sarantakos, 2005) and therefore a quick and easy way for the respondents to record their answers. This potentially increases the return rate, since frustration over a single question can lead the respondents to discard the entire questionnaire. The personal details of the respondents were recorded at a nominal-level only (Appendix 1) (Brace, 2008; Floyd and Fowler, 2009; Sarantakos, 2005). Two hundred and ten questionnaires were collected and analysed and further details of how this sample was obtained are provided below at Section 4.7.

4.5.2 Qualitative method

The qualitative method of data collection is rooted in interpretive methodological principles which provide a detailed description of events, situations and interaction between people and things that are related to the phenomenon under revision (Bryman and Bell, 2011, p. 27; Cooper and Schindler, 2008, p. 77; Saunders et al., 2009, p. 119). It allows researchers to explore and probe deeply into attitudes and provides an understanding of a given context and underlying motivations and values through detailed descriptions (Denzin and Lincoln, 2005; Ghauri and Gronthug, 2010). It is used in this study to add further interpretation and meaning to the quantitative findings.

Qualitative researches usually employ a limited number of interviews or observations to explain the studied concept (Ghauri and Gronthug, 2010). In this study, 26 semi-structured face-to-face interviews were conducted. Questions were taken from the questionnaire, rephrased, and arranged according to a topic sequence, so the questions covered the same issues (Appendix 2). New topics were discussed in the interview as well, such as what kind of knowledge the interviewees needed to achieve their jobs, how they could obtain this knowledge, and whether it was easy to get this knowledge. The interview also looked in detail at the effects of each process of the SECI model on innovation. However, there is still the possibility to change the sequence or to probe for more information. The researcher became so adept at understanding the interviewees that the next question in the sequence flowed naturally based on the previous answer of the interviewee.

The interviews were conducted in the Arabic language, then coded, transcribed and translated into English for analysis (see Chapter 6). The respondents were contacted face-to-face or by telephone to ask for their consent and to arrange a convenient time for the interview. Some of the interviews were conducted in the workplace, others outside the workplace in the evening and during the weekend. Each respondent was given a brief explanation of the nature of this study, why they were selected, what information was needed and the general procedure of the interview. Interviewees were also assured of confidentiality and their right to pause, stop or withdraw from the interview at any point (Saunders et al., 2009, p. 191). The interviews ran for approximately 50 to 105 minutes. Of the 26 interviews: 21 were voice-recorded and for five, notes were taken. Ten of the interviewees had answered the questionnaire before their interviews but no information is

available about the number of interviewees who responded to the questionnaire after their interviews. The researcher was not satisfied with outcomes of the first two interviews because he was guided by banks' management to interview specific persons who provided very brief information. Therefore, the researcher decided to contact interviewees personally, although with the banks' permissions. Details of how qualitative sample was chosen are founded in Chapter 6.

Initially the questionnaire and the interview questions were drafted in English because the constructs were taken from the literature review in English. They were translated into Arabic, because it could not be taken for granted that everyone spoke good enough English. In order to complete the translation process, "parallel translation" was used, whereby the initial English version was translated into Arabic by six independent translators to ensure the meaning of the translated version matched the original. This task was carried out by six Egyptian students and lecturers who are studying and teaching in UK business schools, as experts in business and fluent in both Arabic and English. Then, the six translations were compared and the final version created (Saunders et al., 2009, p. 385).

4.5.3 Pilot testing

Survey research should always be subject to a pilot study before the main survey takes place (Litwin, 1995). The pilot study aims to check whether questions are relevant to all members of the particular sample, whether respondents understand all the questions, whether any questions have a double meaning, and whether any useful ideas arise to develop the survey instrument (Johns and Lee-Ross, 1998; Saunders et al., 2009).

Therefore, a pilot study was carried out after the translated version of the questionnaire had been checked and completed. Since the actual study involved a sample of public and private banks, a total of twelve were chosen from each type of bank for the pilot to ensure that the respondents in the pilot test had similar characteristics as those who would be included in the final study. Three academic staff working in Egyptian business schools were asked to participate as experts. Via Skype meetings, the participants were briefed on the purpose, content and layout of the questionnaire and were encouraged to feedback comments and suggestions. The participants indicated that the response time for the questionnaire was approximately 20 minutes. They suggested changing some spelling errors and some words and expressions to be clearer and more precise in a banking context. For example, participants suggested that “personnel rotation” was not clear and therefore be replaced by “rotate its staff across different departments”. Similarly, the word “conference” is not in common use in Egyptian banks and was replaced by the word “seminar”. The participants also suggested to include the professional Diploma, which is very common in Egyptian banks, when asking about support for postgraduate studies. Their comments were considered and reflected again in the English version of the questionnaire.

The process of conducting a pilot study for the interviews was not as formal, because the interview questions were taken from the questionnaire, and then rephrased. Since they were semi-structured interviews and the interviewer was free to change the sequence or to probe for more information, an informal pilot test was conducted. Two groups of 17 bankers, who were studying for a professional diploma called “Banking Studies” in Domyatt Business School, University of Mansoura, Egypt, were briefed on the purpose of the semi-structured

interview. Each meeting was approximately 50 minutes and feedback was given. The researcher was made aware that the style of question has to differ depending on the managerial level of the interviewee. For example, the interviewer cannot ask a top manager about the effectiveness of their training programme in sharing knowledge, but they can be asked how they plan for these programmes, the criteria for selecting trainees...etc.

4.6 Quality of measures

As questionnaire and interview instruments are supposed to provide accurate and repeatable measures of the research hypotheses, validity and reliability tests are used to establish the quality of any empirical social research (Richardson, 2002; Yin, 2009).

4.6.1 Validity

The assessment of validity is mainly a matter of constructing an appropriate theoretical relationship between a concept and its indicators (Bryman and Bell, 2011; Treiman, 2009; Yin, 2009). Research measures have to recognise two major kinds of validity: content and construct (Gleot and Terziovski, 2004; Sekaran and Bougie, 2010). Content validity aims to ensure that the research methods adequately measure the concept (Sekaran and Bougie, 2010, p. 160). The content validity of a questionnaire could be established by using constructs that have already been validated by other researchers (Nunnally, 1978). In this research, the selection of the initial measurements was based on an extensive review of the literature including these models. The SECI and innovation models are shown to have a reasonable level of content validity. Since the interview questions cover the same issues as the questionnaire, content validity is also achieved in the interview instrument.

Construct validity aims to ensure that the questions reflect the concept they were designed to measure (Bryman and Bell, 2011). Construct validity is established if the questionnaire measures what it was designed to measure. There are two kinds of validity here; convergent and discriminant validity (Nunnally, 1978). “Convergent validity is established when the score obtained with two different instruments measuring the same concept are highly correlated, while discriminant validity is established when two variables are predicted to be uncorrelated, and the score obtained by measuring them are indeed empirically found to be so” (Sekaran and Bougie, 2010, p. 160). Factor analysis using the principal component analysis method with varimax rotation through Kaiser–Meyer–Olkin (KMO) test (Comery and Lee 1992; Sekaran and Bougie, 2010) ensured validity. See Chapter 5, which shows that the KMO test of sampling adequacy accounted 91.5% and 92.4% (Tables 5-4 and 5-5), greater than the minimum acceptable percentage (60%), indicating that the construct validity of the questionnaire has been established (Hair et al., 2010).

However, construct validity is not necessary for the interviews. The high level of validity of the interview is related to clarifying questions, probing meanings of responses, and discussing the topic from a variety of angles (Saunders et al., 2009, p. 327). In this research, several validation tools were used during the interviews such as rephrasing questions, asking the question at one stage and then asking the opposite question at another stage (asking about problems and remedies for example), repeating what the participant said to confirm the answers, doing perception checking by saying: “do you mean that ...?”, and examining

documents and reports to make sure that the participant provided correct answers about reporting facts like reports sent through employee emails, and banking publications.

4.6.2 Reliability

Reliability measures the ability to get consistent scores from the respondents' answers (Treiman, 2009). There are three kinds of reliability: test re-test, alternate-forms, and internal-consistency reliability (Litwin, 1995; Miles, 2001; Richardson, 2002; Treiman, 2009). Test re-test reliability is the correlation between scores of a measure administered at two points in time (Treiman, 2009). If answers vary, it may indicate the measurement method is unreliable. However, this kind of reliability is rare to use in practice because it is difficult to persuade respondents to answer the same questionnaire twice (Saunders et al., 2009, p. 374). Alternate-forms reliability aims to compare responses to alternative forms of the same question or group of questions (Saunders et al., 2009). If the responses are different, that again indicates the measurement method is unreliable. However, this kind of reliability falls into the same practical difficulty as test re-test because "respondents may suffer from fatigue owing to the need to increase the length of the questionnaire, and they may spot the similar question and just refer back to their previous answer" (Saunders et al., 2009, p. 374).

Internal-consistency reliability is a function of the correlation among the items in a measure (Treiman, 2009). It involves correlating responses to each question in the questionnaire with those to other questions in the questionnaire (Saunders et al., 2009). Most researchers investigate only this kind of reliability due to the practical difficulty of

investigating the two other kinds. The Alpha Cronbach Test is widely used to evaluate internal-consistency reliability (Litwin, 1995, Miles, 2001; Treiman, 2009). Alpha with a value of 0.5 to 0.6 suggests sufficient reliability (Nunnally, 1978), and with 0.7 or higher suggests good reliability (Hair et al., 2010). The internal-consistency reliability was investigated for the whole questionnaire and for each section of the questionnaire. The overall Cronbach's alpha value was .962 although it varied from section to section starting from .782, which shows that the questionnaire has a high reliability (Table 5-8: Chapter 5).

The internal-consistency reliability was thus established for the quantitative research and the questionnaire but not for the interview (Miles, 2001; Richardson, 2002). In qualitative research, reliability is concerned with whether alternative researchers would reveal similar information (Easterby-Smith et al., 2008). However, to think that qualitative research could be replicated by other researchers would not be realistic, because the findings of any research reflect reality at the time they were established and in a situation which may be subject to change (Saunders et al., 2009, pp. 327-328). In an attempt to improve the reliability of interviews and decrease any bias of interviewees, in this study, the researcher asked similar participants, based on their job positions, types of bank, years of experience etc about the same issues of SECI and innovation mechanisms to test the consistency and reliability of the answers provided during interviews.

4.7 Research sample

The research sample plays a key factor for successful survey research (Maylor and Blackmon, 2005, p.195). A sample consists of a representative fraction of the whole

population from which a fairly accurate estimate of the whole population can be inferred (Ghauri and Gronhaug, 2010, p.138). Therefore, the primary goal for sampling is to get a representative sample from the larger population.

A common question raised in quantitative research is the size of the sample to make an inference to the population. The sample size depends on three criteria, the size of the population, the amount of variability in the measure and the size of effect to be captured. According to May (2011, p. 101), “it is worth nothing that a large population may not necessarily require a larger sample size and the greater variability in the variable, or what is being measured, the larger the required sample size in cases of research where only small effects are expected in the population, such as exploratory medical research, a larger research may be required”. This reveals that sample size is not necessarily the most important consideration in research because a large, poor quality sample, which does not reflect the population’s characteristics, will be less accurate than a smaller one that does. In conclusion, “power analyses are useful tools to determine sample size requirement” (May, 2011, p. 101).

For statistical testing, Anderson and Gerbing (1988) and Ding et al. (1995) recommend that the minimum number of respondents should be between 100 and 150 to be an effective sample to generalise the findings. According to Anderson and Gerbing (1988, p.415), “a sample size of 150 or more typically is needed to obtain parameter estimates that have standard errors small enough to be of practical use”. In terms of specific statistical tests, Comery and Lee (1992, p. 217) recommend that an adequate sample size to employ factor analysis should be 200 or more, while Field (2009, p. 222) and Hair et al. (2010, p. 175)

suggest a minimum sample size of 50, but preferably a 100 to maintain the statistical power of multiple regression results.

The research population for this study are the Egyptian commercial banks (three public and 27 private banks). Offshore banks were excluded as they follow their home country's rules rather than Egyptian rules. Specialised banks were also excluded because they do not provide banking services, but mid and long term loans to the agriculture and real estate sectors. The sample is based on the current structure of Egyptian banking, but the history and background of how this developed is provided later in Section 4.10. The research data was collected between November 2009 and January 2010. The sample was selected based on secondary data and information that was available before the data collection period. Any changes to this data after October 2009, especially after the Egyptian revolution in 2011, are beyond the scope for this study. The data were collected from a variety of Egyptian cities in the Nile Delta region, where almost 90% of Egyptians live, such as Cairo, Alexandria, Tanta, Domyatt, Al Mansoura, Kafer- El Sheikh, Kotor, and Al Mahalla-Al Kubra.

A total of 450 questionnaires were randomly distributed to all the commercial banks. A total of 237 questionnaires were returned (a 52.7% response rate). Twenty-seven of these were excluded due to incomplete answers and 210 were valid. These valid responses were collected from 12 banks (the three public and 9 private banks). Table 4-1 provides a summary of the response distribution.

Table 4-1: Distribution of sample by bank category

Bank name	Category	Frequency of response	Percentage
National Bank of Egypt	Public	25	12
Banque du Misr	Public	21	10
Banque du Caire	Public	22	10.4
Bank of Alexandria	Private	22	10.4
Union National B.	Private	20	9.5
Arab - African International Bank	Private	18	8.6
Suez Canal Bank	Private	22	10.4
Housing & Development Bank	Private	15	7.2
Commercial International Bank	Private	15	7.2
Nationale Societe General Bank	Private	12	5.7
Barclays Bank Egypt	private	10	4.8
The United Bank	Private	8	3.8
Total		210	100

Although the public banks represent a small portion of the total sample, their responses accounted for almost one-third (the sum of 12 + 10 + 12.2% = 32.4%) of the overall responses. This percentage is satisfactory given the large share of public banks amongst Egyptian financial institutions. Chapter 5 provides further details of the participants' backgrounds.

For the interviews, a purposive sampling technique was used. This enabled the researcher to select among key groups of bankers (Sekaran and Bougie, 2010). As a result, 26 bankers were chosen for interviews from both public and private banks, each having different years of experience and positions. Their experiences were rich and diverse. Fifteen of the interviewees had a minimum of ten years' banking experience while 11 of them had less than ten years' work experience. The positions that the interviewees held within the banking environment reflected this diversity; the largest group were junior bankers (seven)

followed by vice heads of branches (five) and heads of departments (four). Next were the senior bankers, the auditor and the heads of branches (three) and finally the vice head of a department (one). Of the 26 interviews, 11 were conducted in public banks and 15 in private banks. People from the same banks which responded to the questionnaire (Table 4-8) were also involved in the interviews, except for the United Bank, and the National Bank for Development-Islamic Branch was added. Chapter 6 provides details of the interview participants.

The majority of the interviews were conducted with people who work in the banking branches not the headquarters. This is because headquarters usually reflect the main policies of banks while the branches reflect the efficiency of these policies. The research was enriched by investigating the main policies of the SECI model and innovation activities through the headquarters, and examining the efficiency of these activities through the branches. It was difficult to select interviewees from specific departments such as: Credit, Investment, and Customer Service, HRM, Visa and R&D departments. A banker in a branch is considered to be a comprehensive banker who can meet the different needs of customers, except the credit department which has a separate unit in each branch. The main departments are only structured in the banks' headquarters. However, during the interviews the respondents highlighted some aspects of these departments e.g. personnel rotation is rarely employed in the credit department in comparison to other departments.

4.8. Ethical considerations

To get approval and acceptance for conducting this study in Egypt, a letter attached to an Arabic copy of the questionnaire and interview, was sent on May 2009 to the Egyptian Cultural & Educational Bureau in London. A formal approval from the Central Agency for Public Mobilisation and Statistics (CAPMS) in Egypt was received in September, 2009. However, this formal approve was not satisfactory for Egyptian banks. Banking culture is based on a high level of security and confidentiality of data. Therefore, it was important for the researcher to deal with this cultural dimension properly to gain the participants' trust in order to collect as factual and detailed data as possible. For example, as the researcher was conducting his project in the University of Stirling, which is non-Egyptian, the participants were assured by the Egyptian nationality of the researcher and his working as an Assistant Lecturer at Suez Canal University, Egypt, in order to clear any misunderstanding of the research aim.

Managers in Egyptian banks also have substantial authority over their employees, which makes them relatively conservative in providing any data for external requests. To avoid any risk of backlash from their managers, most of the interviewees (15) asked the researcher to conduct the interview outside the workplace while the others (11) asked to conduct their interviews inside the work place before or after the working hours. Furthermore, they asked the researcher to omit any information that could reveal their identity. For both the interviews and the survey, respecting the privacy of participants is a fundamental principle of any research. Therefore, the anonymity of the participants was preserved throughout overall the study and participants were informed that anything they

mentioned would be kept confidential. Participants were assured that the researcher committed himself to treat the data collected with complete discretion and confidentiality where anything the participant mentioned/said during the survey/interview would in no way be used against him/her and would be disclosed only to the researcher for analysis purposes, and that participants should be referred to in the study anonymously. Any details that may lead to revelation of their identity were restricted and limited to the researcher. All the data were held on a password-protected personal computer at the University of Stirling and personal laptop.

4.9 Quantitative data analysis

Methods of quantitative data analysis are dependent on the research aims (Easterby-Smith et al., 2008). This research aims to explore aspects of the SECI model and innovation in the Egyptian banks, as well as investigate the effect of the SECI processes on innovation. Chapter 5 gives details of the statistical techniques employed to achieve these aims using PASW (Predictive Analytics Software) version 17 to analyse the responses of the 210 questionnaires.

Factor analysis was used to test the construct validity of the questionnaire (Comery and Lee, 1992) to ensure that all items that measure one variable are well correlated (Hair et al., 2010). Factor analysis was also used to minimise the multicollinearity problem by decreasing the internal correlation among the SECI variables to be dependent regarding the effect of each of them on innovation (Adams et al., 2007; Hair et al., 2010). A high correlation between independent variables does not entirely reflect the real influence of

these variables on the dependent variable and reflects unrealistic results. So, researchers must avoid these causally related items between independent variables (de Vaus, 2002; Johns and Lee-Ross, 1998; Stevens, 2009).

Cronbach's Alpha was used to test the inter-consistency of the questionnaire (Nunnally, 1978). It tested the reliability of: each variable of the SECI model, the overall SECI, each type of innovation, the overall innovation, and the overall questionnaire.

Frequency and percentage distribution were used as descriptive statistics to provide a brief account of the respondents' profiles. They were also used investigate the first and second research questions by exploring the aspects of each process of SECI, and both product and process innovation by describing the agreement responses to show the extent Egyptian banks perform the SECI and innovation activities .

Skewness and Kurtosis tests were employed to test the normality distribution of data (Kleinbaum et al., 2008). For statistical analysis, data should be distributed normally to make it is possible to evaluate the statistical significance of the relationship between the SECI processes and innovation (Jason and Waters, 2002).

Multiple regression is generally used to test the causal relationship between two or more independent variables and a single dependent variable and to indicate the importance of each independent variable to the relationship (Johns and Lee-Ross, 1998; Stevens, 2009). Therefore, the method was employed to investigate the third research question by testing

the research hypotheses. Multiple regression was used to test the first hypothesis by examining the contribution of the four SECI variables, which are the independent variables, to the innovation activities, the dependent variable. It was also used to test the second set of hypotheses by indicating the proportion of variance of each SECI process accounting for the innovation variances.

Independent *t*-test is generally used to test whether two group responses are different (Kleinbaum et al., 2008; Field, 2009). It was employed to test whether there were different responses between the male and female participants and between participants from public and private banks.

One-way ANOVA test is used to test whether three or more group responses are different (Kleinbaum et al., 2008; Field, 2009). Therefore, it was employed to test whether there were different responses between the years of experience groups (≤ 5 , 6-10, 11-15, 16-20 and > 20 yrs), the academic background groups (high school, graduate and postgraduate holders) and between the job title groups (junior, senior, head of department, auditor, vice manager and manager). Post-hoc test was also used to know which of these groups differ.

4.10 Qualitative data analysis

The qualitative approach is used as part of a mixed methods approach in this study. The qualitative data of 26 interviews was used to give further interpretation and meaning to the quantitative data. The interviews were conducted in Arabic, coded, transcribed and translated into English. Since the main topics of the interviews were basically the same as

the questionnaire, content analysis is a suitable technique to analyse the responses of the interviews. In content analysis, “the researcher interrogates the data for constructs and ideas that have been decided in advance” (Easterby-Smith et al., 2008, p. 173). It enables the researcher to analyse textual information in terms of identifying the presence of certain words, concepts, characters, themes, or sentences. It is an interpretive research method that is used to evaluate the contents of all forms of recorded communication. Since the majority of interviews were recorded (21 out of 26), content analysis was a suitable technique to use. It “can be used to analyse newspapers, advertisements, recordings of the interviews, and the like” (Sekaran and Bougie, 2010, p. 386).

Chapter 6 gives details of the data analysis showing the different dimensions which were identified in advance, i.e. knowledge required, socialisation, externalisation, combination, internalisation, product and process innovation and the effect of each process of SECI on innovation. These data were processed by looking and searching for words and phrases/sentences that could be connected to these dimensions. Each of these dimensions was followed by related aspects, such as types of the required knowledge and informal discussion between employees. The topic of sharing knowledge during the training programmes led to the following sub-aspects: the topic, the trainee background, whether the programme is internal or external, and the extent banks support these programmes. During data analysis, approximately 70 quotations from the interviews were used, to provide evidence for the researcher’s comments. Through the analysis, the quantitative findings detailed in Chapter 5 were given further explanation.

4.11 Research community: The Egyptian banking industry

4.11.1 Overview

Egypt's economy is considered the most varied of the Middle Eastern economies, as the sectors of tourism, agriculture, industry, oil and services (in particular financial and telecommunication services) contribute at almost equal parts to the Gross National Product (Central Bank of Egypt, 2009). The Egyptian economy has established a good track record in terms of macroeconomic stability over the past 15 years. However, at the beginning of this millennium, the growth rate was just 3.2%, the lowest for more than a decade. This slowdown was due to a series of external events: the fallout of September 11, the fluctuation of oil prices, the increase in domestic prices, the slowdown of world trade, and regional conflicts e.g. the Iraq war (Banque Audi, 2009). After a government reshuffle in July 2004, the new team sought to accelerate trade and financial liberalisation by introducing economic and structural reforms. Substantial progress was made in 2005 in the areas of tax reform, management of public finance, monetary policy, privatisation, and restructuring of the financial sector, adding to Egypt's solid infrastructure of transportation, communication, energy sources, a skilled workforce, modern industrial communities, a good banking system and the stock market (Medibtikar, 2009; Egypt State Information Service, 2009).

The Egyptian economy achieved a real growth rate of 7.2% during the financial year 2007/08. This was due to a number of growth stimulating sectors that constitute influential forces behind the national economy. At the top was the tourism sector with a growth rate of

24.3%, followed by the banking industry with 19.9%, Suez Canal revenues with 18%, the building and reconstruction sector with 14.8%, the communication sector with 14.2%, the transport and storage sector with 8.7% and the manufacturing industries with 8%. Due to the slowdown in some other sectors, the overall growth rate was 7.2 % (Egypt State Information Service, 2009; Egypt Economic Report, 2009). During this time the annual rate of increase in the real gross domestic product (GDP) per capita rose from 1.2% in 2003/04 to 5.2% in 2007/08 (Global Investment House, 2008). Unemployment continued to decline from 11.1% in 2003/04 to less than 8.4% in the last quarter of 2007/08 (Ministry of Finance, 2008). These achievements led the World Bank to declare that “Egypt is recognised as the top reformer in the world in early FY08” (World Bank, 2008, p. 42). As a result, Egypt joined the investment committee, affiliated to the Organisation for Economic Corporation and Development, as the first Arab and African member. It was also chosen by the Economic Reform Forum from among seven countries around the world that took measures to develop the climate for investment and improve the business environment, as the only country from the Middle East and North Africa (Egypt State Information Service, 2009).

As part of the economic reform in Egypt, the government started in 2005 to implement financial reforms and become more liberalised, in order to integrate with international financial systems. The banking sector in Egypt continued to dominate the financial sector. It accounted for more than 60% of the aggregate financial assets in 2005. In order to achieve this, the Egyptian government worked hard to make the industry globally competitive by implementing a privatisation programme and rapid consolidation in the

banking system (Mohieldin and Nasr, 2007). This thriving programme and the prospering domestic bond market encouraged banks to search for new investment fields, which helped them to diversify their portfolios and to decrease their financial risks. Meanwhile, most banks expanded their provision of non-traditional services such as brokerage, investment consultations, asset valuations and sales, and mutual fund operations which also improved their capital market services (American Chamber of Commerce in Egypt, 2008). These procedures significantly supported the banking system's role in the overall economic development and growth. By June 2004, the banking system's total assets amounted to 633436 LE million, representing around 138.9% of the GDP at current prices (Ministry of Finance, 2008). By May 2009, this number had increased to 1114357 LE million representing around 188.3% of the GDP at current prices (Central Bank of Egypt, 2005; 2009).

The financial crisis that hit the international markets in late 2008 did not significantly harm the Egyptian banking sector as it had “abundant liquidity due to the accelerated projects by various investors in booming business sectors over the last three years” (International Finance Corporation, 2009). It was not active in the provision of mortgage banking, nor factoring operations nor financial leasing (Reda, 2008).

4.11.2 Evolution of the Egyptian banking industry

The banking industry in Egypt started at the end of the nineteenth century. The first Egyptian bank was the National Bank of Egypt (NBE), which was established in 1898. Banque Misr (BM) opened in 1920, followed by Banque du Cairo (BC) in 1952 and Bank

of Alexandria (BA) in 1957. NBE used to perform the duties of a central bank in the 1950s. The Central Bank of Egypt (CBE) was established in 1961. During the 1960s, banks were nationalised and NBE acted as a commercial bank, while still carrying out some of the duties that were not covered by the CBE at this time (Global Investment House, 2008).

An open door policy was adopted by Egypt in the 1970s to attract foreign investments to expand the banking system, which was composed at that time of four public banks, three investment banks and nineteen specialised banks (Global Investment House, 2008). Starting in 1991, the Egyptian banking industry adopted a deregulation policy which covered a number of areas such as interest on loans and deposits, banking services fees, exchange rates and credit ceilings. It also allowed foreign branches to operate in local currency, allowed foreign ownership in Egyptian public banks and allowed the public business sector to deal with all banks. There were also changes in other areas such as the classification of and provisioning for non-performing loans, capital adequacy, financial reporting, and divestiture of public sector bank's interest in joint venture banks (Reda 2008). In June 1998, the parliament passed Law 155, allowing the private sector to participate in the ownership of public sector banks. The banking structure increased significantly from 26 in the 1970s to 63 banks in 1999. The branch network also expanded from 527 to 2434 branches (Global Investment House, 2008).

However, during the 1990s, at the time of Egypt's economic reform and structural adjustment programme, banking performance was unable to keep pace with other sectors. The slow privatisation progress, market recession and an outflow of non-performing loans

led to a state of imbalance in the banking system by the start of 2000 (American Chamber of Commerce in Egypt, 2008). Consequently, during 2000-2004, the Egyptian economy stagnated, leading to a substantial retreat in its indicators as follows (National Bank of Egypt, 2008):

- Most profitability indicators retreated (e.g. Net profit/shareholders' equity stood at 9.8% in June 2004, against 16.1% in June 2000 and similarly, Net profit/ average assets fell to 0.5% against 0.9% during the two periods under review).
- Placement ratios declined to 64.2% versus 87.1% during the two periods.
- Shareholders' equity/assets, dropped to 5.1% in June 2004, against 5.6% in June 2000.

Accordingly, the Egyptian collective banking sector ranked globally in the 115th position, according to their capital (National Bank of Egypt, 2008).

The new Egyptian government, formed in July 2004, introduced its plan to reform banking financially and managerially in September 2004. This plan depended on five processes over a five year period (National Bank of Egypt, 2008). The first was to merge small banks into larger entities. Bank mergers and acquisitions enhance the efficiency of banks and augment their capital, and thereby create strong and competitive banking entities (Central Bank of Egypt, 2008). Table 4-2 shows Egyptian banks mergers during the period from 2004 to 2007.

Table 4-2: Egyptian banks mergers (2004-2007)

First bank	Second bank	New entity	Date
American Express Bank (Branches in Egypt)	Egyptian American Bank	Egyptian American Bank	Sep-04
Misr Exterior Bank	Banque Misr	Banque Misr	Sep-04
Credit Lyonnais Branch	Credit Agricole Indosuez	Calyon	Mar-05
Misr America International Bank	Arab African International Bank	Arab African International Bank	Sep-05
Mohandes Bank	National Bank of Egypt	National Bank of Egypt	Oct-05
Bank of Commerce and Development	National Bank of Egypt	National Bank of Egypt	Dec-05
Nile Bank with Islamic International Bank for Investment and Development	National Bank of Egypt	National Bank of Egypt	Jun-06
Egyptian American Bank	Calyon	Credit Agricole Egypt	Sep-06
Misr International Bank	National Societe Generale Bank	National Societe Generale Bank	Nov-06
Banque du Caire	Banque Misr	Banque Misr	Feb-07

Source: Central Bank of Egypt, 2008.

There were also some acquisition processes that improved the financial and management performance for both the acquired and acquiring banks. Table 4-3 explains these processes.

Table 4-3: The most important acquisitions (2005-2007)

Acquired bank	Acquiring bank	Acquisition date	Acquisition percentage (%)
Misr America International Bank	Arab African International	May-05	100.0
Egyptian Commercial Bank	Piraeus	Jun-05	88.0
Suez Canal Bank	Arab International Bank	Aug-05	16.8
Misr International Bank	NSGB	Sep-05	90.7
Misr Romania	BLOM Bank	Dec-05	99.4
Egyptian American Bank	Credit Agricole	Feb-06	74.6
Commercial International Bank	A consortium led by Ripple Wood Holdings	Feb- 06	18.7
Cairo Far East	Adui Bank	Mar-06	99.7
Misr Iran	National investment bank	Apr-06	29.9
Development Bank Delta international Bank	A consortium led by Ahli United Bank	Aug-06	89.3
Alexandria Commercial Maritime Bank of Alexandria	Union National Bank San Paolo	Aug-06 Dec-06	94.8 80.0
National Development Bank	Abu Dabi Islamic Bank	Jul-07	51.3
Al Watany Bank of Egypt	A consortium led by National Bank of Kuwait	Dec-07	98.1

Source: Central Bank of Egypt, 2008

The second process involved restructuring the public banks managerially and financially, with the possibility of privatising some of them in the future. In early 2005, the Banking Reform Unit at the CBE introduced a comprehensive restructuring plan to reform the practices of all departments and technological systems, and to establish new departments. There was also a finance agreement with the European Commission to conduct diagnostic reviews of, and develop the current practices of three major departments (Risk Management, Information Technology and Human Resources) at the NBE and BM over a period of three years (Central Bank of Egypt, 2008).

In February 2005, CEB sold Bank of Alexandria to Italy's Sanpaolo IMI Bank, who won the bidding for an 80% stake in this bank for US\$ 1.6 billion (Central Bank of Egypt, 2008). In addition, Banque Misr acquired a 100% stake in Bank du Caire at the end of May 2007. In July 2007, it announced the initiation of a pre-sale process to sell a portion of its stake in Banque du Caire to a strategic investor (Central Bank of Egypt, 2008).

The third process involved the expansion of the ownership base in joint banks by selling the public banks' equities and allocating the sale proceeds to their financial restructuring. The following table shows the recent selling processes of their stakes.

Table 4-4: The sale of public banks' stakes in joint ventures (2004-2007)

Divested public bank	Acquirer	Acquired Shares in joint Ventures
National Bank of Egypt	Ripple Wood Consortium Arab Banking Corporation International Societe Generale	Commercial International Bank Suez Canal Bank National Societe Generale Bank
Banque Misr	National Societe Generale Bank BLOM Bank	Misr International Bank Egypt Romania Bank
Banque du Caire	Arab African International Bank Audi Union National Bank	Misr America International Bank Cairo Far East Alexandria Commercial and Maritime
Bank of Alexandria	Barclays Piraeus Credit Agricole Shareholders in Delta International Bank National Investment Bank	Cairo Barclays Egypt Commercial Bank Egypt American Bank Delta International Bank Misr Iran Development Bank

Source: Central Bank of Egypt, 2008

The fourth process involved the strengthening of banks' supervision to safeguard the banking system and to unify banking and non-banking financial systems in one system. The CBE's Banking Reform Unit, in coordination with the World Bank, has embarked on conducting full audit reviews of the three state-owned banks (after selling Bank of Alexandria), in line with international accounting standards (National Bank of Egypt, 2008).

The final process involved enhancing the role of the CBE in managing and monitoring the reform process. The state-owned banks appointed qualified senior staff and cadres, and obtained the necessary finance from the fund established to develop the performance of the banking sector (National Bank of Egypt, 2008).

4.11.3 Egyptian banking structure and performance

The historical review of the Egyptian banking industry explained that it suffered from several financial repressive policies throughout the 1960s and even after the (opening up)

period in 1974 until the end of the eighties. These policies affected the functioning of this industry to mobilise savings and channel them into productive activities. In 1990, Egypt started an economic reform programme. This programme is designed to transform the Egyptian economy to one being dominated by the private sector through macroeconomic structural adjustments and financial stability. Therefore, Egyptian banking has witnessed several changes in the last decade which affected not only its size, structure and activities but also its efficiency.

4.11.3.1 Banking structure

Due to the emerging, acquiring and stake selling processes achieved within the banking sector over the period 2004-2009, the total number of banks in Egypt decreased from 54 banks in 2004 to 39 in 2009. However, the number of bank branches increased from 2814 in 2004 to 3408 in 2009 reflecting the increased ratio of population/ branch (Egypt Economic Report, 2009). Table 4-5 reflects the Egyptian banking structure development during 2004 -2009.

Table 4-5: The Egyptian banking structure development (2004-2009)

End of June	2004	2005	2006	2007	2008	Mar 2009
Total banks	54	52	43	41	40	39
T. branches	2814	2841	2944	3056	3297	3408
Bank Density	25.1	25	24.4	24.2	22.9	22.4

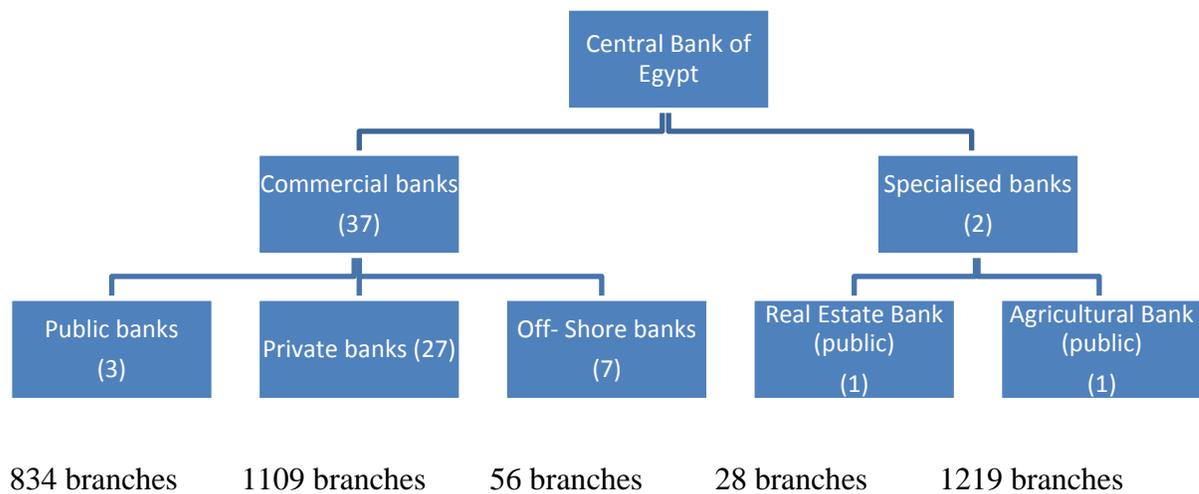
Source: Central Bank of Egypt, different issues

*Population in thousands per each banking unit.

By the end of June 2009, the Egyptian banking industry was comprised of 39 banks under the supervision of the Central Bank of Egypt. This number included 37 commercial banks of which three banks were public, 27 private banks and seven off-shore banks.

Additionally, two specialised public banks provided mid and long term financing to the agriculture and real estate sectors (Central Bank of Egypt, 2009). Figure 4-2 shows the structure of the Egyptian banking industry.

Figure 4-2: The Egyptian banking structure in June-2009



Source: Central Bank of Egypt, 2009

Although the number of public commercial banks is still small relative to the total number of banks operating in Egypt, they account for a large share of banking activities. The three public commercial banks (NBE, BM and BC) are the largest banks operating in Egypt in terms of major financial indicators. By the end of June 2004, the banking system's total assets amounted to LE 633.4 billion, of which 48.2% was held by the public commercial banks which increased to 60% in 2005. The total deposits recorded were LE 461.7 billion, of which the commercial public banks held 55.3%, which increased to 59% in 2005. The loans recorded were LE 296.2 billion of which these banks held 50.1%, which increased to 63.1% in 2005. The shareholders' equity totalled LE 31.8 billion of which 43.1% is held by the public commercial banks (Mohieldin and Nasr, 2007; Ministry of Finance, 2008). In FY

2008/2009, these three banks accounted for 46% of the Egyptian banking sector's total deposits and 38% of the total loans (CAMPAS, 2010). A brief summary of the major Egyptian banks is provided in Appendix 3.

4.11.3.2 Financial aspects

The ongoing major financial restructuring of the banking system led to a significant cut in public sector companies' non-performing loans by more than two thirds. The privatisation of public stakes in joint ventures increased the competition within the banking sector and led to a revival in banking intermediation after years of lingering. Credit growth to the private sector during the year ending June 2008 increased by 12.4 %, up from 3.9% in June 2004 (Egypt Economic Report, 2009). This came when public sector companies' non-performing loans were being settled with their main bank debtors. In addition, the net foreign assets of the banking sector increased by 39% for the twelve month period ending June 2008 to \$57 billion (35% of GDP), whereas "dollarisation" in broad money continued to decline to 20.8% in June 2008, down from 28.4% in June 2004 (Ministry of Finance, 2008).

The inflation rate in Egypt over the period 2004-2009 increased by 25.2% (The International Monetary Fund, 2011). However, the main financial indicators related to banking show that the financial statements highlight a significant increase of assets (by 35.5%) over the period 2004-2009 (Table 4-6) to reflect the expansion of its activities and investments.

Table 4-6: Total assets of the Egyptian banks (2004-2009)

In LE million					
2004	2005	2006	2007	2008	Mar-2009
703,628	761,562	937,923	1,083,311	1,103,366	1,091,631

Source: Ministry of Finance Report, 2009.

According to the deposits indicator, the total deposits increased from 463548 LE million in June 2004 to 813657 LE million in May 2009 which is an increase of 43%. The non-government sector represents the major customers for banks in Egypt (see Table 4-7).

Table 4-7: Deposits with Egyptian banks (2004-2009)

In LE million						
	Jun-04	Jun-05	Jun-06	Jun-07	Jun-08	May-09
Non-government deposits	380479	433998	489326	581313	667945	713987
Government deposits	83069	87747	82135	76902	87691	99670
Total deposits	463548	521745	571461	658215	755636	813657

Source: Central Bank of Egypt, 2009

Egyptian banks consider deposits as the main source to fund their activities and investments. A review of Tables 4-6 and 4-7 show that total deposits accounted for 74.5% of total banking assets in May 2009 and a 43% growth rate over the period 2004-2009. In addition, the banking sector received 87.8% of their deposits from the non-government sector and the rest from the government in May 2009.

According to the credit indicator, the credit provided by banks increased from 296199 LE million in June 2004 to 431158 LE million in May 2009, an increase of 31%. Banks provided 92.5% of their credit to the non-government sector, which shows the importance of this sector for banks as well as for the government (see Table 4-8).

Table 4-8: Credit provided in Egyptian banking (2004-2009)

	Jun-04	Jun-05	Jun-06	Jun-07	Jun-08	May-09
To non government	279996	286177	3033244	327063	370266	398976
To government	16203	22018	20997	26683	31159	32182
Total lending	296199	308195	324041	353746	401425	431158

Source: Central Bank of Egypt, 2009

Credit activities are considered as one of the most important areas for investment of Egyptian banks, as can be seen from Tables 4-5 and 4-7 where the banking sector invested 39.4% of its assets in credit activities.

The thriving privatisation programme and the prospering domestic bond market encouraged Egyptian banks to search for new fields of investment to help them to diversify their portfolios and to lower their financial risks. Meanwhile, most banks also expanded on providing non-traditional services such as brokerage, investment consultations, asset valuation and sales, and mutual fund operations (Banque Audi, 2009). However, there are still many opportunities for banks, particularly in the retail segment as a large percentage of the population still has no bank account. This represents a great potential for Egyptian banks, as they can capitalise on growth opportunities in this segment (Global Investment House, 2008).

4.11.3.3 Islamic banking in Egypt

Islamic banking has the same purpose as conventional banking except that it operates in accordance with rules of Islamic law “Sharia”. Islamic banking does not predetermine

interest “Riba” on loans. Islamic finance works on the premise that both the individual customer and the bank should carry equal risks on the investment; any possible profits or losses should be equally divided between them. Funding activities related to alcohol, gambling and tobacco are prohibited in the Islamic banking system. Moreover, all financial products should be certified as Sharia compliant by an expert in Islamic law (American Chamber of Commerce in Egypt, 2008). During 2008, the global economic downturn emphasised the viability of Islamic banking as an alternative to conventional banking. The global market for Islamic financial services is estimated to have reached \$729 billion at the end of 2007, a 37% increase year-on-year (Duncan, 2009).

Egypt is the pioneer of Islamic banking. It has a long tradition in providing Islamic banking products and showed an early interest (in 1963) in Modern Islamic Finance. However, recently it fell behind other countries in the Gulf and South-East Asia (The Egyptian-British Chamber of Commerce, 2009). There are only two Islamic banks in Egypt: the Faisal Islamic Bank of Egypt and the Egyptian Saudi Finance, in addition to some Islamic outlets/branches of conventional banks. According to a financial report issued by Benaissa et al. (2009), Islamic banking activities represented only 3-4% of the overall banking activities in Egypt, compared to 42% in Turkey and 46% in the United Arab Emirates. During the 1980s, the Egyptian people had a bad experience with some fraud investment companies that claimed they were working under the Islamic law. Many people lost their money. Forbidding interest “Riba” is also a controversial issue since the Egyptian former “Mufti” (Prof. Mohammed Tantaway) issued a fatwa declaring that some kinds of interest in conventional banks are allowed “halal”.

Chapter 5

Quantitative Data Analysis and Hypothesis Testing

The quantitative data analysis in this chapter covers the findings of the questionnaire and the statistical techniques which were used to test the research hypotheses. The chapter looks first at the sample distribution according to the types of participating banks and the profile of respondents in terms of their demographic characteristics (years of experience, gender, academic background and job position) followed by a discussion of the preparation of data for the statistical analysis, and the coding and labelling of data into a Predictive Analytics SoftWare format. After the data entry process, validity and reliability tests are performed on the questionnaire to confirm its quality, while factor analysis is applied to test the construct validity and the Cronbach alpha for reliability.

By ensuring the validity and reliability of the questionnaire, the first stage of the quantitative data analysis uses a frequency distribution to explore the agreement of respondents regarding the performance of SECI and innovation activities in the Egyptian banking sector. Next, the results of the hypothesis testing are explained, starting with a discussion of how the factor analysis results will benefit later statistical tests. This is followed by a discussion of the testing process of the first hypothesis, concerning the relationship between SECI processes and innovation, and the second hypothesis, concerning the contribution of each SECI process in accounting for the innovation variances. In this part, multiple regression analysis is used with investigating some related

issues e.g. the assumptions of normality, linearity and homoscedasticity, the multicollinearity problem and the generalisability of results. The final part focuses on testing the difference between the respondents' demographic groups regarding SECI and innovation activities. The independent *t*-test was used to check the difference between gender and bank category subgroups, while the one-way ANOVA test checked the difference between years of experience, academic background and job title subgroups.

5.1 Sample distribution

Following a formal letter requesting permission to conduct the empirical part of this study, the Central Agency for Public Mobilisation and Statistics (CAPMS) in Egypt authorised the data collection process by issuing decision no. 951 on 1st of September 2009. Questionnaires were administered between November 2009 and January 2010. Responses were filled in by participants and collected personally by the researcher to ensure a high rate of return.

As indicated in Chapter 4, the sample comprised public and private commercial banks. A total of 450 questionnaires were distributed to those banks, of which 237 were returned (a 52.7% response rate). Twenty-seven of these were excluded due to incomplete answers, 210 responses were valid. These valid responses were collected from 12 banks (the three public and nine private). Table 5-1 shows a summary of the responses distribution.

Table 5-1: Distribution of sample by bank category

Bank name	Category	Frequency of response	Percentage
National Bank of Egypt	Public	25	12
Banque du Misr	Public	21	10
Banque du Cairo	Public	22	10.4
Bank of Alexandria	Private	22	10.4
Union National Bank.	Private	20	9.5
Arab - African International Bank.	Private	18	8.6
Suez Canal Bank	Private	22	10.4
Housing & Development Bank	Private	15	7.2
Commercial International Bank	Private	15	7.2
Nationale Societe General Bank	Private	12	5.7
Barclays Bank Egypt	Private	10	4.8
The United Bank	Private	8	3.8
Total		210	100

The public banks' responses accounted for almost one-third (the sum of 12, 10 and 12.2% = 32.4%) of the overall responses. This percentage is satisfactory given the large share of public banks in the Egyptian banking sector. 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).

5.2 Data preparation

PASW software, known as Statistical Package for the Social Sciences (SPSS) till July 2009, was used for data analysis (<http://www.spss.com/software/>)¹. Before the data analysis

¹ PASW became IBM SPSS in August 2010.

process could start, data had to be prepared in terms of coding and labelling to fit the computer software. According to the PASW format, the questionnaire items were coded and labelled as shown in Table 5-2.

Table 5-2: The coding and labelling of research data

Code	Items	Label
SECI		Organisational knowledge conversion
S		Socialisation
S1	The bank follows a systematic plan to rotate its staff across different departments.	Personnel rotation
S2	Detailed face-to-face discussions of work issues are encouraged in the bank.	Face to face discussion
S3	Involving the bank in joint projects supports staff's knowledge through face-to-face interaction with others.	Co-operative discussion
S4	The bank conducts meetings, seminars, workshops to discuss the updating of work issues.	Meetings and workshops
S5	The bank invites its qualified members and external experts to speak about their beliefs, values and culture.	Expert discussion
S6	The bank encourages informal meetings for tea, coffee, having lunch and others.	Informal meetings
S7	The bank encourages social activities outside the work place.	Social activities
E		Externalisation
E1	The bank documents its staff's point of view regarding relevant topics.	Staff's point of view
E2	The bank asks its staff to report results of negotiation with customers	Negotiation with customers
E3	The bank documents the findings of conducted meetings, seminars, workshops, and training programmes	Findings of meetings
E4	The bank issues reports of externals based on its cumulated experience.	Reports about externals
E5	The bank establishes the topics of training programmes and seminars based on its qualified members and external experts.	Training topics
E6	The bank documents the useful experiences of its qualified members into reports.	Experience of expert
C		Combination
C1	The bank classifies information mentioned in databases, networks and reports.	Classification of internal information
C2	The bank updates its databases.	Updating databases
C3	The bank considers information mentioned in databases, networks, and previous reports to develop its rules and decisions.	Developing rules and decisions
C4	The bank uses documented information as a mean of connection between its staff, each to other, and with external bodies e.g. customers, competitors, partners, or the government	Documented communication
C5	The bank collects, classifies and informs its staff with reports and decisions issued by external bodies.	External reports justification
C6	The bank depends on the relevant published research and reports to develop its policies and aims.	Published research
N		Internalisation

N1	The bank encourages its staff to join postgraduate courses e.g. Diploma, Masters or PhD.	Related courses
N2	The bank facilitates the access to outcomes or recommendations of training programmes, workshops, and seminars.	Meetings outcomes access
N3	The bank facilitates the access to its databases and the internet to get required information.	Database access
N4	The bank arranges meetings to explain the content of related reports or documents.	Documents content explanation
N5	The bank arranges meetings to explain and analyse the relevant reports issued by customers, suppliers, competitors, partners, or government.	External reports explanation
N6	The bank believes that the available data and information strongly shape its point of view and culture	Shaping culture
V		Innovation
PV		Product innovation
PV1	The bank follows a formal process to generate and nurture new ideas.	New ideas
PV2	The bank initiates the development of new services based on customers' needs and market trends.	New services
PV3	The bank applies new technologies and software to add new services and improve the quality of current services.	New technologies
PV4	The bank adopts new /non-traditional solutions to solve problems.	Non-traditional solutions
PV5	The bank produces new services to improve customers' access to goods or services	New facilities
PV6	The bank introduces new or significantly improved services into the market before its competitors.	Market leadership
CV		Process innovation
CV1	The bank follows a formal process to keep on improving its services to customers.	Service methods
CV2	The bank tracks the relevant research studies to improve its processes.	Process improvement
CV3	The bank follows flexible management strategies to deal with unexpected changes.	Management strategies
CV4	The bank provides significant improvements in its structures, practices and techniques.	Structure changes
CV5	The bank introduces more developed and distinctive strategies to manage its processes, in a comparison with competitors' strategies.	Competitor strategies
CV6	The bank adopts new/ non-traditional marketing strategies in its promotions and services.	Marketing strategies

5.3 Profile of respondents

This section provides a brief account of the respondents' profiles. Simple frequency counts were used to distribute the respondents according to the following demographic characteristics: years of experience, gender, academic background and job position.

Table 5-3: Respondents background profiles N=210

Items	N (%)
Years of experience	
Less than or 5 yrs	50 (23.8)
6-10 yrs	32 (15.2)
11-15 yrs	30 (14.3)
16-20 yrs	44 (21.0)
More than 20yrs	54 (25.7)
Gender	
Male	185 (88.1)
Female	25 (11.9)
Academic background	
High school	7 (3.3)
Graduate	158 (75.2)
Postgraduate	45 (21.4)
Job position	
Banker (B&A) (Junior)	63 (30.0)
Excellent banker (Senior)	30 (14.3)
Head of department	42 (20.0)
Auditor	37 (17.6)
Vice manager	24 (11.4)
Manager	14 (6.7)

As depicted in Table 5-3:

- Years of experience divided respondents into five groups and all these groups were well represented. There were almost balanced percentages of both the most junior and the most senior staff (23.8 % of respondents have less than 5 years and 25.7% of them have more than 20 years experience).
- Regarding the gender issue, Egyptian banks prefer to employ males rather than females. Table 5-3 shows that 88.1% of the respondents were males. As Egyptian banks usually work from 8.30am to 5pm compared to other businesses who work only till 2 or 3 pm, Egyptian banks believe that these extra working hours significantly add to women's workloads besides their family and domestic responsibilities.

- In terms of the academic background, holding a graduate degree is the minimum qualification to work in Egyptian banks. This reflects the tiny proportion of high school graduates (3.3%) involved in this study. Bankers who had graduated from high school were hired in the past before banks changed their policy and recruit only graduate and postgraduate degree holders. The table shows that the large majority of respondents (96.6%) hold at least a graduate degree. In reality, the majority of these banks strongly prefer to recruit only graduates with high grades (at least 80%).
- The job titles in the banks were divided into seven groups to address all respondents' jobs categories. The table shows that the number of respondents decreases the higher the management hierarchy. The highest number of responses came from the lowest management level (63 bankers) and this number started to decrease to only 14 managers at the top level.

5.4 Quality of measures

Before carrying out the statistical analysis on each of the data categories, the questionnaire was subjected to validity and reliability tests to ensure the quality of measurement (Rose and Sullivan, 1993).

5.4.1 Validity analysis

According to Gleot and Terziovski (2004), both content and construct validity need to be assessed to ensure the validity of a measure. As indicated in Chapter 4, the SECI and innovation variables in the questionnaire have a reasonable level of content validity because the selection of their initial measurements was based on an extensive review of the

literature. Construct validity is established if the questionnaire measures what it is designed to measure. The two kinds of construct validity, convergent and discriminant (Nunnally, 1978) were checked by factor analysis, using the principal component analysis method with varimax rotation through Kaiser–Meyer–Olkin (KMO) test (Comery and Lee 1992). Factor analysis is based on the correlation matrix of the variables involved, and correlations usually need a large sample size before they stabilise. According to Anderson and Gerbing (1988, p.415), “a sample size of 150 or more typically is needed to obtain parameter estimates that have standard errors small enough to be of practical use”. Comery and Lee (1992, p. 217) recommended that an adequate sample size should be 200 or more. Therefore, this study fits the adequate sample size recommended.

The principal component analysis was applied as an exploratory analysis to reduce the large number of questionnaire items to a smaller number of major latent factors. Varimax rotation was used to maximise the variance between these factors and to realise the independence of each. The KMO test was used to predict if questionnaire items were likely to be well factored or not, based on correlation and partial correlation. The variation is from .0 to 1.0 and the overall value should be .60 or higher to proceed with factor analysis (Hair et al., 2010). The eigenvalues technique for factor extraction was used. Only those factors with eigenvalues greater than 1.0 were considered to determine the number of factors to be extracted. A separate factor analysis for all items of SECI and innovation variables was used to establish convergent and discriminate validity (Appendix 4).

The convergent validity was evaluated by examining the factor loadings of indicators. Using the criteria of an eigenvalue greater than 1, the results indicated that there were five factors extracted to represent SECI items and one factor for innovation items. These factors accounted for 65.1% and 58.8%, respectively, of the total variance and the KMO measure of sampling adequacy test accounted for 91.5% and 92.4%, which were greater than the 60% required as indicated above (see Tables 5-4 and 5-5).

Table 5-4: Total variance explained

Components	Initial Eigenvalues (SECI)			Initial Eigenvalues (Innovation)		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	11.039	44.158	44.158	7.061	58.838	58.838
2	1.661	6.645	50.802			
3	1.309	5.235	56.037			
4	1.169	4.677	60.714			
5	1.093	4.371	65.085			

Table 5-5: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		SECI	Innovation
		.915	.924
Bartlett's Test of Sphericity	Approx. Chi-Square	3275.097	1660.043
	Df	300	66
	Sig.	.000	.000

Rotation analysis is usually necessary to facilitate the interpretation of the extracted factors and to make the output more understandable. Hair et al. (2010) recommended that factor loadings greater than 0.50 should be considered to be very significant. Since the aim is to examine the most significant loadings in interpreting the factor solution, the author decided

to use a cut-off point of 0.50. Table 5-6 displays the SECI item loadings, loadings of less than .50 were omitted.

Table 5-6: Rotated component matrix of SECI

SECI items	Component				
	1	2	3	4	5
Personnel rotation				.675	
Face-to-face discussion					
Co-operative discussion				.836	
Meetings and workshops				.552	
Expert discussion	.548			.618	
Informal meetings					
Social activities					.848
Staff's point of view					
Negotiation with customers			.875		
Findings of meetings			.587		
Reports about externals			.608		
Training topics			.563		
Experience of expert					
Classification of internal information		.808			
Updating databases		.794			
Polices development		.614			
Documented communication					
External reports justification		.518			
Published research		.505			
Related courses	.753				
Meetings outcomes access	.797				
Database access	.628				
Documents content explanation	.744				
External reports explanation	.713				
Shaping culture	.583				

The table above shows that 20 item loadings on the five extracted factors were indicated (with loadings of more than .50) and five items were excluded (less than .50). The excluded

items were: face-to-face discussion, informal meetings, staff's point of view, experience of experts and documented communication. Factor loadings were then allocated to each variable. Since the first factor contained all the items related to the internalisation process, it is referred to as the internalisation variable. It is better to load the expert discussion item on factor three as it has a higher cross-loading on this factor than on factor one. The second factor comprised four items related to the combination process, so it is referred to as the combination variable. The third factor contained four items related to the externalisation process and is therefore referred to as the externalisation variable. The fourth factor included four items related to the socialisation process, so it is referred to as the socialisation variable. The fifth factor included only one item which is not acceptable because it does not fit the lowest acceptable criteria of the number of items per factor (p/r ratio) which is three (Ding et al. 1995). Therefore, it can be said that the four processes of the SECI model are confirmed as modes of knowledge conversion by the Egyptian banks.

Regarding the innovation items, the factor analysis could not distinguish between product and process innovation, so only one factor was extracted to represent the innovation variable as seen in Table 5-7.

Table 5-7: Component matrix of innovation

Innovation items	Component
	1
New ideas	.708
New services	.779
New technologies	.694
Non-traditional solutions	.817
New facilities	.747
Market leadership	.815
Service methods	.696
Process improvement	.838
Strategies management	.821
Structure changes	.732
Competitors strategies	.775
Marketing strategies	.764

This table clarifies that only one latent factor was extracted, but all items with loadings of more than .50 were considered. It shows that research items and variables are well represented with a very high percentage of sampling adequacy and a satisfactory total variance. Therefore, all constructs in the questionnaire have adequate convergent validity.

Discriminant validity is the extent to which latent factor 1 discriminates from the other latent factors (e.g. 2, 3, 4, 5) to avoid a mutual effect among these factors which could provide non-meaningful results (Farrell, 2010). To recognise the discriminant validity of a measure, the inter-correlation among the extracted factors should be less than 1.0 (Anderson and Gerbing, 1988). Varimax rotation aims to maximise the variance between the extracted factors by assuming that the correlations between them are zero (Herve, 2003). Therefore, by using varimax rotation, the discriminant validity was achieved. In addition, the result of Bartlett's test of Sphericity was also used to assess discriminant

validity. Table 5-5 shows significant chi-square values ($p < .05$) confirming that the extracted factors were not perfectly correlated. This also supports the discriminant validity of the questionnaire (Anderson and Gerbing, 1988).

5.4.2 Reliability analysis

The estimation of reliability is based on the average correlation among items within a dimension, which is concerned with “internal consistency” (Nunnally, 1978). The basic formula for determining reliability based on this internal consistency is called coefficient alpha (Cronbach’s alpha). Nunnally (1978) suggests that a reliability of 0.50 to 0.60 is sufficient. After excluding six items to establish validity, reliability testing considered the other items. Cronbach’s alpha and the number of items for each variable in this research are listed in Table 5-8.

Table 5-8: The reliability analysis

Variables	Cronbach’s Alpha	N. of Item
Socialisation	.783	4
Externalisation	.800	4
Combination	.841	5
Internalisation	.917	6
All SECI processes	.934	19
Product innovation	.871	6
Process Innovation	.89	6
Innovation	.933	12
All	.962	31

All research variables have Cronbach’s alpha scores above 0.70, which indicates a high reliability of the questionnaire (Appendix 5).

5.5 Descriptive statistical analysis

After investigating the validity and reliability of the research questionnaire, the statistical data were ready to be analysed and the research hypothesis tested (Rose and Sullivan, 1993). A descriptive statistical analysis is the first step. It aims to summarise patterns in the responses of cases in a sample, generally reported in the form of frequency, percentage or mean distributions. In this case, frequency and percentage distribution were used to describe the agreement responses obtained from Egyptian banks regarding the activities/items mentioned in the questionnaire, excluding the six invalid items rejected by the factor analysis in the validity test (Table 5-6). A summary of the agreement responses of valid activities is shown in Table 5-9. The activities of each variable were ordered using a descending hierarchy in terms of agreement percentages.

Table 5-9: Frequency and percentage distribution for SECI and innovation N=210

Activities	Agreement Responses N. (%)		
	Agree	S. agree	Total
Socialisation			
Personnel rotation	77 (36.7)	75 (35.7)	152 (72.4)
Meetings and workshops	86 (41.0)	65 (30.0)	151(71.0)
Co-operative discussion	87 (41.4)	50 (23.8)	137 (65.2)
Expert discussion	58 (27.6)	48 (22.9)	106 (50.5)
Externalisation			
Reports about externals	136 (64.8)	28 (13.3)	164 (78.1)
Training topics	100 (47.6)	52 (24.8)	152 (72.4)
Negotiation with customers	106 (50.5)	44 (21.0)	150 (71.5)
Findings of meetings	96 (45.7)	40 (19.0)	136 (64.7)
Combination			
Updating databases	79 (37.6)	107(51.0)	186 (88.6)
Polices development	113 (53.8)	64 (30.50)	177 (84.3)
Classification of internal information	112 (53.3)	58 (27.6)	170 (80.9)
Published Researches	90 (42.9)	63 (30.0)	153 (72.9)
External reports justification	81 (38.6)	33 (15.7)	124 (54.3)
Internalisation			
Shaping culture	86 (41.1)	65 (31.0)	151 (72.1)
Meetings outcomes access	90 (42.9)	50 (23.8)	140 (66.7)
Documents content explanation	118 (56.2)	22 (10.5)	140 (66.7)
Related courses	88 (41.9)	51 (24.3)	139 (66.2)
Databases access	93 (44.3)	43 (20.5)	136 (64.8)
External reports explanation	80 (38.1)	40 (19.0)	120 (57.1)
Product innovation			
New facilities	64 (30.5)	137 (65.2)	201 (95.7)
New technologies	93 (44.3)	95 (45.2)	188 (89.5)
New services	93 (44.3)	92 (43.8)	185 (88.1)
Market leadership	74 (35.2)	83 (39.5)	157 (74.7)
Non-traditional solutions	74 (35.2)	58 (27.6)	132 (62.8)
New ideas	70 (33.3)	36 (17.1)	106 (50.4)
Process innovation			
Structure changes	115 (54.8)	44 (21.0)	159 (75.8)
Competitor strategies	93 (44.3)	63 (30.0)	153 (74.3)
Service methods	89 (42.4)	66 (31.4)	155 (73.8)
Marketing strategies	83 (39.5)	66 (31.4)	149 (70.9)
Process improvements	89 (42.4)	46 (21.9)	135 (64.3)
Strategies management	86 (41.1)	44 (21.0)	130 (62.1)

Regarding the **socialisation** activities, Table 5-9 shows that 72.2% of respondents agreed that the participating banks followed a systematic plan to rotate their staff across different departments, 71.0% of them agreed that their banks conducted meetings, seminars and

workshops to discuss the updating of work issues, and 65.2% of them thought that involving banks in joint projects could develop staff knowledge through face-to-face interaction with others. Just over half of respondents (50.5%) said that banks invite experts to talk about their banking experience.

With regard to **externalisation**, the results show that approximately three-quarters of respondents agreed that their banks issue useful reports about relevant externals (78.1%), use expert advice for setting the training programme topics (72.4%), and ask staff to write reports about the results of their negotiations with customers (71.5%). This percentage decreased to 64.7% regarding the documentation of meetings, seminars and workshops.

For **combination**, Table 5-9 shows that 88.6% of respondents stated that all internal information in databases, networks and reports is updated regularly and 80.9% agreed that it was properly classified; 84.3% supported decision making and rules; 72.9% agreed that banks depend on the published research and reports to develop their policies and aims; and 54.3% agreed that their banks were keen on collecting and reformulating reports issued by external bodies.

In terms of **internalisation**, 72.1% of respondents thought that all available information shapes the staff's organisational culture and points of view. Almost two-thirds of them agreed that banks in Egypt encourage employees to improve their personal knowledge by studying relevant postgraduate courses, access outcomes of training programmes, seminars, and databases, and by arranging meetings to explain reports and documents; but only

57.1% agreed that their banks arrange meetings to discuss reports issued by external bodies.

The majority of responses reflect that Egyptian banks strongly support **product innovation**; 95.7% of respondents stated that their banks usually produce new facilities to improve customer access for products and services e.g. online banking; 89.5% said that Egyptian banks apply new technologies and software to add new services and improve the quality of current services; 88.1% believed that their banks initiate new services based on customers' need and market trends and 74.7% thought that their banks introduce new or significantly improved services before their competitors. 62.8% of respondents agreed that their banks adopt new/non-traditional solutions to solve problems but only 50.4% said that their banks follow formal processes to generate and nurture new ideas.

Regarding **process innovation**, the table shows that around three-quarters of respondents stated that their banks made significant improvements to their structure, practices and management techniques (75.8%), introduced more developed and distinctive strategies to manage their processes in comparison with competitors' strategies (74.3%) and followed formal processes to keep improving their customer service (73.8%). More than two-thirds agreed that Egyptian banks adopt new/non-traditional marketing strategies (70.9%), track relevant research studies to improve banks' processes (64.3%) and follow flexible management strategies to deal with unexpected changes (62.1%).

5.6 Using factor analysis outputs for statistical techniques

Factor analysis provides the empirical basis for assessing the structured variables and provides a subset of representative variables for later analysis (Hair et al., 2010; Kleinbaum et al., 2008; Stevens, 2009). As explained in Section 5.4.1, data summarisation and reduction were achieved through factor analysis. The 37 items of the questionnaire were condensed into the five factors of socialisation, externalisation, combination, internalisation and innovation. The factor analysis excluded low loading items, reduced the data to 31 items and derived a score for each factor as a substituting value for the original values (Tables 5-6 and 5-7). Hair et al. (2010, p. 123) recommended two approaches using factor analysis results in statistical techniques. The first is to create summated scales from the items in each factor where typically all the high loading items on a factor are combined and the average score of these items is used as a replacement variable, requiring non-parametric tests e.g. Mann-Whitney and Chi-Square. The second is to use “factor scores” which can be calculated by the factor analysis technique, requiring parametric tests e.g. *t*-test and ANOVA.

Parametric tests require that data from the sample of the population should be normally distributed, whereas the non-parametric tests do not (Anderson et al., 2007). If data are normally distributed, then statistical inference becomes more robust and makes the

statistical significance of the relationship between variables more accurate (Jason and Waters, 2002; Tabachnik and Fidell, 2007). Miller et al. (1997, p. 288) stated that “when the sample is normally distributed the statistical power of non-parametric tests will be less than the corresponding parametric test (power-efficiency) and as a consequence, a Type II error is more likely to be committed”. There is a trade-off between information and the ability to use a parametric test with more statistical power. The optimum position in this trade-off will depend on the application but in general where a little aggregation (implying only a small loss of information) is sufficient to construct normal metrics then this is good practice. If a lot of aggregation is necessary, discarding much information, then it is probably better to use non-parametric approach.

The aggregation of the data, by factor analysis in the current study, inevitably involves losing some information from individual questionnaire items (Section 5.4.1). However, as noted above, the information excluded from the factor analysis amounted to only 6 items out of the original 37. Aggregating variables, with a degree of independence, will produce a metric with a distribution that is approximately normal. This then allows various “powerful” standard parametric statistical tests to be applied (Miller et al., 1997; Marjorie, 1997). Therefore, the current study employed the second approach for hypothesis testing because the factor scores have unique properties of standardising the normality distribution

scores with mean of zero and standard deviation of 1 and eliminating the multicollinearity between research variables (Hair et al., 2010). This approach can also achieve the instrument's homogeneity and unidimensionality (Bryman and Cramer, 2005). By ensuring that the data are normally distributed, the researcher can use parametric tests such as multiple regressions, *t*-test and One-way ANOVA to get more statistical power from the results.

5.7 Hypothesis testing

Before testing the research hypotheses, it is important to specify the accepted significance level of the results and the proper statistical test. In social research, authors recommend three common levels of significance ($P \leq .01$, $P \leq .05$ or $P \leq .10$) to obtain a statistically significant result (Hair et al., 2010). The determination of the proper statistical test is based on the hypothesis's aims of investigation (Kleinbaum et al., 1988).

5.7.1 Testing the first hypothesis

Hypothesis 1:

SECI processes positively influence the innovation process within Egyptian banks.

This hypothesis aims to describe the extent, direction, and strength of the relationship between several independent variables (socialisation, externalisation, combination and internalisation) and a single dependant variable (innovation). Therefore, it is recommended to use the multiple regression analysis (Kleinbaum et al., 2008; Hair et al., 2010). In PASW

(Predictive Analytics SoftWare), *Enter* selection is employed to include all these variables in the regression model estimation (Field, 2009; Hair et al., 2010).

5.7.1.1 Multiple regression analysis

Multiple regression is a statistical technique that can be used to analyse the relationship between a single dependent (criterion) variable and several independent (predictor) variables (Hair et al., 2010; Tabachnick and Fidell, 2007). The goal of multiple regression analysis is to use the independent variables (IVs) whose values are known to predict the single dependent variable (DV). Each independent variable is weighted by the regression analysis. These weights, called regression coefficients, indicate the relative contribution of the independent variables to overall prediction and facilitate interpretation as to the contribution of each variable in making the prediction (Hair et al., 2010). The sign of the coefficient (-/+) shows that the predicted value of the dependent variable decreases/increases when the value of the independent variable decreases/increases. In its basic form, the multivariate regression equation is:

$$Y = A + B_1X_1 + B_2X_2..... + B_k X_k + \varepsilon$$

Where Y is the predicted value on the DV, A is the Y intercept (the value of Y when all the X values are zero), X_s represent the various IVs, B_s are the coefficients assigned to each IV during regression, and ε represents the standard error of estimates (Adams et al., 2007; Field, 2009; Hair et al., 2010; Tabachnick and Fidell, 2007). More details about the multiple regression analysis are provided later in Sections 5.7.1.2 and 5.7.2.

It is important to explain some topics related to multiple regression; namely the multiple regression assumption, the multicollinearity problem, and the generalisability of its results.

The assumptions of normality, linearity and homoscedasticity should be investigated before conducting a multiple regression test (Kleinbaum et al., 2008; Tabachnik and Fidell, 2007).

Normality is the assumption that each variable and all linear combination of the variables are normally distributed. Tabachnick and Fidell (2007, p. 78) stated that “statistical inference becomes less and less robust as distributions depart from normality”. This assumption makes it possible to evaluate the statistical significance of the relationship between Xs and Y (Jason and Waters, 2002). Normality of variables can be assessed by either graphical or statistical means through skewness and kurtosis components. Skewness is concerned with the symmetry of the distribution; a skewed variable is a variable whose mean is not at the centre of the distribution. Kurtosis is concerned with the peak of distribution. A rule of thumb is that the values of skewness and kurtosis fall between $-/+2$ (Kleinbaum et al., 2008). An assessment of the normality distribution of each research variable is shown in Table 5-10 (see Appendix 6).

Table 5-10: Normality distribution test (N=210)

Variables	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Socialisation (tacit- tacit)	.000	1.00	-.686-	.168	-.242-	.334
Externalisation (tacit-explicit)	.000	1.00	-.878	.168	1.620	.334
Combination (explicit-tacit)	.000	1.00	-.615	.168	.603	.334
Internalisation (explicit-tacit)	.000	1.00	-.989	.168	1.179	.334
Innovation	.000	1.00	-.874	.168	.591	.334

Based on this table, the values of the skewness and kurtosis tests prove the normality assumption of all variables (all values fall between -0.989 and 1.620). The standard normality distribution is achieved with mean of zero and standard deviation of one, which can be confirmed by using factor analysis scores as substituting values for the original values (Hair et al., 2010; Kleinbaum et al., 2008).

The **linearity** assumption means that there is a straight-line relationship between two variables, where one or both of the variables can be combinations of several variables. Linearity is important in a practical sense as Pearson's correlation coefficient (R) only captures the linear relationship between variables (Tabachnik and Fidell, 2007). Linearity can be achieved by selecting "the linear option" in the PASW.

The **homoscedasticity** assumption means that the variability in scores for one variable should be approximately the same at all values of another continuous variable. If the homoscedasticity is marked, it can lead to serious distortion of findings and weaken the analysis (Jason and Waters, 2002). Homoscedasticity is related to the assumption of normality; when the normality distribution is met, the relationships between variables are homoscedastic (Tabachnik and Fidell, 2007).

It is also important to examine the relationship between the independent variables in a regression model for undesired effects of **multicollinearity**. Multicollinearity exists when variables are highly correlated (0.90 or above) (Jason and Waters, 2002). It indicates a high degree of redundancy of variables, and hence the need to remove them from the analysis

(Hair et al., 2010). Stevens (2002, pp. 91-93) stated that “Multicollinearity poses problems for the researcher using multiple regression for three reasons:

-It severely limits the size of the multi correlation coefficient R , because the predictors are going after much of the same variance only.

-It makes determining the importance of a given predictor difficult because the effects of the predictors are confounded due to the correlations among them.

-It increases the variance of the regression coefficients. The greater this variance, the more unstable the prediction equation will be”.

In PASW, there are several measures for assessing multicollinearity between the independent variables, the classical measures being the tolerance value, and its inverse, the variance inflation factor (VIF). Tolerance ($1/VIF$) refers to the amount of variability of the specified independent variables not explained by the other variables, while VIF refers to the effect that the other predictors of variables have on the variance of a regression coefficient. VIF indicates whether there is a strong linear association between one predictor and the remaining predictors (Hair et al., 2010). Very small tolerance values (and large VIF values) indicate a high level of collinearity, it is therefore recommended that the cut-off threshold is a tolerance under 0.1, which corresponds to VIF values above 10 (Hair et al., 2010; Kleinbaum et al., 2008; Myers, 2000).

The collinearity diagnostics table in PASW is an alternative method of assessing whether there is too much multicollinearity between the independent variables (Jason and Waters, 2002; Kleinbaum, et al., 2008). Multicollinearity can be assessed by using the eigenvalues or the condition indices measures. Eigenvalue of one means that there is no correlation

between the independent variables and eigenvalue of zero means that a degree of collinearity exists. The condition indices are used to flag excessive collinearity in the data. For example, a condition index over 30 suggests serious collinearity problems and an index over 15 indicates possible collinearity problems. The multicollinearity problem can also be overcome by using factor analysis (Adams et al., 2007; Hair et al., 2010). Factor analysis reduces a given data set to fewer variables by finding a linear combination of variables which are highly correlated. These new variables are created in a way to be orthogonal or uncorrelated.

The **generalisability** and the statistical power of the regression results are related to the sample size (Field, 2009; Hair et al., 2010). In particular, the generalisability of results depends on the ratio of observations to independent variables. A general rule is that this ratio should never fall below 5:1, meaning that at least five observations should be conducted for each independent variable, while the recommended level is 15 to 20 observations for each independent variable. However, if the stepwise regression technique is employed, the recommended level is increased to 50:1 due to the fact that this technique selects only the strongest relationships within the data set and suffers from a greater tendency to become sample-specific. In addition, the minimum sample size should be 50 and preferably 100 to maintain the statistical power of multiple regression results (Field, 2009, p. 222; Hair et al., 2010, p. 175). Based on such facts, a total of 210 observations were made for each independent variable in this study to meet the standard required for generalisability and the statistical power for multiple regression results.

5.7.1.2 Discussing the multiple regression results

In order to test the first hypothesis, three results need to be evaluated: the multicollinearity between IVs, the prediction accuracy and the significance of the overall model. Table 5-11 presents the regression results, however full results of the regression output can be found in Appendix 7.

Table 5-11: Summary of regression results

	Unstandardized Coefficients	Standardized Coefficients	T-value	Sig. (P)	Collinearity Statistics	
	B	Beta			Tolerance	VIF
Socialisation (tacit-tacit)	.269	.269	7.462	.000***	1.000	.000
Externalisation (tacit-explicit)	.294	.294	8.138	.000***	1.000	.000
Combination (explicit-tacit)	.500	.500	13.849	.000***	1.000	.000
Internalisation (explicit-tacit)	.569	.569	15.749	.000***	1.000	.000
Prediction accuracy	R=.856 R ² =.733		Adjusted R ² =.727			
Significance	F (calculated) =140.433		P value =.000***			

Note: *** Significant at 1 percent level (P < 0.01)

• Assessing multicollinearity

Table 5-11 shows that the values of tolerance were 1.0 and VIF values were zero for all the independent variables, therefore, the multicollinearity problem between these variables was not marked and the results of regression were meaningful. This is further illustrated by the collinearity diagnostics table indicating that all the eigenvalues were 1.00 and the condition index values were less than 30 for all variables (see Appendix 7).

- **Assessing the prediction accuracy**

Hair et al. (2010, p. 164-165) stated that the most commonly used measure of predictive accuracy for the regression model is the coefficient of determination (R^2) or adjusted R^2 , which indicates the proportion of the variance in the DV which is accounted for by IVs. However, the R^2 tends to somewhat over-estimate the success of the model when applied in practice, therefore, an adjusted R^2 value is calculated in order to take into account the number of variables in the model and the number of observations (participants) the model is based on. In particular, the adjusted R^2 is used if there is more than one independent variable in the model, as in the case with the multiple regression model (Adams et al., 2007). In this study, the adjusted R^2 was .727 which means that the variances of all the SECI processes accounted for .727 of the total variance in innovation in Egyptian banking, leaving .273 of the total variance due to other factors not included in this research.

- **The significance test of the overall model**

As depicted in Table 5-11, the overall results for the regression model were significant at P value =0.000 which means that the regression results are statistically significant. The decision of accepting or rejecting the hypothesis mainly depends on the calculated F (from the ANOVA table in PASW) and critical F (from the statistical tables) values. If the calculated value is higher than the critical value, then the decision is to reject the null hypothesis at the chosen level of confidence (Field, 2009; Hair et al., 2010; Kleinbaum et al., 2008). In this study the calculated $F = 140.433$ was higher than the critical $F = 2.42$ (at df ; 4, 205 and $P < 0.05$) which means rejecting the null hypothesis and accepting the alternative hypothesis which states that there is a significant statistical relationship between

SECI and innovation, which confirms the results of .727 of changes in the innovation process being caused by SECI processes.

- **Assessing the relationship direction**

The goal of regression is to derive the B values known as regression coefficients, or beta coefficients to allow the computation of reasonable Y values with the regression equation. A positive value of B shows that the value of the dependent variable will increase when the value of the independent variable increases and vice versa (Kleinbaum et al., 2008). Table 5-11 indicates that the B value for each independent variable was positive and significant ($P = .000$), concluding that each SECI variable positively influenced the innovation process within the Egyptian banking sector. The positive sign of R (as indicated in Table 5-11) indicates that the relationship between the whole SECI model and innovation is also positive.

To sum up, the first hypothesis was accepted which means that the SECI processes, whether separately or as a whole, positively influenced the innovation process within Egyptian banks.

5.7.2 Testing the second hypothesis

Hypothesis 2:

Each of the SECI processes has a different contribution to the variance in innovation in Egyptian banks.

As mentioned earlier, the beta (B) value indicates the direction of influence (positive or negative) of each independent variable on the dependent variable. It can be also used to

measure how strongly the variance of each independent variable contributes to the variance of the dependent variable: the higher the beta value (ignoring signs) the greater is the contribution of the independent variable to the variance of the dependent variable (Kleinbaum et al., 2008).

The results of the first hypothesis indicated that the variances of the all SECI processes accounted for .727 of the total variance in innovation in Egyptian banking. The ranking of the beta (*B*) values in Table 5-11 also indicates that the internalisation variable had the highest value (.569), followed by combination (.500), externalisation (.294), and socialisation (.269), and all significant: $P = .000$. This suggests that variances in the internalisation process accounted for the highest proportion of variances in the innovation process, followed by the combination, externalisation and socialisation processes, respectively. However, these results do not indicate exactly how much the proportion variance of each process accounted for by innovation variances. Therefore, the multiple regression by selecting the *stepwise* method is used to examine the contribution of each independent variable to the regression model and removed any variables that were not significant predictors (Field, 2009; Hair et al., 2010). Table 5-12 illustrates the individual contribution of each SECI process variances to the variance of innovation in Egyptian banks (Appendix 8).

Table 5-12: Adjusted R^2 for the contribution of each independent variable to innovation

	Internalisation	Combination	Externalisation	Socialisation	Total	Sig. (P)
Adjusted R^2	0.320	0.250	0.085	0.072	0.727	0.000***
Rank	1	2	3	4		

Note: *** significant at 1 percent level ($P < 0.01$)

This analysis indicates that the variance of internalisation has the highest contribution to innovation variances, accounting for .32 of the total variance of innovation, followed by combination, accounting for .25, externalisation, accounting for .085 and socialisation, accounting for .072. Thus both internalisation and combination are the main processes that influence innovation in the Egyptian banking sector, with their sum contribution accounting for .570 of the total variance of innovation compared to only .157 for both the externalisation and socialisation processes. However, employing all four SECI processes is a more effective form of integration to support innovation, as they have the cumulative effect of .727 of the total variance. The high correlation between the SECI processes should be marked to support the significance of the integration process between them. However, the scores yielded from factor analysis assume that the correlation between the independent variables equals zero to avoid the multicollinearity problem and biased regression results. Therefore, to test the correlation between these variables, the average score of each variable will be considered rather than the factor analysis scores (Hair et al., 2010). The correlation matrix between these variables is shown in Table 5-13 (see Appendix 9).

Table 5-13: the Pearson’s correlation coefficients between SECI variables

Variables		Socialisation	Externalisation	Combination	Internalisation
Socialisation	R Sig.	1	.517 .000***	.486 .000***	.596 .000***
Externalisation	R Sig.		1	.629 .000***	.631 .000***
Combination	R Sig.			1	.763 .000***
Internalisation	R Sig.				1

Note: *** significant at 1 percent level (P < 0.01)

Table 5-13 indicates that there was a significant positive relationship between the SECI processes and that the highest correlation was between internalisation and combination (.763). These results confirm the stepwise regression that the integration between the internalisation and combination processes is more valuable for enhancing innovation than that between any other two SECI processes.

5.7.3 Testing the difference between demographic groups

As shown in Table 5-3, there was a large difference between the respondents within some demographic groups, e.g. the gender group comprised 185 males and 25 females and similarly, the academic background group comprised seven high school, 158 graduate and 45 postgraduate holders. Therefore, generalising the results of testing the difference between the means of these groups may not be valid or meaningful. However, the results may still be of interest and could give general indicators about the opinion of each group regarding the performance of the SECI and innovation processes.

In this study, two methods were used to test the different means between groups, based on the measurement scale of the tested variables and the normality distribution of data. The parametric tests (e.g. *t*-test and one-way ANOVA test) are suitable for the ratio or the interval scale and for data that are normally distributed. In contrast, the non-parametric tests (e.g. Mann-Whitney and Kruskal-Wallis tests) are suitable for nominal and ordinal scales and for data which are normally or non-normally distributed (Field, 2009; Kleinbaum et al., 2008). As mentioned earlier, the normal distribution of the research data was examined by the skewness and kurtosis tests (see Table 5-10) using factor scores

(which are not ordinal or nominal scales) yielded by factor analysis for further statistical analysis. The parametric test is used to test the different agreement means between the respondents' demographic groups with regard to the SECI and innovation activities.

Two parametric statistical techniques were used to compare the different means of the groups. The independent *t*-test was used to test the difference between two groups i.e. the mean difference between the male and female staff and between the public and private banks. The one-way ANOVA test was used to test whether three or more group means were different, i.e. the mean difference between the years of experience groups (≤ 5 , 6-10, 11-15, 16-20 and > 20 yrs), between the academic background groups (high school, graduate and postgraduate holders) and between the job title groups (junior, senior, head of department, auditor, vice manager and manager).

5.7.3.1 Independent *t*-test results

The *t*-test is used when there are two experimental conditions (e.g. male and female or public and private banks) and different participants in each condition (e.g. SECI and innovation processes). The independent *t*-test table yielded by PASW normally shows two rows of test statistics: one row is labelled equal variance assumed, while the other is equal variance not assumed. The row to be considered is based on the significance of Levene's test for equality of variances. Therefore, if Levene's test is significant, the equal variances not assumed row will be used for the *t*-test. The significance of this difference is based on the significance of the *t*-test. If this test is significant, the difference between the means of these groups is also significant. The next step is to look at the different means columns to

know how these groups differ. If Levene's test is not significant, then the equal variances assumed row will be used for the *t*-test and if the *t*-test is significant, this result will be significant (Field, 2009, p. 324). The results of Levene's and *t*-test for male and female groups are shown below (Appendix 10).

Table 5-14: Independent *t*- test results for the males' and females' means

Variables	Levene's Test for Equality of Variances		<i>t</i> -test for Equality of Means		
	F (df; 208)	Sig. (p)	t	Sig. (P)	Mean difference (male-female)
Socialisation (tacit-tacit)	.297	.587	-.773	.440	-.165
Externalisation (explicit-tacit)	11.235	.001***	-.603	.551	-.171
Combination (explicit-explicit)	.761	.384	1.024	.307	.218
Internalisation (explicit-tacit)	1.170	.281	-.172	.890	-.030
Innovation	3.091	.080*	.303	.762	.065

Notice: the sample size is 185 males and 25 females.

*** significant at 1 percent level ($P < 0.01$)

* significant at 10 percent level ($P < 0.10$)

This table highlights the two cases of significance of Levene's test. For the socialisation, combination and internalisation processes the test shows that the *F* ratios were not significant, therefore the equal variances assumed row was used for the *t*-test and the results show that all values were not significant. Therefore, it can be concluded that there is no significant difference between the agreement means of the male and female staff for these processes in Egyptian banks. However, Levene's test for the externalisation and innovation processes shows that the *F* ratios were significant ($p < .01$ and $p < .10$, respectively), therefore, the equal variances not assumed row was used for the *t*-test. The *t*-

test results were not significant for either process therefore, it can be concluded that although there was a difference between the agreement means of male and female staff for the externalisation and innovation processes (the male means were a bit less than the female means for the externalisation process, mean difference = -.171 and the male means were a bit higher than the female means for the innovation process, mean difference = .065), however this difference is still not significant. Men and women employees do not perceive any less/more socialisation or internalisation processes.

Regarding public and private banks, a summary of Levene's and *t*-tests is provided in the following table.

Table 5-15: Independent *t*-test for the public and private banks' means

Variables	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F (df; 208)	Sig. (P)	t	Sig. (P)	Mean difference (public-private)
Socialisation	.038	.845	.854	.394	.119
Externalisation	.418	.518	-.1.105	.270	-.154
Combination	5.670	.018**	1.805	.072*	.250
Internalisation	6.019	.015**	4.077	.000***	.548
Innovation	6.532	.011**	3.117	.002***	.426

Notice: the sample size is 3 public and 9 private banks.

*** significant at 1 percent level ($P < 0.01$)

** significant at 5 percent level ($P < 0.05$)

* significant at 10 percent level ($P < 0.10$)

By following the same method of analysis for the independent *t*-test as before, the results show that there was a significant difference between the Egyptian public and private banks for the combination, internalisation and innovation processes. The respondents indicated that the public banks were better at performing these processes than the private banks. Although this difference is small (mean difference = .250, .548 and .423, respectively), it is still significant. Public banks have the largest share of banking activities amongst the Egyptian banking sector (Chapter 4, Section 4.10.3.1) and they are widely spread across the country (834 branches for the three banks) in comparison to the private banks (1109 branches for 27 banks). Therefore, public banks are more keen on sharing the formal knowledge between their employees across branches through the combination and internalisation processes.

5.7.3.2 One-way ANOVA test results

The results of the ANOVA provide the *F* statistic and associated *P* value. If the *P* value is significant, the hypothesis is correct that the means of at least two of the subgroups differ. However, ANOVA does not provide specific information about where the difference between groups lies, making it necessary to carry out further analysis to discover which groups differ. The post-hoc test is recommended for a pair wise comparison of subgroups. Gabreil's and Hochberg's GT2 comparison procedures were employed to take into consideration the different sample sizes between the groups, as Table 5-3 shows (Field, 2009). The following table summarises the one-way ANOVA results for the years of experience, academic background and job title groups.

Table 5-16: One-way ANOVA results

Variables	Years of experience (5 groups)		Academic background (3 groups)		Job title (6 groups)	
	F (df; 4,205)	Sig. (P)	F (df; 2,207)	Sig. (P)	F (df; 4,205)	Sig. (P)
Socialisation	1.498	.204	.270	.763	.675	.643
Externalisation	2.186	.072*	1.914	.150	2.157	.060*
Combination	1.983	.097*	.908	.405	1.943	.089*
Internalisation	1.809	.128	.392	.676	2.115	.065*
Innovation	1.137	.340	.127	.881	1.442	.211

Note: * significant at 10 percent level ($P < 0.10$)

This table indicates that there was no difference between the years of experience groups' means of agreement for the socialisation, internalisation and innovation processes within the Egyptian banks ($P > .10$). However, there was a difference between the agreement means of these groups regarding the externalisation and combination processes ($P = .072$, $.097$, respectively). To know which groups differ, a post-hoc test was administered, with the significant results shown in Table 5-17. The full results are found in Appendix 11.

Table 5-17: Post-hoc test results for the years of experience groups

(I) Y. of experience	(J) Y. of experience	Externalisation (explicit-tacit)		Combination (explicit-explicit)	
		Mean difference (I-J)	Sig. (P)	Mean difference (I-J)	Sig. (P)
Less than or 5yrs	6-10yrs	.593	.079*	.153	.999
	11-15yrs	.233	.973	.635	.054*
	16-20yrs	.224	.957	.191	.986
	More than 20yrs	.434	.231	.170	.991

Note: * significant at 10 percent level ($P < 0.10$)

This table shows that for the externalisation process the means of staff with five years experience or less was significantly higher than of staff with 6-10 years, (mean difference = .593; $P = .079$). For the combination process, the means of this group was higher than that of the 11-15 years group (mean difference= .635; $P = .054$). Therefore, the conclusion can be drawn that staff with five years experience or less is significantly more in agreement with the externalisation and combination processes than staff with 6-10 yrs and 11-15 yrs experience, respectively.

Returning to Table 5-16, no difference was observed between the academic background groups' means regarding the overall SECI and innovation processes ($P > .10$ for each process). The difference between the samples sizes of the academic background subgroups (seven were high school, 158 were graduate and 45 were postgraduate holders) could negatively affect the validity of these results.

Finally, Table 5-16 also indicated that there was no significant difference between the job title groups' means of agreement regarding the socialisation and innovation processes within the banks ($P > .10$). However, there was a difference between the mean agreement of these groups for the externalisation, combination and internalisation processes ($P = .060$, .089, and .065, respectively). The post-hoc test showed that the differences between these groups were not significant (see Appendix 12).

Table 5-18 summarises the results of testing the difference between the means of agreement of the demographic groups with regard to SECI and innovation activities.

Table 5-18: Summary results of testing the difference means between the study groups

Groups	Means difference	Group means comparison
Gender (male-female)	There is no difference	
Bank category (public-private)	There is a difference regarding combination, internalisation and innovation activities.	Egyptian public banks are significantly more concerned with the combination, internalisation and innovation activities than private banks .
Years of experience (≤ 5.....≥ 20 yrs)	There is a difference regarding externalisation and combination activities.	The agreement means of the 5 years or less experience group is significantly higher than the 6-10 years of experience group with regard to the externalisation activities and is significantly higher than the 11-15 years of experience group with regard to performing combination activities in Egyptian banks.
Academic background (high school.....p. graduate)	There are no differences	
Job title (Junior.....Manger)	There is a difference regarding externalisation, combination and internalisation activities	The difference between all groups is not significant

5.8 Conclusion

The initial findings of the quantitative study highlighted several points. In line with the importance of the commercial public banks in the Egyptian banking sector, one-third of respondents came from these banks. Respondents' profiles showed that the majority were males and graduates or post-graduates. All groups were well represented in terms of years of experience and job positions. The questionnaire quality was investigated by employing validity and reliability tests which demonstrated that all research variables were well factored and reliable. The first step of the data analysis, the analysis of descriptive statistics showed a high level of agreement regarding the questionnaire's items which substantiate a

high percentage of agreement for both the SECI variables and innovation. As the banking sector is working in a highly competitive environment, all banks follow policies to improve their operations and increase their market share. This suggests that Egyptian banks follow promising policies in terms of the SECI processes and innovation.

The chapter also discussed quantitative statistical techniques for testing the research hypotheses and the differences between the respondents' demographic subgroups. The factor scores yielded by factor analysis were considered using these techniques in order to standardise the normality distribution of data and collinearity between the independent variables (SECI variables). To test the hypotheses, a multiple regression test was used and the assumptions of multiple regression were investigated. The results of the skewness and kurtosis tests proved that the normality assumption was achieved by selecting the "linear option" for regression tests in PASW which validated both linearity and homoscedasticity assumptions. The sample size in this study met the standard size required for generalisability and the statistical power of multiple regression. 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. It also indicated that the variance of the internalisation process had most influence in accounting for innovation variances, followed by the combination, externalisation and socialisation processes. The integration of all four SECI processes was highly effective in supporting innovation. Regarding the differences between the respondents' demographic groups, both Independent *t*-test and one-way ANOVA test were employed. The independent *t*-test results did not prove any differences between the gender groups, however they highlighted that public banks are

better at the combination, internalisation and innovation processes than private banks. The one-way ANOVA results indicated that staff with five years experience or less were significantly more in agreement than longer-serving staff with 6-10 yrs or 11-15 yrs in achieving the externalisation and combination processes, although these results did not indicate any significant difference between the subgroups of both academic backgrounds and job positions.

Chapter 6

Qualitative Data Analysis

This chapter discusses the qualitative data gathered through 26 semi-structured face-to-face interviews. The interview data aim to add further interpretation and meaning to the quantitative findings by describing precise ways in which SECI conversion processes were either limited or sustained. The qualitative data are used to triangulate the quantitative data and although triangulation typically looks at a topic from independent sources to corroborate findings (Saunders et al., 2009, p. 154), the interviews offer some level of triangulations since the nature of the data gathered was different. Throughout the chapter specific quantitative findings which were mentioned in Chapter 5 are linked to qualitative findings for triangulation. For example, findings of the factor analysis, frequency distributions and interviews are together connected to explore the application of each SECI process and product-process innovation in the Egyptian banks. Next, findings of multiple regression are connected to interviews findings to investigate the linkage between the SECI model and innovation. The qualitative data also support the innovation measurement used in the questionnaire by providing tangible examples of product and process innovations achieved recently by the Egyptian banks. In this sense, the content analysis was used to achieve these goals as indicated in Chapter 4.

The chapter starts with describing the interview process through presenting the background profiles of the interview participants and illustrates the knowledge needed by interviewees to manage their jobs. Then the interview data for both SECI (socialisation, externalisation,

combination and internalisation) and innovation (product and process) activities within Egyptian banks are presented, while the last part states the interviewees' views regarding the relationship between SECI and innovation in these banks.

6.1 Interview process and analysis

Semi-structured interviews were carried out in face-to-face encounters with staff from a variety of Egyptian banks for three months, between November 2009 and January 2010. A total of 26 interviewees (22 men and four women, 85% and 15%, respectively) took part in this study, 11 were attached to public banks and 15 held positions in private banks. Their experiences were rich and diverse and all had a certain amount of experience in banking. Eighteen of the interviewees (69%) had a minimum of five years' work experience in banking while eight of them (31%) had less than five years'. The positions these interviewees held within the banking environments reflected this diversity; the largest group being the junior bankers (seven), followed by the vice heads of branches (five) and then heads of department (four). Next were the senior bankers, an auditor and the heads of branches (three) and finally the vice head of a department (one). Given that bankers are usually very busy, 15 interviews (58%) were arranged outside the workplace and ran for approximately 50 to 105 minutes, lasting on average 75 minutes. Eleven interviews (42%) were conducted inside the work place, which ran for approximately 45 to 80 minutes, lasting on average 60 minutes. Sixteen of the interviewees (62%) were post graduates and ten (38%) were graduates. More details are provided in Table 6-1. Of the 26 interviews, 21 were voice-recorded and for five notes were taken. All of the interviews were conducted in

the Arabic language, however they were coded, transcribed and translated into English for analysis.

The content analysis of interviews was done manually. All dimensions and their aspects as discussed in the interview were coded first. For example, the code “S/Rotation” was used to refer to all data related to the personnel rotations as a mechanism of the socialisation process, and “E/ext-training” was used to refer to all data related to documenting the external training programmes and seminars. The profiles of interviewees were also coded, as explained in Table 6-1. The researcher, as indicated in Chapter 4, Section 4-10, was looking and searching for words and phrases/sentences mentioned by each interviewee that could be connected to these dimensions and their aspects. Then, all data related to a particular dimension was collected together in a separate section. For example, Section one contained all data related to the issue of personnel rotation across department as a mechanism of socialisation. This allowed the researcher to get a detailed and comprehensive view of each item.

Topics covered by the interview schedule included confirming the participant’s background and experience in banking, discussing the type of knowledge required to accomplish his or her job and how this knowledge can be developed. Then, the interview covers the same topics mentioned in the questionnaire in terms of SECI and innovation processes including: the mechanisms used by Egyptian banks to transfer tacit knowledge from person to person, to document tacit knowledge, to transfer tacit knowledge into a proper form and to transfer

explicit knowledge into tacit knowledge; mechanisms that enabled banks to provide product and process innovations; and finally the relationship between SECI and innovation.

**Table 6-1: details
of interview
participants**

Bank	No. of interviewees	Job	Gender	Education	Y. of Experience	Date	Time	Duration (Minutes)	Meeting place	Code
National Bank of Egypt (NBE)	5	Head of Department*	M	P. G	21	15/12/09	9-10	60	Inside work P.	NBE1
		Head of branch	M	G.	30	25/12/09	12-1	60	Inside	NBE2
		Senior*	M	P.G	13	9/11/09	4-4.45	45	Inside	NBE3
		Junior	F	P.G	2	11/11/09	8 pm -9:20	80	Outside work P.	NBE4
		Junior	M	G.	4	10/11/09	7:30 pm-8:10	70	Outside	NBE5
Banque du Misr (BM)	3	Vice head of branch	M	G.	20	3/11/09	11-12	60	Inside	BM1
		Auditor	M	P.G	15	19/11/09	12-1	60	Outside	BM2
		Junior	F	G	3	12/11/09	7 pm-8:15	75	Outside	BM3
Banque du Cairo (BC)	3	Vice head of branch	M	P.G	25	3/12/09	12-1.10	70	Inside	BC1
		Senior	M	P.G	7	7/12/09	6 pm-6:50	50	Outside	BC2
		Junior	F	P.G	3	8/12/09	6pm-7	60	Outside	BC3
Bank of Alexandria (BA)	3	Vice head of department*	M	P.G	26	17/11/09	1-2.40	100	Outside	BA1
		Auditor	M	P.G	17	11/11/09	6:30pm-7:40	70	Outside	BA2
		Junior	M	G.	3	9/11/09	7 pm-7:55	55	Outside	BA3
Housing & Development Bank (HDB)	1	Auditor	M	P.G	13	22/1/10	7 pm-8:10	70	Outside	HDB1
Union National Bank (UNB)	2	Senior	M	G.	10	29/11/09	1-2:30	90	Outside	UNB1
		Vice head of branch	M	P.G	17	7/12/09	7:30 pm-8:25	55	Outside	UNB2
Arab-African International Bank (AAB)	2	Head of department	M	P.G	11	14/1/01	2-3:20	80	Inside	AAB1
		Junior	M	G.	3	13/1/10	11-12	60	Inside	AAB2
Commercial International Bank (CIB)	2	Head of branch	F	P.G	20	10/1/10	11-11:50	50	Inside	CIB1
		Junior	M	P.G	3	11/1/10	10 pm-11:45	105	outside	CIB2
Nationale Societe General Bank (NSG)	2	Vice head of branch	M	P.G	13	12/1/10	9-10	60	Inside	NSG1
		Head of department	M	G.	4	10/1/10	8 pm-9:40	100	Outside	NSG2
Suez Canal Bank (SCB)	1	Head of branch	M	P.G	25	13/1/10	9am-10	60	Inside	SCB1
Barclays Bank-Egypt (BBE)	1	Head of department	M	G.	6	6/01/10	1-2:25	85	outside	BBE1
National Bank for Development- Islamic branch (NBD)	1	Vice head of branch	M	G	24	9/12/09	4-5	60	Inside	NBD1
Total	26		22M, 4F	10 G. 16 P.G				Min 45 Max 105	11 inside 15outside	

* Staff working in the headquarters

6.2 Required knowledge

The respondents replied that they needed knowledge about the rules and procedures of their job as well as some knowledge about the customers they serve, the available banking services and the products that their bank and other banks provide. They also need to be familiar with the related software and the English language in order to deal with the international computer software and banking terminology and reports written in English. Knowledge is also required about bank products and services such as expiry dates, interest rates and requirements and qualifications to apply for these products and services.

“We need to know about the rules, procedures and software that are related to our job, we need to know what the other banks produce and also how to use the computer software and English language that help us to achieve our job” (NBE4).

“For the goods department that I am working in, I need to know what are the goods, prices, expiry dates, sticking to the laws of the storage of these goods – can they be stored or not – the years of validity of the storage” (UNB1).

All respondents agreed that they can easily obtain this knowledge through the training programmes, from the intranet, internet, periodic reports issued by headquarters, bank rules, the public relations office, the relevant instructions from the Central Bank of Egypt (CBE) e.g. money laundering issues, personal experiences and qualifications and finally the publications of other banks.

6.3 SECI processes

As indicated in Chapter 5, Section 5.4.1, the four processes of the SECI model were confirmed as modes of knowledge conversion in Egyptian banks. The following qualitative data provide an overview of each SECI process in detail.

6.3.1 Socialisation (tacit-tacit)

Socialisation consists of the transfer of tacit knowledge from person to person through face-to-face discussions of shared experiences. This could be achieved through discussions conducted in formal and informal meetings, seminars, workshops and training programmes or by involving the staff in a personnel rotation process across departments and in discussions with external bodies e.g. co-operatives, competitors, the Central Bank of Egypt (CBE), and customers. The frequency and percentage distribution presented in Chapter 5, Table 5-9, show that 71.0% of respondents acknowledged that their banks conducted meetings, seminars, workshops and training programmes to update everyone on work issues, almost half of them (50.5%) said that their banks invited experts to talk about their banking experiences and 65.2% of them thought that involving banks in joint projects could increase the staff's knowledge through face-to-face interaction with others. 72.2% of respondents agreed that the participating banks followed a systematic plan to rotate their staff across different departments. The qualitative data provided more details regarding these findings.

The interviewees explained that the staff share their knowledge easily between groups, departments, and between the top and bottom of the organisational structure as all

managerial levels convene in the same hall. Staff can also share their knowledge before working hours, in particular, 8 am to 8.30 am or after the end of customer service time at 3 pm.

“Yes, there are discussions across all levels. As you see the deputy director’s office is in the hall behind the junior and the senior bankers and heads of departments and this actually allows face-to-face discussion for all to share their experiences” (NBD1).

“Of course, there are daily issues we normally talk about e.g. the exchange rate, interest rates, and sovereign decisions taken by CBE that have not been sent to us by emails, problems, suggestions and consultations. There is always a daily dialogue – sometimes a client comes and asks for a transaction that is not related to our department, then we orally ask our colleagues in other departments what to do with him etc. After the time for serving clients is over at 2.30, sharing knowledge always exists to discuss the daily banking issues or to prepare for future work. The bank management, at least twice a year, invites some of us from all the branches to a general meeting in a big hotel - at this gathering, they are very careful that the maximum number of employees from one department is one or rarely two at the same table to allow us to meet new people from different departments. And the management always welcomes to hear from us and take into account our suggestions and observations” (UNB1).

Banks encourage detailed face-to-face discussions through working in open spaces or floors not closed offices and conducting meetings and seminars. Nevertheless, the interviewees explained that informal discussions between the staff is limited due to work issues as staff are not allowed to engage in this kind of discussions. Manager did not fully trust employees and regard most informal dialogue as being focused on personal and social interactions rather than being work related. Banks also do not encourage informal meetings

for tea, coffee, having lunch and other activities. Interviewees pointed out that they need this kind of discussion to support their social relationships between each other and to build trust which is necessary for knowledge sharing.

“Yes, with regard to work issues, there are continuous consultations between the staff and the managers as none of them have closed offices, but they are sitting in the same hall with the rest of the staff - we do not have a common place to gather to have our lunch or take coffee or tea that gives us the chance to communicate friendly, everything is formal. Managers limit the informal discussions because they think that employees focus on personal issues rather than work issues” (CIB1).

“..... we are allowed to speak about anything related to work matters - there is knowledge transfer between all staff from a section for mutual benefit, I mean, I help the others to find them in the case of need. But this is not enough. We need more informal discussions because this allows for us to be close to each other, then we can feel free to talk about work problems and help each other to solve them” (AAB1).

Regarding the training programmes and workshops, the interviewees indicated that banks are interested in giving their staff the chance to share their knowledge with internal and external experts through external or internal training. With regard to the external training, the public banks and some private banks such as BA, HDB, SCB and NBD usually involve their staff in training programmes conducted by the Egyptian Banking Institute (EBI) that is directed by CBE as it is a public institution and apparently cheaper than the private institutions. The experts in this institute are a mixture of academic staff from Egyptian universities and experts from the banks themselves.

“The external training is usually done by the Egyptian Banking Institute. All public banks are supposed to send their staff to this public institute which is directed by the Central Bank of Egypt” (SCB1).

The rest of the private banks support their staff to attend the training programmes in the private institutions e.g. the American University in Cairo (AUC) or the Arab Academy for Science, Technology & Maritime Transport (AASTMT) as they think that these institutions are more professional in relation to the EBI.

“Our bank depends on private training institutions but selecting which one depends on the course. For example, we study MBA in the AASTMT and English Language courses in the American University in Cairo or the British Council. Also we study the bank foundation course in Format Institute in the British or German Commercial Chamber. Our bank usually searches for the outstanding training research centres specially the foreign centres” (NSG2).

Regarding the internal training, banks in Egypt usually depend on their own internal training centres or rent hotels and invite some internal and external experts from different countries e.g. Europe, India, China, Korea and USA to deliver training.

“For internal training, the bank invites experts from other banks e.g. a bank manager and head of sector. Lately, the bank conducted contracts with the well-known names of Egyptian, Arabian and foreign experts (executives or academics) for training programmes and workshops. The bank rents big hotels to conduct these sessions. For example, our bank funded a very expensive credit course [15.000 Egyptian pounds/person=£1660 roughly] because the participants were the owners of this system. The discussion with those experts is so valuable. Now, the bank invites the international experts to come here to benefit from them instead of sending its staff to foreign missions and training abroad, taking into consideration

the costs of travelling abroad and the social dimension as employees prefer to be close to their families” (UNB1).

The respondents agreed that they got considerable benefit from their discussions with the executive banking experts. They mentioned that they could share their knowledge and speak about the problems that occur regularly and obtain good recommendations and feedback from those experts.

“Discussions with executive experts are important in order to learn how to deal with customers, related rules and financial issues e.g. credit, fake money, loans, return on investment (ROI) analysis” (BC2).

However, regarding the discussions with academic experts there were two points of view. The first one represented the majority of interviewees who agreed that the academic staff provided them with the relevant academic theories regarding customer relation management, communication skills, marketing strategies and leadership theories.

“Academics talk about the relevant academic theories and how to prepare marketing plans, those academics cannot be ignored because they give the scientific and practical basis, and they highlight the frontiers of science in banking and management issues. For instance, for us as executives, we cannot put together marketing plans without knowing the scientific basic of how to prepare a plan. The executive banking experts also transfer their experience from the executive sector to us” (SCB1).

While the other point of view showed that sharing knowledge with academic staff has limited benefits as they are speaking about old academic theories that are not related to the latest banking applications.

“Some academic trainers are very weak and we find that sharing knowledge with them is useless. I mean they speak about old topics such as how to design the income statement, they are speaking about some unimportant topics. I think the management select those trainers based on personal relationships not on their qualifications. Lectures should be as strong as Basel 2 [a financial concept related to the proper capital levels for banks] and should highlight the latest developments” (BM2).

The interviewee added that the internal and external training/seminars are not only a good opportunity to share knowledge with executive and academic experts but also a good opportunity to share knowledge with colleagues from either different banks or different departments.

“External training in the Egyptian banking institute allows us to share knowledge with our colleagues from the other banks, and the internal training allows us to share knowledge with different levels of management and departments. As we give them some knowledge about our departments, they also give us some knowledge about their departments. Also, it is useful because we normally choose these courses. The bank usually sends a list of available courses and we choose which of them we need” (NBE3).

The personnel rotation process was another mechanism used by banks to support the socialisation process. Banks believe that the banker should have a comprehensive knowledge and be aware of all banking transactions that enable him to meet customers’ needs professionally. The interviewees acknowledged that personnel rotation gave them a wide experience and knowledge about most banking jobs and allowed them to share knowledge with other staff from different departments and branches. To maximise the benefits of rotation, banks provide internal training for staff for the new jobs they will be

rotated into. The majority of banks such as NBE, BM, BA, NBD, CIB and SCB rotate their staff every six months but the AAB rotates its staff every three months and the NSG and UNB only every 3 and 4 years respectively. However, interviewees criticised the rotation time and commented that “the duration of personnel rotation should be neither short nor long, every one or two years is fair to get the advantages of specialisation and to transfer the experience to another department” (BM2). In addition, it was clear that the rotation policy was also used for aspects of managerial control regarding the selection of staff and jobs. It was mentioned that rotation is not for all staff, that is, if an employee is particularly efficient or hard to replace, the manager may keep him or her in the same job and rotate the less efficient staff. On the other hand, if there is rotation outside the branch, banks rotate only the less important or the undesirable staff who are perceived as causing problems and taking lots of holidaysetc.

“Rotation is located sometimes every six months– there is no fixed duration - meaning as long as you are doing well in your place and perform better, they will not rotate you” (NBD1).

“In our bank, rotating staff is usually done every six months - but this is limited to some staff, not all. For example, if I have 15 employees in one department three of them are hard workers whose performance could be evaluated as 10/10; they are not allowed to be rotated from the standpoint of their manager. By the same token, if there are other three staff whose performance could be evaluated as 7 / 10 then their manager will see first the alternative employees, if they are at the same level of performance the manager will accept this replacement. The manager automatically accepts to rotate the low-qualified employees and those with unwanted behaviours. However, the situation gets worst if the rotation is between the branches. Hence, branch managers just rotate staff with unwanted behaviour e.g. a lady get used to

taking many vacations, unhealthy old man cannot work, seniors stopped to develop themselves, and those who have unethical behaviour and cause problems” (BM2).

It was also clear that this mechanism of socialisation is limited to the more routine jobs and is not available for the important jobs. The interviewees mentioned that the rotation happens just in the more routine jobs such as the treasury, transferring, customer services or secretarial jobs, except for the NBD which does not rotate the customer service staff, believing it is not good for customers having to deal with different staff in the short term. However, no rotation is in place for specialist jobs such as the credit jobs, as the training programmes for those staff are so expensive, which makes it difficult to rotate them after investing a lot of money to train them.

“There is personnel rotation every three months for staff working in some departments such as the customer service department but not for staff working in the credit department. A department such as credit, for example, is unlikely to be involved in rotation because the customers have files and long transactions and the employer needs to be familiar with customers themselves and payment methods and policies, therefore it is difficult to rotate him. Credit courses are also too expensive as there is one person from Netherland usually comes to train us. But before working in the credit department you have to be rotated across all departments to get enough experience (AAB1).

The last mechanism used by banks to support the socialisation process is allowing face-to-face discussions with externals. The interviewees confirmed that these discussions are very important in terms of getting more experience and valuable feedback about their bank’s performance. Therefore, banks give their staff the chance to meet staff from other banks, customers and related companies and agencies’ representatives. Banks allow their staff in some departments such as the customer service and credit departments to conduct social

meetings with their current and expected customers outside the workplace to promote their products and services and to discuss the customers' problems and suggestions, but this is not allowed to happen regularly. It happens just for once, especially during the month of Ramadan or a maximum of two times a year. Besides, there are contract bankers who continuously contact the customers by telephone to promote new banking products and services and to ask them about their satisfaction regarding the bank services and staff.

“The bank usually arranges a reception each year especially during Ramadan in a famous hotel e.g. the Intercontinental. We invite the premier customers for an open meeting with the management board and the branch managers to consult with each other on all issues and to discuss problems and suggestions” (NSG1).

“Giving the chance to deal directly with externals usually happens, but in each department separately. For example, the retail and corporate staff usually arrange personal meetings with current and expected customers to promote the bank's products and to ask them about their needs and if they have problems. Most of these meetings could be arranged after the end of working hours to find a greater chance and time for marketing the new products” (UNB1).

“Regarding our bank, if it has a sales plan, then it makes a plan to conduct personal interviews and area study for the expected customers in order to achieve its objectives The discussion with those customers is a good chance to get proper feedback about our bank and its staff performance”(CIB1).

Finally, there are continuous discussions with the regulators' representatives from the Central Bank of Egypt and the Central Auditing Agency and with the companies that ask banks to provide consultation services such as feasibility studies, area studies, etc.

“Our bank is a supporter for some companies regarding credit issues. For example, Talaat Mustaffa group for construction (one of the biggest Egyptian companies in

this field) asked us to do some consultancy studies for its companies and pricing its stocks through our banking investments department” (AAB1).

“There are deals between banks and each other, especially if they are planning to participate in funding some mega projects. For example, there was one company funded by six banks and when the company lost, then the management board resigned and the six banks participated in managing the company. Our bank has some sub-companies such as LG Live Insurance – one company for car rental and another one for finance” (NSG1).

The interviewees above suggested some limitations that minimised the benefit of socialisation processes within the banks. For example, some negative feedback was given regarding the benefits of sharing knowledge with academic experts and applying personnel rotation to important jobs and hardworking staff. It was also apparent that the benefit of sharing knowledge between the staff themselves and with customers during social meetings was limited due to the small number of meetings, may be one or two times a year especially in Ramadan, and the limited number of staff and customers who are invited to these meetings. This negative feedback supports the factor analysis which marked socialisation as the least important process among all the SECI processes in banks (Chapter 5: Table 5-4 and 5-6).

6.3.2 Externalisation (tacit-explicit)

The frequency and percentage distribution (Chapter 5: Table 5-9) showed that the majority of participants agreed that their banks have particular mechanisms to place people’s personal experience and informal skills on record for others to access. Approximately three-quarters of respondents agreed that their banks issue useful reports about relevant

external events (78.1%), use expert advice for setting training programme topics (72.4%), and ask staff to write reports about the results of their negotiation with customers (71.5%). This figure decreased to 64.7% regarding documentation of meetings, seminars, workshops and training programmes. The qualitative data provided more details and explained that the willingness of transferring tacit into explicit knowledge differs, based on whether the programmes are arranged by the bank itself or by external bodies. Banks are more interested to document internal rather than external events. When a bank arranges internal training programmes, workshops and seminars, it follows formal processes to capture the experts' tacit knowledge. These processes include providing handouts to all participants and documenting the content of these activities, then sending it by email to all staff, publishing it in the periodic reports, bulletins and leaflets and on the website. This is usually achieved involving different departments such as training, systems or information technology.

“The results of each seminar or workshop conducted by the bank are documented in reports and sent by email, saved as hard copies on files and mentioned in the periodicals issued by the bank. Six months ago, the bank invited foreign experts from Ukraine and Russia to talk about Visa issues and asked them to provide the bank with electronic and hard copies of the training and seminars materials” (BM2).

“The training department documents these activities and sends them in the form of periodic books or sends them as brochures by emails to all colleagues. We keep these documents as a reference that we can refer to whenever we want. In addition, the head office has a central library that captures the banking experts' publications and conferences through books, journals and newspapers” (UNB1).

In contrast, when a bank sends its staff to external training programmes, workshops and seminars, it follows just one formal process to capture the experts' tacit knowledge. Banks ask the participants to write a report including their feedback about this event. But some participants informally volunteer to leave some handouts in the branch for those who are interested.

“In the seminars or training programmes held by externals such as the Egyptian Banking Institute, the bank itself does not have any formal system for documenting these seminars and programmes. However, those externals give us hand outs for ourselves - some of us leave his copy in the branch for his colleagues to take a look, in an informal manner” (BM2).

“The Egyptian Banking Institute sends us a course content booklet and we take notes during the lectures. If we want to know anything, we refer to this booklet that we personally keep because the bank does not officially keep this booklet in its databases. There is no available database which could enable you to access the content of external training programmes, meetings or seminars” (HDB1).

Documenting the findings of direct discussion and negotiations with the customers was another mechanism used by banks to transfer tacit into explicit knowledge. However, this mechanism was limited to corporate customers (companies) and did not apply to individuals. The interviewees who are involved in direct discussion and negotiation with corporate customers confirmed that they usually report all findings in detail to their managers. They explained that their banks have a file for each corporate customer to keep these reports as a record in its file.

“The corporate department usually allocates some representatives from us for consultation with companies regarding related issues. One of the main duties for those is to provide the management with detailed reports about all the discussions

and problems that faced them. For example, we have a file for every company we deal with, this file has the contract, reports for each meeting with its representatives, actually this file is available for each staff who deal with the company and after each meeting the employer provides a report in two copies; one of them to the manager and one attached to its file” (CIB1).

“When the bank is going to fund some project it transfers this to the Investment Trustees Department to negotiate with these companies and to conduct the necessary financial, technical and marketing studies. Based on these studies the decision is made. The keeping and accumulation of such studies provide the bank with great experience about what the successful projects are? Which kind of industries could the bank invest in and what are the surrounding financial, competitive and marketing conditions for each industry?” (NBE2).

In contrast, interviewees who work with individual customers mentioned that their banks did not follow any formal process to document their discussions with those customers. They criticised this ignorance from banks and mentioned that they sometime need to document important customer issues to be available to the management and all staff in order to be aware of any problems which could occur in the future.

“Our bank never asks us to write a report about our discussions with individual customers. It does not have any formal process to document these discussions. It is not good because sometimes the customers highlight some important issues which are necessary to be circulated for all staff not just for tellers themselves to avoid further problems - and this well never happen without documenting these issues and making them available for all” (NBE2).

The above argument highlights some limitations that minimised the benefit of the externalisation process within banks. Externalisation processes were not available either for

the external training programmes and seminars/workshops or for individual customers. For external events, the benefits of discussions conducted at these events are limited to the staff who attend, and similarly the benefits of discussions with individual customers are limited to the tellers. By ignoring the documentation of these discussions banks missed the chance to circulate valuable knowledge to all staff and reduced the benefit of the externalisation process in general. These negative findings support the factor analysis which marked externalisation as the second lowest rank after socialisation in terms of the least important process among all SECI processes in banks (Chapter 5: Table 5-4 and 5-6).

6.3.3 Combination (explicit–explicit)

The combination process could be applied by reformulating explicit knowledge into a clearer and more beneficial form for the bank and its staff. The frequency and percentage distribution (Chapter 5: Table 5-9) showed that the Egyptian banks perform certain activities to implement this process. 88.6% of responses stated that all internal information mentioned in databases, networks and reports are updated and properly classified (80.9%), and considered to support decision making and rules (84.3%); 72.9% of respondents agreed that banks depended on the relevant published research and reports to develop their policies and aims; and 54.3% of the respondents agreed that their banks are keen to collect and reformulate reports issued about external bodies. The interviewees confirmed that Egyptian banks usually use the updated instructions and reports, taken by the top management and the CBE on all relevant issues, to update their databases and then circulate them to staff via emails and periodic reports/bulletins. Also banks are usually keen to translate the relevant managerial and banking studies issued in different languages. Certain departments are

authorised to deal with processes such as the communication, information technology, information service or state service departments.

“The state service department is concerned with such issues, it explores the customers’ opinions about the other banks as competitors – it is responsible for this subject – it is responsible to let us know anything it thinks that is necessary for us, each in his department. For the Central Bank, there is one of our colleagues in the headquarter who holds only our bank transactions with the Central Bank- he sends any instructions from the Central Bank to every one of us to read and to see if they are relevant to our work or not. If there is an article published about the bank, we receive an email from the communications department saying” folks, there is an interview with one senior staff from our bank at (Time/date) to speak about..... in channel, please follow up. And sometimes they email us saying that the bank is going to publish an advertisement in the newspaper page, day..... please wait it. If there is something related to the bank published, they send it to us by email saying this report was published by (Name of the publisher) in (day) page This circulation lets every one of us know anything related to our bank” (UNB2).

“The IT department usually transfers many files from hard copies into electronic versions and uploads them on the web for those who want to have a look. These files are usually related to the financial statements and the bank's policies and training courses and activities being held by the bank, as well as products and services and consultancies offered by the bank. This could happen every three months (BA3).

“....., the monthlybank magazine usually refers to all the related news or reports written about the bank by others e.g. if a study, article, or report referred to our bank., some time they select some international banking studies or consultancy reports and translate them into Arabic. Also, our central library emails us each month with a list of new books that came to the library and asks us if we need some” (AAB2).

However, the interviewees also highlighted two negative points. The first was that reformulating documents into a clearer and more beneficial form was limited to external publications only and did not cover the rules and instructions issued by headquarters and the CBE. For external reports and publications, BM3 stated that “the top management sends the original reports issued by these external agencies to us in different words/forms to be more understandable and beneficial for all”. In contrast, the interviewees mentioned that the rules and instructions issued by headquarters and the CBE are usually sent to staff unchanged and signed by common phrases such as ‘to be implemented’, ‘to be circulated’ or ‘attached’. They believed that the managers at higher levels did not want to take the risk of interpreting these documents. The interviewees criticised this method and said that each staff member therefore interprets the same instructions based on their own point of view and this caused a lot of conflict among the staff, between the staff and their managers and between the staff and customers.

“The instructions normally come to us as ‘based on the instructions of the Central Bank... or the Central Auditing Organisation or the President of the director’s board, it has been decided that.....’.The Central Bank instructions are sent exactly in the same text and signed by the word ‘circulated’.The officials do not like to take the responsibility of a possible erroneous interpretation of these instructions/reports. Therefore, these reports usually are commented as ‘circulated and implemented’ without giving any explanation in order to evade any responsibility. This is wrong, because in some cases we do not understand what is required and then each of us strives to interpret what is required; accordingly, the clash between us could happen. Never any person came and held a meeting to discuss the sent reports and their impact – none did this before” (BC3).

The second point concerned the lack of dealing with reports that refer to competitors. Banks do not follow any formal process to inform staff of these reports. The only thing that can happen is that the staff collect these reports and keep them for themselves. These findings were supported by the quantitative data (Chapter 5: Table 5-9) which showed that only 54.3% of respondents agreed that their banks were keen to collect and reformulate reports issued by external bodies.

“If there was something published about the other banks or major customers, we cannot know officially about it - there is no formal process to inform us. But we can know some of them by chance through our colleagues or customers” (NBD1).

Although banks neither formulated reports and instructions issued by the head offices and CBE nor issued reports about their competitors’ publications, they got substantial benefits from the other combination mechanisms, e.g. the continuous updating of their databases/websites based on the relevant instructions, reports and publications and circulating these updates to all staff via emails and periodic reports/bulletins. These findings underline the importance of the combination process in Egyptian banks and support the factor analysis which ranked combination after internalisation in terms of the most important process among all SECI processes in banks (Chapter 5: Table 5-4 and 5-6).

6.3.4 Internalisation (explicit-tacit)

Both quantitative and qualitative data highlighted that Egyptian banks support particular activities related to the conversion process of explicit knowledge into tacit knowledge. The frequency and percentage distribution (Chapter 5: Table 5-9) showed that almost two-thirds of them agreed that banks in Egypt encourage employees to improve their personal

knowledge by studying relevant courses, by accessing outcomes of training programmes, seminars, databases, and by arranging meetings to explain the content of related reports and documents. A total of 72.1% of respondents thought that all the available information strongly shaped their organisational culture and points of view. In line with these findings, the interviewees mentioned that Egyptian banks allowed their staff to enroll for postgraduate degrees or certain professional courses e.g. credit, customer services, corporate and MBA courses. These courses offered good opportunities to transfer explicit knowledge into tacit knowledge by reading all materials provided such as the handouts, books and any electronic materials. Interviewees mentioned that the success of these programmes depended on whether the bank asked its staff to attend particular programmes in particular places or the staff could choose to attend some programmes to develop themselves. Banks usually strongly support staff to attend practical banking programmes e.g. credit, customer services, corporate and MBA courses by paying the costs of these programmes, providing financial rewards after completion of the course, and by increasing the chances of promotion.

“Our bank funds the non-academic (specialised) sessions. For example, when the bank started to apply the Temenos system, it selected one person from every sector and provided them with a training course for one and a half months to explain how they can use this system, each in his area. After that, those persons were asked to explain to their colleagues how to use this system in order to circulate it to all branches” (UNB1).

“They encourage us to study for an MBA. They fund 50% of the cost - they just accept MBAs conducted by the American University in Cairo. In our bank you have to attend this course in Switzerland or America to be in the top management” (NSG2).

“The bank prefers the specialised courses in banking such as credit, guarantee letters and corporate courses... etc and then they fund you” (CIB1).

Interviewees also mentioned that some banks do not fully support postgraduate degrees e.g. Diploma, MSc or PhD² based on the view that these more academic degrees are not necessary or appropriate for a banking career. However, these banks may have an informal support system, e.g. they may not formally allow staff to leave the bank during working hours to study these courses, but the managers often provide informal permission for a member of staff to leave for two or three hours, if his colleagues are willing to do his job till he comes back. Banks also put other restrictions on their staff, e.g. they should have at least two years of experience before commencing these courses. After getting the degree, banks often just give them a small amount of money as a reward, not more than 300 Egyptian pounds, roughly equal to £34 Sterling, and increase the basic salary by 3%-5%.

“The support of postgraduate programmes in our bank is limited. The bank does not give you the time off, and you have to rely on yourself to find the appropriate time to study, may be after working hours or on the weekend –I have to be in the bank for 5 days per week from 9 am to 5 pm. During my master studies, my strategy was to take a friendly permission from my colleagues to go outside for two or three hours on some days to attend my classes and come back again for the work. After I finished my master, my monthly salary was increased by 6 pounds [£1=9 Egyptian pounds] and I received a check for 300 pounds as a bonus. For the PhD, the system changed as my monthly salary increased by 5% of my basic salary. No formal system for promotion - the promotion system is still based on a seniority basis. We as staff just take these degrees as a refresher for our knowledge” (BM2).

²The Egyptian system of Master and PhD in social science requires studying particular courses in the first year only and after that doing the research from home. You don't need to come to the university regularly. You just come if you need to meet your supervisor or go to the library. There is no office or desk allocated to a PhD student.

“There are no encouragements for academic courses, if you wish to commence them, ok. go, but this is under the conditions: not to affect your job and your formal work hours; there's no financial incentives or study leave. Our bank considers that the extent of your success in doing your job is the standard of your performance assessment” (UNB1).

Although banks do not strongly support these postgraduate programmes, the interviewees highlighted the importance of books, compact disks and handouts as good sources to provide them with updated theories and to support their personal knowledge.

“Sure, I get personnel advantages. I cut off my own and family time to develop myself and not for the bank because it does not provide me with any support. The materials of these programmes provide us with more banking experiences and knowledge. Through these programmes I can develop myself as I cannot work with colleagues who have a higher academic degree than me” (BA3).

However, the interviewees also confirmed that they can easily access all their banks' databases such as the internal reports, documents, instructions, files and websites. They highlighted these databases as important sources to update their knowledge and to fulfill their jobs effectively. They also mentioned that their banks regularly sent emails to all staff to inform them of the updates on all banking issues. They considered that to be aware of these updates is necessary to do their job professionally.

“If I want to know something about the customer, I find all his data is available on my computer. If I want any instruction it is easy to find. Each employee has a file box to save all the related instructions and publications. Each branch has two files, one is input and the second is output to save everything - for example if there is a report sent by the Central Bank on a specific date and I need it, I go to the input file and search the day to find it. In addition, all updates come through emails” (AAB2).

“Yes, all this data is available – if I need a report, I send an email to the Helpdesk or the Information Technology Systems department asking them to send it. Directly, they print and send it to me. They always send us emails with updated issues, events, and reports. Informing us with updates is necessary to be aware of all issues related to your job, so I feel sure when I make any decision” (NBD1).

The arguments above highlight that banks support a considerable range of internalisation mechanisms such as allowing staff to access outcomes of training programmes/seminars and bank’s databases and arranging meetings to explain the content of relevant reports and documents. Banks also support 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 full support did not include the more academic (postgraduate) courses, interviewees still informally attend these courses and get good knowledge from the material of these courses. Therefore on balance these findings show the importance of the internalisation process in Egyptian banks and support the factor analysis which showed that internalisation is the most important process of all SECI processes in banks (Chapter 5: Table 5-4 and 5-6).

6.4 Innovation

6.4.1 Product innovation

As indicated in Chapter 5: Table 5-9, the frequency and percentage distribution showed that the majority of responses reflected that Egyptian banks strongly support product innovation. For example, 88.1% of respondents said that their banks initiate new services based on customers’ needs and market trends and 74.7% thought that their banks introduce new or significantly improved services into the market before competitors. A total of

62.8% of respondents agreed that their banks adopt new/non-traditional solutions to solve problems. The qualitative data provided more details to confirm these findings. The interviewees mentioned that banks depended on internal and external sources to generate new ideas. The external sources were ideas of customers and competitors and the internal sources were ideas of staff and bank management. Interviewees regarded all of these sources to be working comprehensively together. Although external sources were considered to be the most important sources by 16 of the 26 interviewees (nine for customers and seven for competitors), interviewees also emphasised the fact that each bank's management transfers customers' and competitors' ideas to internal sources by doing further analysis, and studies, to develop these ideas to be more valuable for the bank.

Generating new ideas through dealings with customers was thought of highly by the interviewees, who mentioned that taking customers' needs and suggestions into consideration was a guarantee for success. They also stated that customers are the main source to gain information about the other banks and their updates. Interviewees thought that the process of generating ideas starts when customers provide the staff with their own suggestions and with an update of other banks' products/services. Then the staff pass these suggestions and competitors' updates to their bank's management who conducts further analysis and studies to produce improved products/services. Banks usually receive customers' suggestions and ideas through their daily dealings with customers, by inviting them for social gatherings during the month of Ramadan, or by reviewing their feedback regarding the bank's services and products.

“The customer is a main source of getting new ideas. This is because the customer comes to you and tells you what he wants. Accordingly, if you provide the product or the service that the customer needs, this will be a guarantee success. You can provide a new service or product and discover that the customer is not satisfied or your product does not meet the cost or the expected market share, then you actually will lose massive costs. Also he can tell you the advantages of other banks relative to your bank. So I think the customer is the most important source of getting new ideas” (BM1).

“The daily dealings with customers is very beneficial and opens new issues you do not know. For example, when a customer comes to you and says “there is another bank that provides a specific service, could you please provide this service for me?”. Then, we pass this information to the bank’s management who conducts a survey about this service and adds some advantages to be special for our bank” (AAB1).

“Gathering with customers in social meetings is a good opportunity to get new ideas. For example, the head office usually invites some owners of car shops across Egypt and each vice manager and managers of all branches for a special breakfast during the month of Ramadan. This big gathering is a good chance to discuss the problems and suggestions that have been highlighted by those owners” (NBD1).

Some banks also try to benefit from the suggestions of a specific customer segment. This was apparent when ABB2 stated that “the bank lately arranged a competition among students across the Egyptian universities for creating the best ideas and banking products. The first prize was 5000 pounds and the second was 3500 pounds and the third was 2000 pounds”.

Regarding competitors, interviewees considered that other banks' products and services are the stimulus to their own banks' product development. Interviewees know about other banks' updates through their direct dealings with customers and through discussions with their colleagues from these banks in the external training programmes and seminars. If they find out that other banks provide a new service/product which is not yet provided by their own bank, they pass this news to the bank's management who collects further information about this service/product and then develops it to provide a more valuable and advanced service/product. The interviewees also confirmed that NBE and CIB are the major competitors for all banks due to the fact that NBE is so strongly supported by the government and CIB is successful private bank.

“The customers from other banks, specially the NBE are the main sources of getting ideas. The customer comes to us and says that ‘the other banks charge him .002 to collect the cheque and your bank charges .003’. Then, I pass this information to my managers for inquiry. NBE bank is the biggest competitor bank for us, not the other private banks, because the private banks e.g. CIB or NGB just deal with companies and rich people. That is, if I have 10,000 pounds, these banks will not accept a deposit of this small amount. All the people are looking at the NBE as it is supported by the government, so the people feel safe relative to the other banks” (BBE1).

“The competitors are important sources for development and innovation. Other banks' products/services are the mirror that reflects your place in the development. We consider these products/services as a basis to develop and produce the latest. The major competitor for us is CIB. When I deal with a customer, he tells me how the CIB deals with him and what CIB offers. Then, we try to conduct an area study and a profitability analysis for this service and add something special to be more distinctive. For the NBE, it is the strongest competitor, it is considered as the

central bank for the government and the government strongly supports the public banks [e. g. at least 75% of the public companies' deposits must be invested in the public banks]. However, NBE can compete with me just in the deposits, certificates such as the platinum certificate, we produce a similar one called the pentagon certificate. NBE cannot compete with us in some products such as the auto loom or in the quality of service. For example, in our bank you can access your bank account if you are outside Egypt and you can transfer money to any place through USB [Internet banking], and this service is not available in the NBE, it just provides the service to check your account online but you cannot do any further transactions”(NGS2).

For internal sources, the interviewees confirmed that their bank's management conducted further studies and analysis to develop the external ideas coming from customers and competitors and to transfer these ideas into internal products/services. Interviewees mentioned that there was no specific unit or department to deal with innovation issues. Each department had its own strategy for the generation, development and collection of ideas in a special file or a think tank.

“Every department, separately, manages its own innovation issues inside the department. That is, every department has a file for its own ideas related to its field. For example, the training department has its own ideas related to developing the training process and information technology (IT) department has its own ideas related to developing the technological processes inside the bank” (CIB2).

“If I have an idea, I send it to the specialised department. If it is related to deposits, I send it to the deposits department. If it is related to credit, I send it to the credit department and so on” (NBD1).

Regarding staff suggestions, the interviewees stated that if the management asked formally their staff to submit their suggestions/ideas regarding particular issues, then the

management deals seriously with these suggestions and rewards staff with valuable prizes and higher jobs.

“Sometimes the top management sends us an email and says that ‘we are planning to produce a new product related to one issue, please if you have any suggestions or new ideas send them to us’. Also, they sometimes arrange a competition to select the best name of one product planned to produce and they give the winners financial prizes. For example, last year, they allocated 2000 pounds as a prize for the person who created the best name for the new car loans policy” (BC1).

“The bank told us, as branch managers, that ‘the head office is planning to establish a new ATM in our city’ and asked us to advise the proper place in this city to put this machine. Then, we asked our staff and explored their suggestions regarding this issue and accordingly we sent their opinions to the head office. This is because we are the only ones who know every place in this city” (NBD1).

“When any member of staff participates to develop any product, his name becomes well known to all the branches as well as the HRM and product development departments. Sometimes they advertise that they need head officers or branch managers for new branches. Then our managers nominate the people who created something before. We have a branch manager who is just 32 years old, all of these are incentives” (AAB2)

“We have one friend who created a new container called ‘EL-Ahly for companies’. The bank rewarded him and published his name and granted him a certificate of appreciation” (NBE5).

However, interviewees also pointed out that generally their banks do not deal seriously with suggestions that the staff volunteer. They stated that when they send their own suggestions or ideas to their manager, most of the time they do not receive a positive reply.

These findings explain why only half of the questionnaire participants (Table 5-9 in Chapter 5) agreed that their banks follow formal processes to generate and nurture new ideas.

“We send our suggestions by email to our managers who may reply or not. They usually do not accept our suggestions. They need something formal from a higher level of management to take our suggestions seriously” (BBE1).

“The only available way is to send our suggestions to the top management directly, in particular, the technical office which is a substitute for the senior principal office. His office usually ignores our suggestions and rarely asks for further explanations” (BC3).

Therefore, the statements above show that banks were on the whole alert to feedback on product innovation. They dealt seriously with ideas coming from customers and competitors and used them as a basis to develop new banking products/services. The same happened with ideas that the staff were asked to produce but not with ideas that the staff volunteered.

- **Examples of recent banking products**

The interviewees identified many new products or services introduced to customers in the last five years. One of the comments stated that “As we are a developing country; the market is still open and can accommodate a lot of products” (BM3). These services and products can be divided into six types. Firstly, Master and Visa cards which enable people to use credit or debit cards to buy goods or services through the internet. Secondly, the retail banking service which creates banking services for a specific segment of customers such as the academic staff at a university, doctors in hospitals, staff working for the police,

or students as well as services for specific age groups such as under 16s or over 50s. Retail banking also provides loans for specific purchases such as cars or real estate. Thirdly, corporate banking which deals mainly with companies. It sets different minimum and maximum loan allowances and also the interest rate. Fourthly, the small and medium enterprises (SMEs) banking service, which is the newest service that some banks e.g. NGB and CIB provide. Fifthly, the provision of certain financial consultations such as investment and feasibility studies for companies. And sixthly, the provision of particular Islamic products such as Visa Hajj and Omra, produced by the Islamic branch of MB, and Murabaha (cost-plus profit), Mudharaba (profit sharing) and Musharakah (profit and loss sharing), produced by the Islamic branch in of NBD. Table 6-2 includes examples of the banking products/services mentioned by the interviewees for each bank.

Table6-2: Examples of Egyptian banking products/services produced in the last five years

Bank	products
National Bank of Egypt (NBE)	NBE Diners Club, Amulet-Advantage Master Card, Certificates' Credit Card, Golden Master Card, Internet Card, Instalment Card, Gold MasterCard Egypt Air, Premium Card, Sun Card, NBE's Affinity Card, Payroll Card, City Stars Card, Youth Card, the Platinum certificate, pentagonal certificate. Retail banking, online banking service, paying bills.
Banque du Misr (BM)	Visa Hajj and Omra, Plastic Cards, MB youth Visa, Retail Banking, BM card, internet card, Gift card, Misr club cards, Educational loans- banc assurance programmes: education programme, future programme, protection programme and safety programme, online banking service.
Banque du Cairo (BC)	Retail banking, Golden Card, Corporate loans, Visa international credit cards, silver and gold, Master card international credit cards, silver and gold. MasterCard international direct debit cards and MasterCard international salary cards. Loans for government, public sector companies, loans for private sector employees, and Micro-finance programme
Bank of Alexandria (BA)	Retail banking, gold card, plastic cards, family cards, loan for government staff- raising the loan ceiling for government staff.
Housing & Development Bank (HDB)	My salary Card, Premium card, master card, my money card, trustees of investment services, investment and feasibility studies, and family cards.
Union National Bank (UNB)	Retail banking in particular for the General Authority for Drinking Water and Sanitation, police and, funding the educational programmes of schools and universities students, Rice loans.
Arab African International Bank (AAB)	SMS alert service, retail banking, 4 U visa prepaid card, visa smart cart, ATM card, visa mini card, Health & life style Visa Card. Green pearls, Emerald certificates. Shield mutual fund, Juman Money market fund, corporate and restructure funds.
Commercial International Bank (CIB)	Retail banking, premier card, institutional banking (corporate, structured finance), SME banking, women banking, A world of discount card, Pos machines, prepaid cards, ART promotion, internet banking and corporate e-payroll.
Nationale Societe General Bank (NSG)	Retail banking, SMEs banking, premier card, restructuring finance for companies.
Suez Canal Bank (SCB)	MasterCard, Visa Card and ATM Card.
Barclays Bank-Egypt (BBE)	Alico Healthcare Card, premier life and latitude club, premier league card, classic card, gold car, overdrafts, short term loans, investment banking, personal loan and premier loan. Premier banking (privilege, platinum card and premier life).
National Bank for Development-Islamic branch (NBD)	Islamic products: Murabaha (cost-plus profit); Mudharaba (profit sharing); Musharakah (profit and loss sharing).

6.4.2 Process innovation

As mentioned in the frequency and percentage distribution (Chapter 5: Table 5-9), respondents stated that their banks have made several improvements to their structure, practices and management techniques (75.8%), have introduced more developed and distinctive strategies to manage their processes in comparison with competitors' strategies (74.3%) and have followed formal processes to keep on improving customer service (73.8%). They agreed that Egyptian banks adopt new/non-traditional marketing strategies (70.9%), track relevant research studies to improve banks' processes (64.3%) and follow flexible management strategies to deal with unexpected changes (62.1%). These findings are now explained in more detail through the qualitative data and suggest that there has been a recent surge in the pace and level at which process innovation has occurred. The interviewees confirmed that Egyptian banks implemented considerable process innovations, both administrative and technological. The administrative innovations include establishing new branches, providing more facilities in the waiting halls, creating new posts and establishing new or improving the existing departments. They also focused on a change in management style as most of the transactions now have to be approved by the head office, not just the branches. These improvements reduce the work load of staff and enhance customers' ability to access their services easily.

“We have some posts that appeared in recent years such as customer service manager in the head office and a general manager for all branches. Also, the bank divided the branches based on the region and divided some departments into small units e.g. budget, planning and financial issues departments. Furthermore, the new thing we have is that it is not acceptable for any customer to have more than one account number in our bank. That is, you will have the same account number even if you have different accounts. For example, if you already have a current account

in Tanta city and your account number is 307 [referring to the code of this city] and you need to open a saving account in Aswan city, the banker checks your ID details and he will not give you a new account number (referring to Aswan code). But he will keep your current account number [which includes the Tanta code] the same and just will add a slash and a simple number for it to be for example 307/3 and so on” (BA1).

“We have new branches. In the past, there were just eleven branches but over the last three years this number increased to 23 branches distributed across the country. There are also new departments such as communication, training and development and IT. Besides, the bank divided the credit and goods follow-up department into two departments, one is the managerial credit issues department and the other is the goods issue department. This reflects to what extent the bank increased its activities” (UNB2).

In line with the technological revolution in IT that took place in Egypt at the beginning of 2005 with a prime minister (Prof. Ahmed Nazeif) from an IT background, Egyptian banks had a large share in these developments and have implemented many technological innovations in their operations. The major new technologies were establishing internet and intranet networks, which in turn encouraged banks to apply new banking software such as Temenos, Alex-cube, Tokay and Globus systems to all of its operations, including to processes such as printers and photocopiers. These improvements affected the banking system positively by speeding up procedures and facilitating the dissemination of information/reports amongst the staff. Banks also used these technologies to increase their customer service facilities such as electronic signatures, online banking and the queuing system.

“There is now the internet and the internet phone server (IP) that shows the caller’s name for any incoming call. In the past we were writing and counting the certificates manually but now we no longer do this because we use computers for everything; computers make it very easy. Now we have an electronic copy for every certificate and form, we just click print and select the number of copies we wish to print. Also, any reports or instructions are no longer sent by post but they are now sent through emails” (NBE3).

“Frankly, the most beneficial thing we adopted was the internet. This is because the internet is a massive database that helps the staff to know a variety of information about the bank, customers, competitors and related national or international issues. Also, the intranet network facilitated the communication process, speeded up the decision making process and helped to find any rules and reports in a second, as everything is already saved there. Besides, the bank paid five million Egyptian pounds to purchase a new Indian system/software, called Alex-cube. This system enables the staff to check customers’ files if required from any place in Egypt. It also shows the instant banking transactions done in all branches” (BM1).

“The new thing is developing the banking system. In the past we were doing the transaction in fifteen minutes but now the same transaction just takes five minutes. In the past there were many spaces in the form you had to fill in by hand, or when I was wanting to tie a deposit I was required to do a value date and mutuality date for it; these were needing a lot of time. But now everything is automatically done by Tokay system” (CIB1).

Both administrative and technological innovations support banks to be more customer focused. The frequency and percentage distribution in Chapter 5: Table 5-9 showed that 95.7% of respondents were convinced that their banks produced new facilities to improve customers’ access for available products and services. Also, 89.5% of participants said that Egyptian banks currently apply new technologies and software to add new services and

improve the quality of current services. The qualitative data confirmed these findings. Banks focus on using tools that provide access to customer services easily and speedily. The benefits of innovative administration, e.g. establishing more branches, movable branches and more ATMs, made it is easier for customers to get their service from the nearest place and reduce the waiting queues. Also, offering comprehensive tellers in banks enabled customers to get their services easily and speedily and supplying the waiting halls with more facilities such as water coolers and air--conditioning made customers feel more comfortable and appreciated by their bank.

“We have a moveable bank that has the same facilities that exist in the normal branches. This bank has qualified staff to achieve all the banking transactions e.g. withdrawing and depositing money, collecting cheques and paying salaries. Maybe there is a moveable bank every month in front of one company which has a big deal with our bank, instead of forcing the employees to go to the branches to get their salaries. In addition, our bank increased the number of the ATMs to 400 machines. In our city [Dumyat] there was just one machine but now we have four. Moreover, the bank extended the working hours till 10 pm in some branches for currency exchange transactions. Currently, the bank is planning to divide the current customers into groups, 50 customers each, and allocate one staff for each group. These staff will work as a banking consultant for any banking inquiries e.g. how to open a new account, to purchase certificates, or how to use online banking” (NBE3).

“In the past there was just one teller allocated for one kind of transaction e.g. one teller for investment certificates and one for transfers and cheques. But now the policy is different, there is a comprehensive teller who is qualified to achieve all the expected transactions the customer needs. The customer no longer needs to deal with more than one teller to get his service. For marketing issues, the bank now asks every teller to promote the other banking products while serving the customer.

Also, we have contract staff who usually call the customers to promote our products” (NBE5).

Regarding the technological innovations’ benefits, using banking systems such as Temenos, Alex-cube or Globus enables customers to get their service from any branch anywhere in the country. Establishing call centres inside banks enabled customers to be in touch with their bank at any time, 24 hours/day and seven days/week. Also, banks added more facilities to ATMs to enable customers to do further transactions on their accounts such as transferring and depositing money. Also using the queuing system for banks enabled them to know the average number of transactions per day and accordingly to identify the proper number of tellers in order to reduce the waiting time of customers. Recently, a few banks such as NBE and ABB established electronic branches at particular places to enable customers to get their needs easily. Although providing online banking gives customers the opportunity to check their account at any place or time, there are some barriers for banks and customers to overcome in order to benefit completely from this technology. Online banking is still at the infant stage in Egypt and neither banks nor customers are completely sure of its security level. Therefore, only six banks (NBE, BM, UNB, AAB, CIB and NSG) provide their customers with the facility of checking transactions and their balance online but also post them a monthly paper report reflecting these transactions, while the rest of the banks do not supply online banking and depend entirely on the monthly paper report.

“Our bank’s policy is to serve customers in a shorter time and to decrease the service waiting list. So we recently applied the queuing system that shows all transactions achieved per day and length of each transaction. We have a record of how many customers deal with our branch every day. Based on this record we

select the proper number of tellers to reduce the waiting time for customers” (BBE1).

“There is also online banking but just to check your account, not more, as this system is still new in Egypt and the banks are not completely sure regarding the effectiveness of the security level of this system” (BA3).

The statements above show that Egyptian banks implemented considerable innovations that enabled them to develop their processes and be customer driven. The major administrative innovations were establishing new branches and departments, increasing the number of ATMs and establishing moveable branches. The majority of these innovations enable customer to access the service more easily rather than to develop banking processes. The major technological innovations were implementing professional banking systems, the internet, the intranet and automation. These innovations were widely used to develop banking processes and to enable customers to access services more easily. However, Egyptian banks still need to maximise the benefits of these technologies to be more customer oriented. As mentioned before, banking technologies in Egypt are still in its early stages and the majority of customers still need more time to use some of its applications such as online banking and electronic branches. Table 6-3 provides examples of process innovations achieved by each bank recently.

Table 6-3: examples of process innovation achieved recently by the Egyptian banks

Bank	Administrative	Technological	Customer orientation
National Bank of Egypt (NBE)	<ul style="list-style-type: none"> -New branches. -Restructuring the current departments e.g. HRM, CRM, commitment, developing department, system department, Anti-money laundering department, operating risks department, IT, real estate marketing department and health care department. -Specialisation and dividing departments into smaller units. - More centralisation and less decentralisation. -Salaries restructured. 	<ul style="list-style-type: none"> - The internet, the intranet. -Temenos banking software, - Internet phone service (IP), personal email and the electronic signature. - Automation of printing statements, receipts and documents. 	<ul style="list-style-type: none"> - Mobile banking, E-banking- electronic branches, call centres, increasing number of ATM, increasing the options in ATM. -A comprehensive teller to do all the transactions for the customer. -Conducting contracts with private speed post service company e.g. DHL rather than the public posts to deliver the post fast. -Dividing the customers into groups and appointing a banking consultant for each group to recommend them regarding the proper services and products and advertising the banking products. -Extending the opening time in some branches for exchanging currency and some transactions. Queuing system, outdoor staff for marketing. -Improving the waiting hall and supporting it with more facilities e.g. chillers, vans and cold water. - Inviting some customer to join the bank in social events such as Ramadan breakfast.
Banque du Misr (BM)	<ul style="list-style-type: none"> -New branches. -New departments such as the real estate marketing, foreign transactions, systems, computer departments. -Trend toward centralisation by merging some branches' operations as a one region's operation. -Hiring banking experts from outside the bank. 	<ul style="list-style-type: none"> - Automation for printing (no handwritten documents, all are printed), using computers for all processes. -The intranet, the internet and emails. -Alex-cube banking software. 	<ul style="list-style-type: none"> -Issuing ATM card to all bank customers. -The promotion for other products during serving the customers. -Reducing the minimum limit for opening new accounts. -Advertisements in the Television and the roads, contract representatives for promoting banking products for customers. -Online banking. -Reducing the procedures to decrease the duration of serving customers.
Banque du Cairo (BC)	<ul style="list-style-type: none"> -New departments such as the transferring, Swift department, senior customers, banking commitments, money laundering department and loans units for small and micro projects. 	<ul style="list-style-type: none"> -Alex-cube banking software. -Improving the internal communication network. 	<ul style="list-style-type: none"> -Visiting for the premier customers. -Inviting the customers for Ramadan breakfast -The promotion of other products serving the customers -Outdoor staff for promoting the bank's products -Decreasing the banking fairs. -Increasing the number of tellers to reduce the waiting time for the customers.

Bank of Alexandria (BA)	-New posts such as customer manager in the central office and general manager for all branches. -Dividing some departments such as budget, planning and financial issues departments. -New branches.	-The automation and computer systems. -The internet and intranet.	-Decreasing the loans' guarantees. -Contract staff for promoting the bank's products. -The promotion for other products during serving the customers. -Increasing the number of tellers to decrease the time of serving customer. -Extending the time of exchanging currency till 10 pm. -Adding more options in the ATM e.g. depositing money.
Housing & Development Bank (HDB)	-New branches. -Updating the current banking systems.	-New technical machines e.g. computers, printers, photocopy machine etc.	- Increasing the numbers of ATMs in many cities. -Improving the waiting halls. - Increasing the facilities to fund the customers' projects.
Union National Bank (UNB)	- 12 new branches in the last 3 years. -New departments such as communication, treasury, training and developing and IT and renamed the credit & goods follow-up department into the department of managerial credit issues.	-Temenos banking software.	-Inviting some customer for Ramadan breakfast and discussing their problem and suggestions. -Meetings with the current and expected customers to promote the bank's products. -Online banking. -Dividing the customers into groups and allocating one staff to deal with each group. -Adding more options in the ATM e.g. depositing money.
Arab-African International Bank (AAB)	-New departments such as: product development, retail marketing, pay roll and IT. -Dividing all the banking processes into retail and corporate banking.	-Continues updating for bank computer software.	- Sending a representative to get the assignment of owner companies' customers instead of coming to the bank. -Online banking. -Automatic branches depending on the ATM machines e.g. Alexandria Automatic -branch in Zezenia area. -Movable branches focus on the tourist places
Commercial International Bank (CIB)	-New departments such as Total quality management (TQM). -New scientific techniques to evaluate the customer and product such as: the profitability and SWOT analyses.	-Tokey banking software.	-Dividing the customers into different segments and suggesting the proper product for each segment. -Calling the customers for to ask them about their feedback regarding the bank products, services. - Internet banking. -Sending SMS for customers to confirm every transaction they have done.
Nationale Societe General Bank (NSG)	-New departments such as Total quality management (TQM).	-Updating of current banking software. -New software for analysis methods such as ROI, and profitability for each staff.	-Dividing the customers into different segments and allocating a banking consultant per each segment. - Adding more options to the ATM e.g. depositing money. - Surveying customer satisfaction. - Call centre to receive the customers' feedback and suggestions.

			<ul style="list-style-type: none"> - Sending SMS for customers to promote new products and to confirm the transactions achieved.
Suez Canal Bank (SCB)		<ul style="list-style-type: none"> -The internet, the intranet and emails. -Automation for the printed documents. -Globus banking software. 	<ul style="list-style-type: none"> - Some presents such as diaries, calendars etc. - Increasing the numbers of ATM in different cities.
Barclays Bank-Egypt (BBE)	<ul style="list-style-type: none"> -New departments such as operations, systems, customers service department. - New branch e.g. Kafir- Elshekh branch. -Hiring regional manager for each department such as the West Delta Region manager for operations and the West Delta manager for customer service. -Trend toward centralisation. 	<ul style="list-style-type: none"> -The internet, the intranet and emails. -Updating current banking software. 	<ul style="list-style-type: none"> -Call centre (166222) for customer feedback 24 hours/day. -Adding more options to the ATM e.g. depositing money -Increasing the number of ATM. - Establishing the queuing system. - Reducing the procedures to decrease the time of customers' serving.
National Bank for Development-Islamic branch (NBD)	<ul style="list-style-type: none"> -Two new branches. -Trend toward centralisation. -The centralisation of processes (doing any transaction from any branch). 	<ul style="list-style-type: none"> -The internet, the intranet and emails. -Automation such as printers and photocopy machines. 	<ul style="list-style-type: none"> -Ramadan breakfast for car loan customers -Surveying 10 cars' customers about their feedback every six months. -Advertisements and promotions such as diaries and calendars. -Increasing the numbers of ATMs in many cities. -The customers can do any transaction related to their account from any branch. - Improving the relationship with the care sellers.

6.5 The relationship between SECI and innovation

In Chapter 5, the factor analysis results did not distinguish between product and process innovation as it loaded them both as one factor labeled innovation (Table 5-7). The regression findings (Table 5-11) also showed that the SECI processes whether separate or as a whole, positively influenced the innovation process within Egyptian banks and that approximately 73% of innovative behaviour was due to SECI processes. These findings were confirmed by the interviewees who did not differentiate between product and process innovation and thought that the effect of SECI on innovation is reflected in the process of generating ideas related to services, products and processes. They supposed that their role was confined to producing new ideas and the top management was the body in charge of implementing these ideas after further analysis. The following part discusses the relationship between each of the SECI processes and innovation in more detail.

6.5.1 Socialisation and innovation

The interviewees explained that the discussions between themselves and with their managers taking place in workshops, training programmes or bank halls, or through social events such as Ramadan breakfast gatherings, give all bank staff the chance to share their knowledge, to help solve problems and to improve their bank's processes and services. They also stated that their discussions with 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 suggest new ideas related to their

bank's products, services and processes. Interviewees also confirmed that the discussions between them and the internal and external experts provided them with the knowledge to deal with different situations and to introduce constructive ideas to enhance the bank's performance. Finally, their discussions with customers through daily dealings and in social meetings, such as Ramadan breakfast, allowed them to feedback suggestions to improve their bank's performance. However, the negative feedback which were given regarding the benefits of sharing knowledge with academic experts and the lack of applying personnel rotation and of supporting informal interactions limit the ability to solve problems.

“Sharing experiences among the staff with each other and with their managers helps us to deal with problems. When one employer faces a problem, he usually asks his colleagues for advice. For example, the waiting queue of customers in the front of each teller in our branch was too long. This led the staff to discuss this problem with their managers. Based on this discussion the branch manager decided to increase the number of tellers” (NBE5).

“The personnel rotation is very helpful and provides a good knowledge that gives you the confidence to follow your initiative to deal with daily work issues. Sharing knowledge makes our job easily done. The external discussion usually highlights new services and products required by customers and shortage points the bank should cover. But unfortunately, there is lack of applying the personnel rotation and in supporting the informal dialogue between us, which limits the chance to find someone you trust and has enough experience in your job can help in suggesting valuable solutions for work problems ” (BA3).

“Sharing knowledge during the training programmes/seminars provides the basics for developing products, services, and processes. In order to produce something new, it is necessary to be aware of what the current products in the market are? And what does the customer need? You can know these through training programmes which are conducted by the Egyptian Banking Institute. In these programmes you meet other bankers from different banks and you can know what is new that their banks provide for customers and what new systems they apply, based on that you can build your ideas to innovate, but some academic training is useless and do not add value. Also, the external discussion with customers and external organisations provide you with what your bank needs in terms of the development in its processes, products and services”(BM2).

6.5.2 Externalisation and innovation

The interviewees confirmed that documenting the findings of discussions with internal and external bodies is the basis for generating ideas. These documents provide the necessary data and information on which to build new ideas. They were also considered as valuable memory aids that enabled staff to recall anything from the past. Documents were also seen as an indicator of the latest innovations and the starting point of new products.

“The documentation of knowledge is the scientific basis for building ideas and proposals. This process is considered as a tangible memory where we could store the experiences to use them in case of need. For example, our bank usually documents the ideas initiated during internal seminars and training programmes to solve problems or to develop policies and it returns to these ideas to develop our policies” (BC1).

“This documentation is very important as references. We can refer to these data any time we need. Documenting valuable discussions is a scientific basis for building ideas and suggestions. For example; there was a complaint from some clients that the bank’s statements did not mention the client’s name. We reported this to our managers who automatically added the client’s name to statements” (NGS2).

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

“What we can do is just generate ideas but we do not have any authority to force the management to implement these ideas. Documenting knowledge is very important in work, for example, in the operation activities, there is a manual that contains all information related to how to open the treasury in the beginning of the working hours and how to close it at the end of the day. Any time you do not remember these procedures, the guide helps you” (BBE1).

Interviewees, as mentioned above in Section 6.3.2, consider that by ignoring the documentation of these discussions banks missed the chance to circulate valuable knowledge and so were less aware of any problems which could occur in the future and the suggested solutions.

“Our bank never asks us to write a report about our discussions with individual customers.It is not good because sometimes the customers highlight some important issues which are necessary to be circulated for all staff not just for tellers themselves to avoid further problems - and this well never happen without documenting these issues and making them available for all” (NBE2).

6.5.3 Combination and innovation

The interviewees suggested that updating them continuously by relevant reports and publications is necessary to complete their daily work and to revise their knowledge. They opined that updating knowledge is the first step in innovation as it is difficult to generate new ideas if you depend on old reports. They also highlighted that the reports issued about competitors' performance are used as a basis to develop their bank's products and processes.

“The continuous updating of information makes me updated for all surrounding, where our bank stands, and what kind of products and services or processes should be developed. All of these are the basis of generating ideas and innovation” (CIB).

“I, personally, was asked to do a study about the ten largest banks in Egypt working in retail banking [in particular, two types of retail: personal and car loans]. I conducted the study and sent it to the management which passed the results to more competent staff for further advanced studies and they began to generate new products which were different and distinct in relation to similar products in rival banks” (UNB1).

6.5.4 Internalisation and innovation

The interviewees explained that the reading of training group and seminar findings or postgraduate materials provided them with new knowledge and gave them the chance to be aware of scientific and professional updates. This helped them to develop their skills and to look at problems philosophically and with an open mind which enabled them to produce innovative solutions. The interviewees also mentioned that reviewing the

published reports from competitors provided good opportunities to learn how they think and what they produce and accordingly suggest new ideas and products. They also revealed that the easy access to their banks' databases enabled them to be aware of all related issues and thus produce valuable ideas to improve their banks' performance.

“Postgraduate studies make my thinking differently. During these studies they asked us to search out new banking topics that have not been done before and this helps us to find new ideas. The more you read, the more you develop yourself, the more development of the whole staff's thinking. Then the bank's vision will be developed and will look forward to continuous development and improvement. Also, the more availability of the bank's database to access the more experience the staff get to introduce innovative solutions for problems” (BC2).

“Reading more banking information makes me aware of how to solve problems. When you go outside your workplace, you will learn additional things, and you will come back to develop your bank and like the change. Notice one member of staff is sitting on his desk every day and doing the same job and is meeting the same people, if you say to him we will provide you with new technology or to ask them to leave his desk, he will refuse and resist these because he puts himself in the corner zone without any updates” (AAB2).

“The development of products sometimes comes from the market. But when you read news or see advertisements about a new product you should not imitate it, but you should add to it. The training/seminars materials and the bank databases are used as bases for building ideas and for developing proper banking policies” (UNB1).

“None of us had any banking experience at the beginning of working in banks. Later, the difference between us is based on the amount of experience and training programmes offered by the bank you work in. In this sense, it is possible to find two colleagues who graduated in the same year and were hired by two different banks, one of them developed and provides all tools to support its staff knowledge and the other bank is ordinary. Sure, the employee who works in the first bank will have more experience relative to his colleague and accordingly he will contribute in developing his bank performance” (AAB1).

Although both quantitative and qualitative findings confirmed that each SECI process positively affects the innovation process, the regression analysis highlighted that the effect of each process is different. Table 5-12 in Chapter 5 showed that the socialisation process had the lowest effect on innovation (7.2%). These findings were confirmed by factor analysis (Chapter 5: Table 5-4 and 5-5) which showed that the socialisation process had the lowest share of importance among all SECI processes. As noted above the interviewees suggested some limitations that minimised the importance of socialisation in banks including the bias of applying the personnel rotation policy, the limited number of social meetings and the lack of more academic training programmes. Next in line was the externalisation process, holding the second lowest rank with an influence share on innovation of 8.5%. The interviewees stated that the externalisation process was available neither for discussions of external training programmes and seminars nor for individual customers’ suggestions and accordingly these limitations minimised the benefit of this process. In contrast, the quantitative findings showed that internalisation and combination were the most important processes of SECI and

accordingly they had a higher effect on innovation (32% and 25% respectively). In line with these findings the interviewees appreciated their banks' effort regarding these processes but would like more formal support for postgraduate degrees and a clear interpretation of the CBE's instructions to maximise the benefits of these processes.

6.6 Conclusion

This chapter discussed the findings of the qualitative data based on 26 interviewees in order to strengthen and expand the quantitative findings and explain in more detail how the Egyptian banks perform the SECI and innovation activities. In terms of the socialisation process, the interviewees talked about how their banks gave them the chance to be involved in face to face discussions by working in open halls and not in closed rooms, the training programmes/seminars, the daily dealings with customers. They also mentioned some important limitations regarding personnel rotation and academic programmes and social meetings mechanisms that considerably reduced the benefits of socialisation. Next, the interviewees explained how their banks transferred tacit into explicit knowledge and the formal and informal processes to achieve that. However, they highlighted that the externalisation mechanism was not available for external training programmes and events, and this minimised the benefits of externalisation in banks. Next, the interviewees detailed the process of reformulating and classifying related reports and publications and updating banks' databases to be more useful. They also explained how their banks worked to support the process of transferring explicit into tacit knowledge to support their staff skills. The interviewees

did not suggest major limitations regarding the combination and internalisation processes, therefore banks got high benefits from both.

Regarding product innovation, the interviewees referred to customers, competitors and staff as the main sources for generating new ideas and they highlighted how the bank's management dealt with these ideas. Next, the interviewees presented some examples of recent banking products and services such as Master and Visa cards, retail, corporate, SME and Islamic banking. They also drew attention to the fact that process innovation produced administrative and technological innovations which encouraged Egyptian banks to develop their processes and to be more 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. This technology also enabled banks to produce new products/services for customers like ATM cards, internet cards, electronic branches and signatures and online banking. IT technology enabled banks to develop their processes by applying advanced banking software/systems such as Temenos, Globus, Alex-cube and Tokay.

With regard to the relationship between SECI and innovation, the interviewees opined that the effect of SECI on innovation is reflected in the generation of new ideas related to banking services, products and processes. Finally, the chapter discussed how each SECI process affects the innovation process and why socialisation and externalisation

processes have a lower effect on innovation than combination and internalisation. Egyptian banks should work hard to maximise the benefits of both socialisation and externalisation processes and maximise their positive effects on innovation. Banks should deal seriously with the negative points highlighted by the interviewees regarding the whole SECI process and particularly the socialisation and externalisation processes.

Chapter 7

Discussion

The quantitative and qualitative data analyses in Chapters 5 and 6 presented the results obtained from the survey and interviews, together with triangulation between data sources also done in Chapter 6. The research findings will be discussed in this chapter to ascertain how these can contribute to KM, the SECI model and the innovation debate. The findings are discussed in the context of wider comparisons with the literature discussed in Chapter 2 and 3. This chapter also suggests implications for the effective working of banks in terms of SECI patterns. In this sense, the findings are discussed in relation to the SECI framework and its implications in different cultural and business contexts. The role of leadership in using this model for enhancing innovation is explained. Related issues to innovation are also arisen e.g. novelty of innovation and its relation to technology.

The chapter discusses first the aspects of using the SECI model in Egyptian banks, providing further analysis and interpretation for the strengths and limitations of using each process of SECI and the model as a whole. Next, aspects of product and process innovations achieved by banks in recent years are discussed, and which of these innovations were radical-incremental or administrative-technological. This is followed by an examination of the relationship between each process of SECI and innovation in Egyptian banking and its application to other business contexts.

7.1 Aspects of the SECI model in the Egyptian banking industry

As indicated in Chapter 5, Section 5.4.1, the factor analysis divided knowledge conversion activities in the Egyptian banks into four valid groups/processes, namely internalisation, combination, externalisation and socialisation. Therefore, it can be concluded that the four processes of the SECI model are confirmed as modes of knowledge conversion that were all in use in the Egyptian banks (although not all to the same degree).

7.1.1 Socialisation (tacit-tacit)

The transfer of tacit knowledge from person to person is achieved in Egyptian banks through discussions conducted in formal meetings, seminars and training programmes. It is also done by involving staff in a personnel rotation process across departments/branches and in discussions with external bodies e.g. co-operatives, competitors, the Central Bank of Egypt, and customers. This was similar to the majority of Japanese banks which used personal social networks, in-house training and job rotation to share knowledge (Kubo et al., 2001).

As people in the Arab world are part of a collective, rather than individualist society (Hofstede and Hofstede, 2005), it is natural for them to socialise in the workplace (Weir and Hutachings, 2005). But banks regard most informal dialogue as being focused on personal and social interactions rather than being work related, and hence managers are reluctant to allow uncontrolled socialisation. This reluctance tends to reflect the high

power distance of the Egyptian community, where managers have strong authority over their employees (Hofstede and Hofstede, 2005). Informal discussions in support of willingness to share knowledge and necessary to build trust between staff may be limited (von Krogh et al., 2012). Employees stated (see Chapter 6, Section 6.3.1) that sharing knowledge in Egyptian banks is more formal and based on the mutual benefit of helping each other out, but not so much on opportunities for friendly communications (AAB1 and CIB 1).

Banks have implemented external and internal training programmes and workshops to enhance knowledge sharing. Through these programmes, employees gain more experience, by face-to-face discussions with colleagues from either different banks or different departments, and with banking executive and academic experts. Employees, for example, can learn how to deal properly with customers, new banking practices and theories. However, it was found that professional training is more beneficial than academic instruction to transmit the latest banking applications. Employees stated that some academic training programmes were useful and provided them with the relevant academic theories, but that the majority of them were not related to the latest banking applications. In contrast, they mentioned that professional training was important to discuss banking problems and related issues and to obtain good recommendations from professional trainers.

Applying personnel rotation across department/branches, as a mechanism of enhancing face-to-face discussions, has also some limitations related to the rotation period and the nature of the job. There is no clear policy for applying personnel rotation in Egyptian banks. The high power distance of banking managers gives them full authority to determine the rotation period and to select the person and the job that can be rotated. Accordingly, these limitations have minimised the benefits of this mechanism. The findings indicated that this lack of personnel rotation minimised the opportunities of gaining more knowledge about other banking jobs and of sharing knowledge with other staff from different departments and branches.

As well as between staff, face-to-face discussions with customers are important to create and share knowledge (Nonaka and Takeuchi, 1995). While working in branches allows bankers to conduct daily face-to-face discussions with customers, Egyptian banks also have contract bankers who continuously contact customers. Conducting business discussions in a social context with customers outside the workplace was limited, but in contrast, there were continuous formal discussions with the regulators' representatives from the Central Bank of Egypt and the Central Auditing Agency and with the companies that ask banks to provide consultation services such as feasibility studies, area studies, etc. This suggests that banks in Egypt support formal over informal discussions.

In summary, although people in the Arab world tend to socialise more, the findings revealed limitations that minimised the benefit of the socialisation process. Negative feedback was received regarding the benefit of sharing knowledge in academic training programmes/seminars, applying personnel rotation, and supporting informal discussions. The benefit of sharing knowledge between staff and customers in more social settings was also limited due to the small number of meetings, and the limited number of staff and customers who are invited to these meetings. The arrangements of practice-based sharing (e.g. social spaces, lunchtime meetings etc) were also very limited, and certainly there was no evidence of anything similar to communities of practice which have required ongoing interaction in specific problem-related groups (Section 6.3.1). All these limitations support the factor analysis findings (Chapter 5, Section 5.4.1) which marked socialisation as the least important process among all the SECI processes in banks.

7.1.2 Externalisation (tacit-explicit)

In Egyptian banks, experts' knowledge is made explicit through the participation of setting the topics and contents of training programmes/seminars. Banks also transform tacit into explicit knowledge by documenting the outcomes of dialogue. Employees are asked to document and report the outcomes of their discussions in meetings, seminars and training programmes. However, the findings in Chapter 6: Section 6.3.2 suggested that the willingness of transferring tacit into explicit knowledge differs, based on whether the seminars/training programmes were arranged by the bank itself or by

external bodies. Employees are usually asked to document internal rather than external events. The outcomes of internal programmes are summarised in reports and sent by email in the form of periodic books/brochures to all staff. However, access to the outcomes of external programmes is limited, as staff are asked to give feedback about an event to their managers only and formal reports are not entered into any database and therefore not accessible to all staff. Therefore, the benefit of external events is limited to staff who attend these events.

Employees in Egyptian banks have also been asked to report the outcomes of their direct negotiations with customers. However, this process was limited to corporate customers (companies) and did not apply to individuals. The representatives of banks who are in charge of corporate customer negotiations have to report the outcomes of any discussion. These reports, then, are attached to customers' files. However, reporting the key points of discussions with individual customers was limited.

This is potentially a big aspect of banking behavior and reveals that Egyptian banks are weak in the area of documenting customer feedback. Banks should document important customers' issues and make them available to all staff and managers in order to be aware of problems which might arise in the future.

“Our bank never asks us to write a report about our discussions with individual customers.....It is not good because sometimes the customers highlight some important issues which are necessary to be circulated for all staff not just for

tellers themselves to avoid further problems - and this will never happen without documenting these issues and making them available for all” (NBE2).

In summary, the externalisation process was only available to a limited extent either for the external training programmes and seminars/workshops or for the outcomes of discussions with individual customers. For external events, the benefits of discussions conducted at these events are limited to employees who attend these events, and similarly the benefits of discussions with individual customers are limited to staff who deal directly with those customers. By ignoring the documentation of these discussions, banks missed the chance to circulate valuable knowledge to all staff and reduced the benefit of the externalisation process in general. These limitations support the factor analysis findings (Chapter 5, Section 5.4.1) which gave externalisation the second lowest rank in the use of SECI processes in Egyptian banks. These findings are supported by Weir and Hutchings (2005) who indicated that the externalisation process is not widely used in the Arab world because Arab culture is highly tolerant of ambiguity and Arabs prefer to hold on to their knowledge until there is an absolute need for disclosure. As a result, while some knowledge is made explicit, much remain tacit.

7.1.3 Combination (explicit–explicit)

The combination process reformulates explicit knowledge into a clearer and more beneficial form for the bank and its staff. Egyptian banks perform certain activities to implement this process such as the continuous updating of databases, networks and reports using the updated instructions and reports taken by the top management and the

CBE on all relevant issues and then circulate them to staff via emails and periodic reports/bulletins. Banks are also keen to get relevant managerial and banking studies from different languages translated. Certain departments such as communication, information technology, information services or state services, are authorised to deal with such processes.

However, reformulating documents into a clearer and more beneficial form was limited to external publications and did not cover the rules and instructions issued by headquarters and the CBE. External reports and publications are reformulated by the top management to be more understandable and beneficial. In contrast, rules and instructions issued by headquarters and the Central Bank of Egypt (CBE) are usually sent to staff unchanged because managers at higher levels did not want to take the risk of interpreting these documents (fear of mistakes). Hofstede and Hofstede (2005) suggest that people in the Arab world score highly on the Uncertainty Avoidance Index in which managers try to be careful to pass the important information without any changes. Without this interpretation by the higher levels of management, each member of staff interpreted the same instructions based on their own point of view which created conflict among the staff, between the staff and their managers and between the staff and customers. As we saw in Chapter 6, Section 6.3.3, this was seen by staff as managers evading their responsibilities and potentially causing conflict because in some cases staff do not understand what is required and thereby each of them strives to interpret what is required.

This suggests that the high power distance in the Arab world provides a strong authority for each managerial level over the lower levels, which makes each level more conservative in dealing with reports coming from a higher level. The same problem arose when dealing with reports that refer to competitors. Banks did not follow a formal process to inform staff about these reports, employees only knew about them informally from their colleagues or customers.

Although banks neither reformulated reports and instructions issued by the head offices and CBE nor issued reports about their competitors' publications, they got substantial benefits from the other combination mechanisms, e.g. continuous updating of databases/websites, reports and publications and circulating these updates to all staff via emails and periodic reports/bulletins. These findings underline the importance of the combination process in Egyptian banks and support the factor analysis findings (Chapter 5, Section 5.4.1) which ranked combination after internalisation as the most important SECI process. This reflects a broad "formalisation" in Egyptian banks. People are processing and accumulating formal knowledge, and using this for combination and internalisation. Therefore, these findings disagree with Weir and Hutchings (2005) who indicated that the combination process was not widely used in the Arab world.

7.1.4 Internalisation (explicit-tacit)

Banks in Egypt encourage employees to internalise explicit knowledge by studying relevant courses, accessing outcomes of training programmes, seminars, databases, and by arranging meetings to explain the content of related reports and documents. Banks usually support staff to attend practical banking programmes e.g. credit, customer services, corporate and MBA courses. In contrast, banks do not formally support postgraduate degrees e.g. Diploma, MSc or PhD based on the view that these academic degrees are not necessary or appropriate for a banking career. Employees, however, highlighted the importance of books, compact disks and handouts as good sources to provide them with updated theories and to support their personal knowledge. Internalising knowledge is also related to “learning by doing”, so training on the job has an important role (Nonaka and Takeuchi, 1995). As banking jobs are mainly administrative, accessing relevant material from training programmes/seminars, professional courses and databases is an important part of job training.

The arguments above highlight that banks support a considerable number of internalisation mechanisms such as allowing staff to access outcomes of training programmes/seminars and bank databases and arranging meetings to explain the content of relevant reports and documents. Banks also support staff to attend practical courses and give them the chance to acquire the support materials for these courses. Although this support did not include academic courses, employees still attend these courses and gain knowledge. These findings support the factor analysis findings (Chapter 5, Section

5.4.1) which showed that internalisation is the most important SECI process in banks. Therefore, these findings disagree with Weir and Hutchings' (2005) point that the internalisation process is not widely used in the Arab world.

7.1.5 Overview of the whole SECI model

The findings above indicate that the internalisation and combination processes have a more important role in Egyptian banks than the socialisation and externalisation processes. Public banks were more keen on applying these processes in comparison to the private banks due to their large share of banking activities and their wide spread across the country. These findings more generally support those of Glisby and Holden (2003), Weir and Hutchings (2005), Haag et al. (2010), and Andreeva and Ikhilchik (2011) which suggest that the SECI model is not universal and that not all its modes have the same importance in different cultural and business contexts. Although Hofstede and Hofstede (2005) indicated that people in the Arab world follow a collectivist rather than an individualist social system, however the socialisation process was limited in Egyptian banks. The informal networks between employees were limited because of the basic lack of trust in socialisation activity, in large part due to the high power distance of managers. This reveals that the nature of business might affect the use of each SECI process. In socialisation, for example, banking as service industry has a huge customer base in their extensive branch networks. Therefore, formal and informal discussions between employees and customers are strongly supported. Formal discussions with customers are a part of employees' task and informal discussions are

necessary to strengthen trust and loyalty. Formal discussions between employees are also necessary to achieve their work, but social and informal activities between them might receive less support in order to serve customers, although it is also important to build trust. Therefore, literature (Sections 3.2.2.2 and 3.2.2.3) stressed that banks in Canada, Malaysia, Libya and UAE need to build organisational cultures of trust to enhance knowledge sharing.

It was also noted that the nature of a task could affect the use of each process as personnel rotation was not common between employees who held important positions such as credit jobs, due to the high cost of training those employees, or customer service staff, to strengthen their social realities with customers. This was also found in the complaint management in Tunisian banks which mainly depend on the face-to-face interactions between employees and customers for reporting customers' complaints rather than documenting them (Chapter 3, Section 3.2.2.3).

In brief, the complexity of culture and its effect on knowledge transfer was reflected in the Egyptian banks. National, organisational and occupational cultural dimensions were interrelated, interdependent and sometimes contradictory. Although, as mentioned above, people in Egypt tend to socialise intensively in the community and other settings outside work, managers have strong authority over their employees to limit their informal interactions. Indeed, managers do not fully trust employees and regard most informal dialogue as being focused on personal and social interactions rather than being

work related. The organisational culture of banking is based on high levels of security and confidentiality of data. Managers, therefore, tend to focus more on formal knowledge rather than on informal knowledge. Moreover, personnel rotation was limited to the more routine jobs (such as treasury and customer service) and was not applied to jobs regarded as critical to operations (such as credit), and in these areas occupational cultures were much stronger (Section 6.3.1).

The role of SECI processes in global banks was different from one country to another. In Egypt, the internalisation and combination processes are widely used by both private and public banks. In contrast, as we saw in Chapter 3, in Malaysia, the internalisation and combination processes were not represented in the Tiger Bank, adding to these processes, the socialisation process was also missing in the Camel Bank. It was also found that the combination process was absent in the Asian Development Bank. In Mauritius, the externalisation and combination processes were not represented while in Tunisia, all SECI processes were applicable in the supportive environment of a knowledge sharing culture and facilitating the internal and external connection mechanisms. Japanese banks such as Michiko and Tokyo Mitsubishi focused more on the socialisation process. PNC bank in USA and banks in Germany focus more on the externalisation process through codifying individuals' knowledge, however Tunisian banks do not pay enough attention to document customers' complaints (Section 3.2.2.2).

Thus, the differences in the use of the SECI model in global banking might be based on the difference in culture or leadership in the same culture e.g. Tiger and Camel banks in Malaysia.

Therefore, the findings of this study are in disagreement with Nonaka and Takeuchi (1995, p. 66) who consider the externalisation process as the key resource of knowledge creation, but are in agreement with Kao et al. (2011, p. 1041) who suggest that successful knowledge creation occurs when organisations combine and internalise explicitly received knowledge, and generate new knowledge. The spiral process of knowledge conversion does not necessarily have to start with the socialisation process, as maintained by Nonaka and Takeuchi (1995), but can also start with the combination or internalisation processes. Several mechanisms of the SECI processes overlap and can be connected to more than one process. Training programmes can be considered as methods of enhancing face-to-face discussions and externalise knowledge by documenting these discussions, or internalise knowledge by reading the material and outputs of these programmes.

Similar to the majority of banks in developed countries e.g. UK and USA (Section 3.2.2.2), the SECI model in the Egyptian banking sector is not only human-oriented (as it is in many developing countries e.g. Mauritius, Tunisia and Libya (Section 3.2.2.3), and also in Japanese banks, but also technology oriented. The case was different in Malaysian banks; whereas some of them are more human-oriented e.g. Tiger Bank, the

others are more technology-oriented e.g. Camel Bank (Section 3.2.2.3). In Egyptian banks, face-to-face discussions through social events, training programmes, and personnel rotation are fully human-driven (Section 6.3.1). Documenting individuals' knowledge through the use of an intranet network, reports and updated banks' databases are mainly technology driven. The SECI processes also work through organisational processes such as: offering training programmes, creating communities of practice, encouraging knowledge sharing and providing time and space for practicing knowledge activities.

Although banks had several mechanisms for acquiring external knowledge, e.g. through contact with customers, contract bankers, interaction with external bodies or studying professional courses, documenting external knowledge and arranging events with external bodies was limited. This reveals that Egyptian banks, like the majority of Japanese banks and Tunisian banks, do not pay enough attention to documenting external knowledge, and unlike the US banks which focus more on the external knowledge (Sections 3.2.2.2 and 3.2.2.3). Banks, like the Portuguese banks, may be focus more on developing existing internal knowledge rather than acquiring new knowledge from outside (Sections 6.3.2 and 3.2.2.2).

This study, however, confirms the findings of Nonaka et al. (2000) and von Krogh et al. (2012) that leadership indicates the extent an organisation can use the SECI model. In Egyptian banks, managers have both positive and negative effects on the use of each

process of SECI. The management of banks provided spaces, times and opportunities (*Ba*) to enhance face-to-face discussions by providing a place and for internal and external training, open spaces/halls to encourage staff to work together in the same place, and by allowing staff to conduct informal discussions before or after working hours. *Ba* was also provided through codifying and transferring knowledge through computers, emails, the intranet, and the internet. Managers also supported the documentation of outcomes of internal programmes, updating bank's databases and providing easy access for these databases.

However, the use of the socialisation process was limited, because managers were biased in their application of personnel rotation, and they did not pay enough attention to informal discussions as an important source of an organisation's knowledge assets (von Krogh et al., 2012; Nonaka et al., 2000). The use of externalisation was also limited because managers did not encourage documenting external knowledge or individual customers' feedback. Senior managers passed reports received from higher managerial levels to their staff without any interpretation, leaving room for conflict. Finally, they did not support commencing academic studies which are important to develop employees' personal knowledge. Therefore, it can be said the managers in Egyptian banks do not have a proper "knowledge vision" and need to increase their focus on socialisation and externalisation processes. For effective knowledge management; Egyptian banks, like banks in developing countries, need to build a

knowledge culture to pay equal attention to the four processes of SECI (Section 3.2.2.2).

The argument above confirms that the SECI model can be applied in Egyptian banks, but the focus on one process rather than another depends on the national culture, the leaders' support and the task. These findings support Nonaka and Takeuchi (1995) and Nonaka et al. (2000) suggesting that culture and leadership roles cannot be ignored in ensuring the successful application of SECI.

7.2 Aspects of innovation in the Egyptian banking industry

In the Egyptian banking industry, many new products and services were introduced to customers over the last few years including internet banking cards, retail banking, corporate banking, SME banking, Islamic banking, and a financial consultation service. Batiz-Lazo and Woldesenbet (2006) and Gopalakrishnan and Damanpour (1997) suggest that product innovations are primarily customer driven. Banks therefore depend on external and internal sources to generate new ideas. The external sources are ideas from customers and competitors, the internal sources are ideas from the bank's staff and management. Bank managers usually transfer customers' and competitors' ideas to internal sources by doing further analysis and studies to develop these ideas. However, banks only consider ideas that the staff were asked to produce but not ideas that the staff volunteered. This suggests that high power distance provides bank managers with the authority to ignore or accept ideas or suggestions. It also suggests that these

innovations are incremental/not radical because they are improvements of existing ideas/products (Cooper, 1999; Gopalakrishnan and Damanpour, 1997).

To enhance product innovation and to enable customers to access services more easily, Egyptian banks have made significant improvements to their structure, practices, management and marketing techniques. Banks implemented several process innovations, both administrative and technological. The administrative innovations included establishing new branches, providing more facilities in the waiting halls, creating new posts and establishing new or improving existing departments. These improvements reduce the work load for the staff and enhance customers' ability to access their services easily.

In responding to the recent technological revolution in Egypt, many technological changes in banking operations have been made in order to speed up procedures and to facilitate the dissemination of information/reports amongst the staff. The new technologies were mainly establishing internet and intranet networks and new banking software. Banks also used new technologies to improve their customer service facilities such as electronic signatures, online banking and the queuing system. All these innovations can be considered radical because they produced fundamental changes in banking operations (Gopalakrishnan and Damanpour, 1997). However, many customers still need more time to get used to some of the technological applications such as online banking and electronic branches (Chapter 6, Section 6.4.2).

7.3 The relationship between the SECI model and innovation

The quantitative and qualitative findings (Sections 5.5, 6.4.1 and 6.4.2) suggest that several of the SECI processes are in use and many product and process innovations were achieved in the last few years. Some of these product and process innovations were incremental-radical and administrative-technological. The study (Sections 5.7.1.2 and 6.5) suggested that the SECI processes positively influence innovation by increasing the generation of ideas for banking services, products and processes, but it did not distinguish between these innovation types in terms of the effect of the SECI model on each type. Therefore, these findings are in agreement with the literature suggesting that the SECI processes are a key resource and a prerequisite for innovation (Lee and Choi, 2003; Kamasak and Bulutlar, 2010; Swan and Newell, 2000; McAdam, 2003; Nonaka et al., 2006). However, these outcomes suggest that employees' ideas are not being taken up more directly in the context of an innovation model (see Section 3.1.31) which could potentially contribute at least to initial stages of creativity and selection. The actual development stages (incubation) of banking products and services may not realistically fall in the range of employee skills. Perhaps employees could contribute again in final implementation stages and user and customer involvement – though again they were not asked for their input. Employees might also have had more involvement in the final learning stage, if they were encouraged to give feedback on how new products and processes were working and how they could be utilised in the organisation.

With regard to **socialisation**, the findings of this study confirm that the social interaction among individuals and groups creates new knowledge in organisations and thereby increases their capacity to innovate (Aramburu et al., 2007; Darroch and McNaughton; Schulze and Hoegl, 2008; Nonaka and Takeuchi, 1995; Popadiuk and Choo, 2006; Peltokorpi et al., 2007). In Egyptian banks, discussions between employees themselves and with their managers, and with internal and external experts give them the chance to share their knowledge, to help in solving problems and to improve their bank's processes and services.

Discussions with colleagues from other banks also help employees to suggest new ideas related to their bank's products, services and processes. Staff need to know the new products other banks provide for their customers and new systems they introduce in order to suggest new products or processes. For example, while the National Bank of Egypt used ATMs only for withdrawals, CIB and other banks added more facilities such as transfers and deposits. Daily discussions with customers also highlight new services and products required by customers and shortage points the bank should cover such as offering comprehensive tellers that enable customers to get their services easily and speedily. In brief, the socialisation process supports staffs' knowledge and experience that enable them to deal with different situations and to introduce constructive ideas for enhancing banking performance.

However, the effects of socialisation on innovation in Egyptian banks are still limited because banks depend too much on formal discussions rather than the informal ones. Western authors consider that the informal interaction between individuals either inside or outside the workplace forms the basis of creativity (Aramburu et al., 2006; Darroch and McNaughton, 2002; Handzic and Chaimungkalanont, 2004; Schulze and Hoegl, 2008; Yavuz and HeideIman, 1999). Employees who share a common vision and empathise with each other are intrinsically motivated and thus promote a deeper intrinsic interest and desire in specific ideas to be realised. Egyptian banks should pay more attention to support informal discussions in order to maximise the positive effect on innovation.

This study suggests that the **externalisation** process positively influences innovation. However, the findings are in disagreement with Schulze and Hoegl (2008) and Kamasak and Bulutlar (2010) who suggested that externalisation is only related to the improvement of the existing products/services or processes but not to the generation of new developments. Documenting the findings of discussions with internal and external bodies was considered to be the basis for generating ideas. These documents provide the necessary data and information on which new ideas are built. Documentation was also considered as a valuable memory that enabled staff to recall information from the past e.g. the procedures of opening and closing the treasury at the beginning and end of working hours. Findings reflect also that documentation of valuable discussions is a scientific basis for building ideas and suggestions. For example, one of interviewees

stated that “there was a complaint from some clients that the bank’s statements did not mention the client’s name. We reported this to our managers who automatically added the client’s name to statements” (NGS2). Therefore this study confirms the findings of Lin (2007), Martin-de-Castro et al. (2008), Li et al. (2009), and Tsai and Li (2007), suggesting that articulating tacit knowledge into explicit improves the stock of available knowledge for an organisation and accordingly the ability to improve the existing products/processes and to generate new developments.

However, the effects of externalisation on innovation in Egyptian banks are still limited because banks depend too much on documenting the internal discussions rather than the external ones. Cassiman and Veugelers (2006) maintain that innovation management requires a tight integration of internal and external knowledge to provide sustainable competitive advantage. They suggest that acquiring and documenting external knowledge provide better understanding of the innovation process by either following up competitors’ innovations or imitating new ones. Egyptian banks should pay more attention to support the documentation of external knowledge in order to maximise the positive effect on innovation.

With regard to **combination**, the study suggests that converting the existing explicit knowledge into more systematic sets of knowledge positively influences innovation. The study is in disagreement with Schulze and Hoegl (2008) who argue that the combination of existing explicit knowledge does not lead to truly novel product/process

ideas but to improvements in the existing products/processes. The findings indicated that updating staff with relevant reports and publications is necessary to complete their daily work and to revise their knowledge. Updating knowledge is an important prerequisite for innovation and is used as a basis to develop existing banking products and processes. For example, the management of United National Bank (UNB) produced more facilities on its personal and car loans after investigating the top 10 largest banks in Egypt working in this area (Chapter 6: Section 6.5.3). The findings are also in agreement with the majority of literature indicating that novel product/process ideas involve the effective connection, reconfiguration and organisation of existing explicit knowledge into a new and more structured form of explicit knowledge (Koberg et al., 2003; O'Connor and McDermott, 2004; Wielemaker et al., 2003; Martin-de-Castro et al., 2008; Li et al., 2009). For example, the head office of Egyptian banks usually asks employees to send in suggestions regarding possible products. Further analysis of these suggestions may lead to the introduction of new products. Therefore, it can be said that the combination of explicit knowledge is an important recourse for improving existing products/processes or generating new developments.

Finally, the study indicates that the **internalisation** process positively influences innovation. The findings are in agreement with the literature suggesting that experiencing by reading enhances the absorption of existing knowledge, which in turn enable individuals to create new operational knowledge and hence novel ideas (Schulze and Hoegl, 2008; Dougherty, 1992; Hargadon and Sutton; 1997; Hatten and Rosenthal,

2000; Helfat and Raubitschek, 2003; Koberg et al., 2003; Ng et al., 2011). The reading of training and seminar papers or postgraduate materials provides staff with new knowledge and develops their skills which in turn help create innovative solutions. Reviewing published reports from competitors also provides good opportunities to understand their thinking and their products and accordingly suggests new ideas or products/processes. Easy access to banks' databases also enables staff to be aware of related issues and thus produce valuable ideas to improve their bank's performance. For example, it was stated in Chapter 6 (Section 6.5.4) that "The more you read, the more you develop yourself, the more development of the whole staff's thinking. Then the bank's vision will be developed and will look forward to continuous development and improvement" (BC2).

Findings from this study (Sections 5.7.2 and 6.5.4) also confirm that each SECI process positively affects the innovation process but the share each process has is different. The socialisation process had the lowest effect on innovation. The limitations imposed on this process minimised its effect of creating and sharing knowledge in banks and accordingly the ability to innovate. The limitations included the lack of applying the personnel rotation policy equally, the lack of informal interaction inside and outside the workplace and the lack of academic training. The externalisation process held the second lowest rank, because the imposed limitations ignored the transfer of important tacit into explicit knowledge, such as discussions of external training programmes and seminars as well as individual customers' suggestions. This minimised the benefits of

transferring knowledge, and accordingly the ability to innovate. In contrast, internalisation and combination were the most important SECI processes in terms of creating and transferring knowledge, and accordingly had a higher effect on innovation. However, employees still need more formal support for commencing postgraduate studies and a clear interpretation of the CBE's instructions to maximise the benefits of these processes.

The study confirms the findings of Refaey (2002), Schulze and Hoegl (2008) (see Chapter 3-Section 3.1.5), that not all four processes of SECI have the same effect on innovation. However, the importance of any process on innovation might differ from business to business. It was found that socialisation has a low effect on innovation in the Egyptian pharmaceutical sector (Refaey, 2002) and the Egyptian banking sector, but a large effect in both manufacturing and communication sectors in Europe (Schulze and Hoegl, 2008). Externalisation also has a low positive effect on innovation in the Egyptian banking sector but a negative effect on the manufacturing and communication sectors, while it has a large effect on the Egyptian pharmaceutical sector. Combination has a large positive effect on the Egyptian banking and pharmaceutical sectors, while it has a negative effect on the manufacturing and communication sectors. Finally, internalisation has a large effect on innovation in the Egyptian banking and pharmaceutical sectors as well as in the manufacturing and communication sectors in Europe.

The findings of this study (Sections 5.7.2 and 6.5.4) do not confirm the Ng et al. (2011) suggestion that organisations should focus on the socialisation and internalisation processes rather than the combination and externalisation processes in order to generate novel ideas. Organisations should use all four processes to maximise the positive effect on innovation. The limited effect of both socialisation and externalisation in Egyptian banking is due to the constraints imposed on them concerning, for example, the lack of supporting informal interactions and the documentation of external knowledge. Banks can maximise innovation if they work on minimising these limitations. Banks in Egypt also seem to focus more on formal knowledge through the combination and internalisation processes in order to innovate rather than on informal knowledge that can be gained during the socialisation process and be documented in the externalisation process. To maximise innovation, banks should also consider informal knowledge which is important to build trust and encourage employees to share knowledge.

Chapter 8

Conclusion

This chapter describes the main achievements of the research and how it could be carried forward. The thinking behind this research grew out of an initial perception that the transformation of knowledge into added value is the core of innovation which is of vital importance to maintain a competitive advantage (Batiz-Lazo and Woldesenbet, 2004; Drucker, 1993). Furthermore, the management of knowledge has been seen as the key to this process of transformation. Ikujiro Nonaka is one of the leading management scholars to make an impact on KM (Earl, 2001). Arguably the model that best embraces the nature of KM is one that Nonaka and Takeuchi (1995) proposed as the SECI model of knowledge conversion (Aurum et al., 2008). The focus of the research, namely the exploration of this model in banking, is suffering from a lack of research even though it is a knowledge-intensive industry. Since the original SECI model was based on Japanese values, it was useful as a comparison to conduct this study in the Arab world, a region comprised of several countries and mainly shaped by Islamic culture, where little research has been done so far. Egypt, as the biggest Arabic country, was the specific research site.

The results derived from the empirical tests answered the research questions relating to the SECI model and innovation and their relevance to Egyptian banking, and paved the

way for future studies to explore the application of the SECI model of knowledge conversion. Using both qualitative and quantitative methods, the study helped to confirm the appropriateness of using a mixed method approach in social inquiry. The thesis contributes to the debate on the SECI model in several ways. Although the model was proposed as having a universal application, the variations in different contexts are being increasingly explored. It has been realised that the use of each SECI process is subject to the cultural context, leadership support, and types of task. The use of each process in knowledge creation and the spiral movement between them are debated in this research and the manner of how each process affects innovation is explained. The importance of both informal and external knowledge to maximise knowledge sharing and new ideas has also been addressed. Practical implications for effective KM and innovation in Egyptian/Arab banks, along with proposals for further research have been suggested.

This chapter begins with a summary of the study findings. The main contributions of this study are then summarised, suggesting theoretical and practical implications. The strengths and limitations of the research are described, and the main challenges faced during the research process are explained. Finally, the chapter offers suggestions for further study.

8.1 Summary of findings

The aim of this study was to investigate the use of the SECI model by Egyptian banks and its effect on innovation. Therefore, the use of each process of SECI was investigated, followed by aspects of innovation in banks, and finally the relationship between the SECI model and innovation was examined. The four processes of the SECI model (socialisation, externalisation, combination and internalisation) and two types of innovation (product and process) were considered in this study. Integrated scales were developed to measure the research variables in the banking sector based on the literature review. The study used both quantitative (210 questionnaires) and qualitative (26 interviews) methods to investigate the research questions. Qualitative data provided a contextual background and supplemented the quantitative results. The main findings of the study were as follows:

1. All processes of SECI were used by Egyptian banks. However, some self-imposed limitations relating to the academic training, personnel rotation, informal knowledge exchange through social interaction and the documentation of external knowledge minimised the benefits of the socialisation and externalisation processes to create and codify knowledge. In contrast, the internalisation and combination processes were more useful to create and transfer knowledge in banks. No difference between the respondents according to demographic group (gender, job position, years of experience and educational background) regarding the use of the SECI model was found, but public banks were more likely to apply the combination and

internalisation processes than the private ones. Leadership and its high power distance, in particular, emerged as a major factor affecting the use of each SECI process (see Chapter 7: Section 7.1.5).

- The transfer of tacit knowledge from person to person is achieved in Egyptian banks through discussions conducted in general interactions at work, formal meetings, seminars and training programmes. It is also done by involving staff in discussions with their colleagues through a personnel rotation process across departments/branches and through discussions with external bodies. However, negative feedback was received regarding the benefits of sharing knowledge in banks due to the lack of academic training programmes/seminars, equal personnel rotation, and supporting informal discussions.
- Egyptian banks mainly transform tacit into explicit knowledge by documenting the outcomes of internal dialogues. Employees are asked to document and report the outcomes of their discussions in meetings, seminars and training programmes. But again the externalisation process was limited to the external training programmes and seminars/workshops and the outcomes of discussions with individual customers.
- Egyptian banks support a considerable number of mechanisms in order to collect and reformulate existing explicit knowledge into a more accessible form through the continuous updating of databases/websites, reports and publications and circulating these updates to all staff via emails and periodic reports/bulletins. Although banks neither reformulated reports and instructions issued by the head

offices and CBE nor issued reports about their competitors' publications, they got substantial benefits from the other combination mechanisms such as the continuous updating of their databases.

- The banks support a considerable number of mechanisms in order to convert existing explicit knowledge into personal knowledge by allowing staff to access outcomes of training programmes/seminars and bank databases. Banks also support staff to attend practical courses and give them the chance to acquire the support materials for these courses. Although this support did not include academic courses, employees still attend these courses and gain knowledge.

2. In the Egyptian banking industry, many product and process innovations were achieved in the last few years. This was mainly due to the introduction of a range of new technologies and the appointment of a prime minister with an IT background (Chapter 6: Section 6.4.2). The new products and services introduced to customers included different types of banking cards, retail banking, corporate banking, SME banking, Islamic banking, and a financial consultation service. Process innovations included establishing new branches, providing more facilities in the waiting halls, creating new posts and establishing new or improving existing departments. Many technological changes in banking operations were introduced such as establishing internet and intranet networks and new banking software. Banks also used new technologies to improve their customer service facilities such as electronic signatures, online banking and the queuing system.

3. The study suggested that the SECI processes, whether separate or as a whole, positively influenced innovation by increasing the generation of ideas for banking services, products and processes, but it did not distinguish between the effects of the SECI model on each type of innovation.
- The socialisation process supports staffs' knowledge and experience that enable them to deal with different situations and introduce constructive ideas.
 - Articulating tacit into explicit knowledge improves the stock of available knowledge for an organisation and accordingly the ability to improve the existing products/processes and to generate new developments. The findings suggest that the documentation of valuable discussions is a systematic basis for generating ideas and suggestions.
 - Updating knowledge is an important prerequisite for innovation and is used as a basis to develop existing banking products and processes. Novel product/process ideas are based on the effective connection, reconfiguration and organisation of existing explicit knowledge into new and more structured forms of knowledge.
 - Experiences of reading training materials, related reports and professional materials and/or accessing databases enhances the absorption of existing knowledge, which in turn enables individuals to create new and operational knowledge and hence novel ideas.
4. Findings from this study also confirm that each SECI process positively affects the innovation process but the share of each process is different. The socialisation process had the lowest effect on innovation. The imposed limitations on this process

(see p. 255), minimised its effect on creating and sharing knowledge in banks and accordingly their ability to innovate. The limitations included a lack of applying the personnel rotation policy equally, a lack of informal interaction inside and outside the workplace and a lack of academic training. The externalisation process held the second lowest rank, because the imposed limitations hindered the transfer of important tacit into explicit knowledge, such as discussions of external training programmes and seminars as well as individual customers' suggestions, which minimised the benefits of this process in transferring knowledge, and accordingly the ability to innovate. In contrast, the internalisation and combination processes were the most important in creating and transferring knowledge, and accordingly had a higher effect on innovation. However, employees still need more formal support for postgraduate studies and a clear interpretation of important instructions to maximise the benefits of these processes. The greater use of the combination and internalisation processes over the socialisation and externalisation processes reveals that banks in Egypt focus more on converting explicit knowledge over tacit knowledge to enhance creativity.

8.2 Theoretical and practical implications

The research findings have several implications for both theory and practice. The theoretical implications suggest recommendations which contribute to the growing debate around the SECI model. The practical implications offer more specific

recommendations for a better use of the SECI model by organisations, and specifically by Egyptian banks.

8.2.1 Theoretical implications

The use of mixed research methods for this study, combining survey and interview data, confirmed the appropriateness of using mixed approaches in social inquiry. The relative depth and informative nature of findings from the interviews was particularly useful for an explanatory kind of study. Interviews were vital for collecting more details about the use of the SECI model and the innovation applications in the present case. Quantitative and statistical methods help researchers to explore the relationship between variables, but often in fairly superficial ways, whereas interviews, by getting more details from respondents, add depth and complexity to understanding.

This study contributes to the literature debate on the theoretical framework of the SECI model, its universal application and its effect on innovation by asserting the following points:

1. The SECI model of knowledge conversion is a universal model and its four processes are confirmed through the factor analysis (Chapter 5, Section 5.4.1), but the use of each process is subject to the cultural context, leadership support, and types of task (Chapter 7, Sections 7.1 and 7.2). In general, a collective society is expected to be more socialised than an individualist society. However, the high power distance between managers and their employees limits the process of sharing

knowledge, especially in an informal way, due to the lack of trust of discussing personal rather than only work related issues. By limiting the informal interactions, the motivation for achievement is also limited (see Chapter 7; Section 7.3). In social settings outside the workplace, employees try to avoid communication with their managers because there is not enough trust. When managers asked their employees to document findings of any discussions, due to a fear of making mistakes, the employees were very cautious to document exactly what they were asked to do, without reference to their feedback from managers, or other useful informal knowledge. It was also noted that the nature of a task could affect the use of each process. For example, personnel rotation, as a mechanism of enhancing face-to-face interactions, can be difficult between employees who hold important positions such as credit jobs, due to the high cost of training those employees, or customer service staff, to strengthen their social relations with customers.

2. It was apparent that some activities fulfil more than one process of the SECI model, but they are subject to the business context (Chapter 4, Section 4.3). For example, face-to-face discussions in manufacturing industries may occur less often during job training, which focuses on the work with machines (Martian-de-Castro et al., 2007). However, it was found that in banking, as administrative work, job training is an effective mechanism to enhance direct communication. Job training in the manufacturing industry is strongly related to the internalisation process, which is mainly based on learning by doing (Nonaka and Takeuchi, 1995), rather than the socialisation process which depends on face-to-face discussions.

3. The study suggests that the externalisation process is not necessarily the key resource of knowledge creation, a finding that disagrees with Nonaka and Takeuchi (1995, p. 66). Organisations may have relatively little control over the process of converting tacit into formal knowledge. As seen in Chapter 2: Section 2.7, limitations on the effectiveness of the externalisation process can be expected because some tacit knowledge, even if crucial, can be difficult to make explicit because of fear of making mistakes or lack of trust. In addition, creating knowledge through the socialisation process is also not easy, since it is dependent on trust, loyalty, and commitment between employees and their managers/trainers. In contrast, organisations have higher control over the formal knowledge which they offer through combination and internalisation processes. The findings of this study suggest that successful knowledge creation occurs when organisations combine and internalise explicitly received knowledge to generate new knowledge. Accordingly, the spiral process of knowledge conversion does not necessarily have to start with the socialisation process, as suggested by Nonaka and Takeuchi (1995), but can also start with the process of combination or internalisation process.
4. The SECI model is not only working on internal knowledge but also on external knowledge from customers, competitors and other external bodies (see Chapter 2, Section 2.5). The external training programmes/seminars gave the staff the chance to obtain new knowledge from colleagues from other organisations and from external experts. Customer feedback is also important to develop an organisation's performance. The lack of documentation of the external knowledge with the

possibility of access to all staff, however, limits the benefits of this external knowledge to only those who were directly involved in the discussions.

5. The SECI model positively influences innovation through enhancing the processes of generating ideas related to services, products or processes. The ability to generate ideas is subject to creating and sharing knowledge, which is the core of SECI. Therefore, the lack of use of certain of the SECI processes limits the knowledge creation and transfer knowledge and thereby the ability to innovate.

8.2.2 Practical implications

To the best knowledge of the author, this study is the first detailed investigation of the use of the SECI model in the banking sector in general, and in developing countries in particular. It is also the first to investigate the effect of the SECI model on innovation in this sector. As shown in Chapters 2 and 3, the SECI model has been investigated in different business contexts such as the pharmaceutical sector; the IT sector; the manufacturing, high-tech and service sectors; the construction sector; multi-organisational projects; and education and training systems, but little research had been done on the use of SECI processes by banks and their effect on innovation.

Given this context, the study also provides some suggestions for Egyptian banks to manage their knowledge more effectively and accordingly maximise innovation. These suggestions can also be used as a guide by banks or organisations in the Arab world or in developing countries.

1. The lack of supporting informal discussions between employees and with their managers negatively affected the knowledge sharing process due to a lack of trust and the fear of making mistakes. Therefore, banks should consider making changes to support informal interactions such as setting a formal lunch time, offering common spaces, and perhaps arranging social events outside the workplace. This should allow staff to become closer to each other, build trust and decrease the fear of making mistakes which will encourage them to share knowledge and to talk about work problems to arrive at common solutions.
2. The lack of support for the informal discussions between employees and customers negatively affected the absorption of external knowledge and precluded valuable feedback about the bank's performance. Banks might need to increase the number of social meetings between staff and individual and corporate customers outside of work to increase the inter-organisational knowledge flow. It is suggested that each branch arrange these meetings separately and report the outcomes to head office and related departments.
3. The lack of applying personnel rotation equally across departments and branches to all jobs and individuals limited the face-to-face discussions between new staff and thereby knowledge sharing. In order to improve learning by doing as a mechanism of internalising knowledge, personnel rotation across departments or branches should be applied equally to a greater numbers of jobs. As discussed in Chapter 6, Section 6.3.1, personnel rotation gives employees a range of experience and knowledge about most banking jobs and allows them to share knowledge with other staff from

different departments and branches. It can be suggested that the duration of personnel rotation should be neither short nor long. Rotation every one or two years might be useful to get the advantages of specialisation and to transfer the experience to another department.

4. As far as sharing knowledge during academic training programmes is concerned, especially those conducted by the Egyptian Banking Institute, these were seen as not very useful and speaking about unimportant topics. Therefore, the training programmes conducted by the institute should be about more relevant topics and to be related to up-to-date management and banking theory. The Egyptian Banking Institute may need to develop its academic and theory aspects by closer contacts with the universities and use of academic skills. Up-to-date academic theories give a scientific and practical basis, and highlight the frontiers of science and research in banking and management issues.
5. The capture of experts' knowledge was limited due to a lack of documenting and reporting worthwhile discussions during external training programmes/seminars. There was also no database available to access the content of these external events. To enable all staff to benefit from the outcomes of these discussions, banks need to ask their participating employees to report the outcomes in detail and add these reports to their databases with access for all. The documentation of experts' ideas from external seminars and training programmes could be used as a reference to solve problems or to develop policies

6. Documenting customers' feedback was limited to corporate customers, not the individual ones. Interviewees mentioned (See Chapter 6, Section 6.3.2) that sometimes the customers highlight some important issues which could very usefully be reported and circulated for all staff to avoid further problems. Therefore, banks might ask their staff to report the valuable feedback of individual customers for further consideration.
7. There was a lack of explanations of the rules and instructions issued by headquarters and the Central Bank of Egypt. Very often staff members did not understand what was required and therefore each interpreted the same instructions based on their own point of view and this caused a lot of conflict among the staff, between the staff and their managers and between the staff and customers. So, bank managers should take the responsibility to give employees enough explanations to avoid such kinds of conflict.
8. There was no formal collection and reformulation of reports issued by external bodies, especially competitors. Employees only knew about them informally from their colleagues or customers (see Chapter 6; Section 6.3.3). It was found that reports issued about a competitor's performance can be used as a basis to update knowledge and produce new ideas (Chapter 6: Section 6.5.3). Therefore banks should give more consideration to this kind of reporting.
9. Although postgraduate programmes provided by Egyptian universities are important for employees to develop their personal knowledge by reading the materials provided, such as the handouts, books and any electronic materials, there was a lack

of time and financial support to join these programmes. Banks might therefore need to refer to the Egyptian Banking Institute, as a unit of the CBE, to be in charge of granting professional banking diplomas, Masters and PhDs instead of relying on Egyptian universities. This would allow managers to provide formal support to their staff for these studies. Also, since these programmes would be directed by the CBE they would be professional and up-to-date.

10. Banks were not very alert to the innovative ideas volunteered by the staff leading to a decrease of their organisational loyalties. Each department worked separately to generate, develop and collect ideas but there was no specific unit or department to link all innovation issues. Therefore, banks should consider adding an “Innovation Unit” to their R&D department, to collect valuable ideas and develop them into actual products, services and processes. By taking the ideas volunteered by staff more seriously the organisational commitment and loyalty of staff should increase.
11. As mentioned in Chapter 6; Section 6.4.2, because the banking technology in Egypt is still at its infant stage, it is recommended that banks increase the security level for internet technologies and provide short technological training programmes for interested customers to increase its uptake.

8.3 Strengths, limitations and challenges of the study

The research population consisted of three public and 27 private commercial banks. As indicated in Chapter 4, the sample size (210 questionnaires and 26 interviews in 12 banks) was sufficient to get a true representation given the heterogeneity of the research

population. The number of questionnaires was sufficient to fulfil the requirements for statistical tests, e.g. factor analysis and regression, and to extrapolate the research findings. The interviews provided additional information to the quantitative findings and highlighted important issues which were not elicited in the quantitative data such as the effect of leadership, the cultural influence on the SECI processes in Egyptian banks and the focus on formal rather than informal knowledge.

Although this study achieved its objectives and answered the research questions, it is not without certain constraints and limitations, which were unavoidable and do not invalidate the findings of the study, and may provide practical guidelines for future research. The study was restricted by time and cost, which limited the cover of any changes after the Egyptian revolution in January 2011. Time and cost restrictions limited the researcher to conduct comparisons between Egyptian banks and banks in other developed countries, which might have a different culture. With regard to the triangulation of the research data, the quantitative and qualitative data cannot be considered independent data sources, as both reflect the opinions drawn from the same basic population of respondents, although they were different kinds of data that allowed respondents to express their opinions and attitudes in different ways. But in future research truly independent data sources might be considered.

In addition, it was also difficult to investigate the use of the SECI model in different banking departments, as the sample sizes in each unit would have been too small for

statistical comparisons. It was assumed that the bankers in each extensive branch were aware of the many tasks involved to serve the different needs of the customers. Since the Egyptian banks prefer to employ males rather than females (Chapter 5, Section 5.3), it was also difficult to conduct a comprehensive study investigating whether the use of the SECI model and its effect on innovation differ according to gender, although some observations were made through surveying 25 and interviewing four females. Some other related issues were also outwith the scope of this study, particularly cultural influences and foreign banks in Egypt.

Some other challenges were faced during the research process. In general, writing the thesis in English, which is the second language for the researcher, was a challenge. The researcher had little experience in this style of academic writing, which necessitated considerable revisions during the writing process. Even though formal permission from the Central Agency for Public Mobilisation and Statistics in Egypt to collect data from the Egyptian banking sector was obtained, the interview process was fraught, mainly because banks preferred to assign specific persons to be interviewed, who had been briefed extensively. Therefore, the researcher contacted staff personally to conduct more detailed interviews, though it was still sometimes difficult to achieve the balance between allowing interviewees to talk freely and maintaining the structure of the interview. Surveying 25 and interviewing four females was a challenge due to the low number of female staff in banks. It was even difficult to find and contact this number of female employees from different banks, branches and cities. Even though female

employees admitted that working late in banks, till 5 pm, makes it difficult to balance their work with their family responsibilities, they were happy since they got a higher salary, compared to working in other organisations. Transcribing, translating and analysing 26 interviews from Arabic into English also took a long time (more than six months).

8.4 Proposals for future research

For future research, it is suggested to investigate the use of the SECI model in multi-national organisations with employees from different cultures. It would be useful to conduct comparison studies between banks in developing and developed countries with different cultures. It is also suggested to examine the use of SECI in different business contexts. Studying the model in different cultural and business contexts will contribute to the debate about the universal application of the SECI model. Investigating the use of this model relating to different tasks or gender will also provide more details of how the use of each process could be different. Investigating the relationship between the style of leadership and the use of SECI model in organisations is another suggestion for future research. With regard to the relationship between the SECI model and innovation, it is suggested to conduct further research on the effect of each process of SECI on each stage or type of innovation in the manufacturing and service sectors.

The study also has different data sets which could perhaps be used in further analysis. The survey data, for example, could be used in a different manner (non-parametric

analysis of the individual innovation issues) to provide a more detailed link between KM and product and process innovation. For example, it was difficult for the researcher to examine the relationship between the SECI model and each type of innovation because the factor analysis did not distinguish between product and process innovation, as only one factor was extracted to represent the innovation variables (Section 5.4.1: Table 5-7). However, employing the non-parametric analysis involving the average scores of questionnaire's items instead of the factor analysis scores (Section 5.6) may allow examining the linkage between each process of SECI and product and process innovation. The comments on training programmes provided in the interview data could also be used to evaluate the efficiency of the external and internal job training in Egyptian banking.

As shown in the study, knowledge management initiatives won't take hold unless they are supported by the culture, which is naturally complex. Therefore, national culture and other cultural factors such as: corporate culture, organisational structure, management style, business systems, and human resources might be considered as part of developing effective KM strategies. The study showed that the introduction of a range of new technologies in Egypt contributed considerably to many product and process innovations in the last few years and therefore further research is suggested to explore the more detailed links between technology and innovation. It might also be useful to conduct ethnographic research, participant observations, and/or case studies of a selection of the banks surveyed to provide increased scope for detailed appreciation of

the factors involved in the management of knowledge and its impact on innovation. The linkage between KM and innovation can be investigated more thoroughly by considering specific innovation models.

References

- Abou-Zeid, E. & Cheng, Q.Z. 2004, "The effectiveness of innovation: A knowledge management approach", *International Journal of Innovation Management*, vol. 8, no. 3, pp. 261-274.
- Adams, J., Khan, H., Raeside, R. & White, D. 2007, *Research Methods for Graduate Business and Social Science Students* Sage Publications Ltd, UK.
- Ahmed, P.K., Lim, K.K. & Loh, A. 2001, *Learning through Knowledge Management*, Oxford: Elsevier Butterworth- Heinemann.
- 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.
- Akamavi, R.K. 2005, "A research agenda for investigation of product innovation in the financial services sector", *Journal of Services Marketing*, vol. 19, no. 6, pp. 359-378.
- Alavi, M. & Leidner, D. 2001, "Review: knowledge management and knowledge management systems: Conceptual foundations and research issues", *MIS Quarterly*, vol. 25, no. 1, pp. 107-137.
- Alhawary, F.A. & Alnajjar, F.J. 2008, "Impact assessment of I/S technology utilization on knowledge creation and conversion: An empirical study In Jordanian universities ", *Journal of Knowledge Management Practice*, vol. 9, no. 1.
- Ali, H. & Ahmed, N. 2006, "Knowledge management in Malaysian banks: A new 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.
- Alrawi, K. & Elkhatib, S. 2009, "Knowledge management practices in the banking industry: Present and future state-case study", *Journal of Knowledge Management Practice*, vol. 10, no. 4.
- American Chamber of Commerce in Egypt 2008, *Banking Sector Developments in Egypt*, Business Studies & Analysis Center, Egypt.

- Amin, A. & Roberts, J. 2008, "Knowing in action: Beyond communities of practice", *Research Policy*, Vol. 37, pp. 353-369.
- Anderson, D., Sweeney, D., Williams, T. & Freeman, J. 2007, *Statistics for Business and Economics*, Thomson, UK.
- Anderson, J. & Gerbing, D. 1988, "Structural equation modeling in practice: a review and recommended two-step approach", *Psychological Bulletin*, vol. 103, no. 3, pp. 411-423.
- Andreeva, T. & Ikhilchik, I. 2011, "Applicability of the SECI model of knowledge creation in Russian cultural context: Theoretical analysis ", *Knowledge and Process Management*, vol. 18, no1, pp. 1-11.
- Andrew M., F. 2010, "Insufficient discriminant validity: A comment on Bove, Pervan, Beatty, and Shiu (2009)", *Journal of Business Research*, vol. 63, no. 3, pp. 324-327.
- Antonova, A. & Csepregi, A. 2011, "Sharing and transferring knowledge-how to increase efficiency of soft techniques for KS", *12th European Conference on Knowledge Management – ECKM Academic Publishing Limited*, Reading, UK, 1-2 September, pp. 37-44.
- Asian Development Bank (ADB) 2008, *Knowledge management in ADB*, Available from: www.adb.org.
- Assink, M. 2006, "Inhibitors of disruptive innovation capability: A conceptual model", *European Journal of Innovation Management*, vol. 2, no. 9, pp. 215-233.
- Athey, S. & Schmutzler, A. 1995, "Product and process flexibility in an innovative environment", *RAND Journal of Economics*, vol. 26, no. 4, pp. 557-574.
- 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.
- Awang, M. 2009, *Knowledge Management in Malaysian Secondary School: Implications of the "Smart School" Initiative*, PhD edn, University of Stirling.
- Bala-Subrahmanya, M.H. 2005, "Technological innovations in Indian small enterprises: dimensions, intensity and implications", *International Journal of Technology Management*, vol. 30, no. 1/2, pp. 205-219.

- Banque Audi 2009, *Egypt Economic Report*, www.banquraudi.com.
- Barachini, F. 2009, "Cultural and social issues for knowledge sharing", *Journal of Knowledge Management*, vol. 13, no. 1, pp. 98-110.
- Basadur, M. & Gelade, G.A. 2006, "The role of knowledge management in the innovation process", *Creativity and Innovation Management*, vol. 15, no. 1, pp. 45-62.
- Batiz-Lazo, B. & Woldesenbet, K. 2006, "The dynamics of product and process innovation in UK banking", *International Journal of Financial Services Management*, vol. 1, no. 4, pp. 400-421.
- Batiz-Lazo, B. & Wood, D. 2002, "An historical appraisal of information technology in commercial banking", *Electronic Marketing*, vol. 12, no. 3, pp. 192-205.
- Beijerse, R. 2000, "Knowledge management in small and medium- sized companies: Knowledge management for entrepreneurs", *Journal of Knowledge Management*, vol. 4, no. 2, pp. 162-179.
- Benaissa, N., Parekh, M. & Wiegand, M. 2008, *A growth model for Islamic banking: As competition grows, incumbents must work harder to remain distinctive*, McKinsey Quarterly, <https://www.mckinseyquarterly.com>.
- Betz, F. 1993, *Strategic Technology Management*, McGraw-Hill, New York.
- Bi, K., Sun, D., Zheng, R. & Li, B. 2006, "The construction of synergetic development system of product innovation and process innovation in manufacturing enterprises", *Proceedings of the 13 International Conference on Management Science and Engineering (ICMSE)*, Lille, France, 5-7 October, pp. 628-636.
- Bjørnson, F., Olav 2007, *Knowledge Management in Software Process Improvement*, Department of Computer and Information Science, Norwegian University of Science and Technology.
- Bonner, J.M., Ruekert, R.W. & Walker, O.C. 2002, "Upper management control of new product development projects based on structural performance", *Journal of Product Innovation Management*, vol. 19, no. 3, pp. 233-245.
- Bose, R. 2004, "Knowledge management metrics", *Industrial Management & Data Systems*, vol. 104, no. 6, pp. 457-468.

- Bose, R. 2002, "Knowledge management capabilities and infrastructure for e-commerce", *Journal of Computer Information Systems*, vol. 42, no. 5, pp. 40-49.
- Bouthillier, F. & Shearer, K. 2002, "Understanding knowledge management and information management: the need for an empirical perspective", *Information Research*, vol. 8, no. 1.
- Brace, I. 2008, *Questionnaire Design: How to Plan, Structure and Write Survey Material for Effective Market Research*, Second edn, Kogan Page, UK.
- Branscomb, L.M. & Auerswald, P.E. 2002, *Taking Technical Risks*, The MIT Press, USA.
- Bratianu, C. 2010, "A critical Analysis of Nonaka's model of knowledge dynamics", *Electronic Journal of Knowledge Management*, [Online], vol. 8, no. 2, pp. 193-200. Available from: www.ejkm.com.
- Brown, J.S. & Duguid, P. 2001, "Knowledge and organisation: A social-practice perspective", *Organisation Science*, vol. 12, no. 2, pp. 198-213.
- Bryceson, K. 2007, "The online learning environment: A new model using social constructivism and the concept of 'Ba' as a theoretical framework", *Learning Environment*, vol. 10, no. 3, pp. 189-206.
- Bryman, A. & Bell, E. 2011, *Business Research Methods*, Third edn, Oxford University Press Inc., USA.
- Bryman, A. & Cramer, D. 2005, *Quantitative Data Analysis with SPSS 12 and 13: A Guide for Social Scientists* Routledge, UK.
- Buono, A.F. & Poulfelt, F. 2005, *Challenges and issues on Knowledge Management*, Information Age Publishing, USA.
- 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, E.F. & Cabrera, A. 2005, "Fostering knowledge sharing through people management practices", *International Journal of Human Resource Management*, vol. 16, no. 5, pp. 720-735.
- Calabrese, F.A. & Remshard, J. 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.
- Carneiro, A. 2000, "How does knowledge management influence innovation and competitiveness?", *Journal of Knowledge Management*, vol. 4, no. 2, pp. 87-98.
- Carrión, G., González, J. & Leal, A. 2004, "Identifying key knowledge area in the professional services industry: A case study", *Journal of Knowledge Management*, vol. 8, no. 6, pp. 131-150.
- Cassiman, B. & Veugelers, R. 2006, "In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition", *Management Science*, vol. 52, no. 1, pp. 68-82.
- Cebi, F., Aydin, O.F. & Gozlu, S. 2010, "Benefits of knowledge management in banking", *Journal of Transnational Management*, vol. 15, no. 4, pp. 308-321.
- Central Agency for Public Mobilisation and Statistics (CAMPAS) 2010, *Economic bulletin for commercial banks*, CAMPAS, Egypt.
- Central Bank of Egypt 2009, *The monthly statistical bulletin N. 148*, Central Bank of Egypt, Egypt.
- Central Bank of Egypt 2005, *Annual Report 2005/2006*, Central Bank of Egypt, Egypt.
- Central Bank of Egypt 2008, "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/.
- Chang, S.C. & Lee, M.S. 2007, "The effects of organizational culture and knowledge management mechanisms on organizational innovation: an empirical study in Taiwan", *The Business Review*, vol. 7, no. 1, pp. 295-301.
- Chatzoglou, P., D. & Vraimaki, E. 2009, "knowledge - sharing behaviour of bank employees in Greece", *Business Process management Journal*, vol. 15, no. 2, pp. 245-266.
- Chee W., Holden, T., Wilhelmij, P. & Schmidt, R., A. 2000, "Where does knowledge management add value?", *Journal of Intellectual Capital*, vol. 1, no. 4, pp. 366-380.

- Chen, Y. & Li, L. 2006, "Deriving information from CRM for knowledge management- A note on commercial bank", *Systems Research and Behavioral Science*, vol. 23, pp. 141-146.
- Chiang, F. 2005, "A critical examination of Hofstede's thesis and its application to international reward management", *The International Journal of Human Resource Management*, September, pp. 1545-1563.
- Chiran, J. 2008, "Knowledge management in banking industries: uses and opportunities", *Journal of the University Librarian Association of Sri Lanka*, vol. 12, pp. 68-84.
- Choi, B. & Lee, H. 2003, "An empirical investigation of KM styles and their effect on corporate performance", *Information & Management*, vol. 40, pp. 403-417.
- Choi, B., Poon, S.K. & Davis, J.G. 2008, "Effects of knowledge management strategy on organizational performance: A complementarity theory-based approach", *Omega*, vol. 36, no. 2, pp. 235-251.
- 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.
- Choo, C. & Johnston, R. 2004, "Innovation in the knowing organization: a case study of an e-commerce initiative", *Journal of Knowledge Management*, vol. 8, no. 6, pp. 77-92.
- Choo, C. & Neto, C. 2010, "Beyond the ba: managing enabling contexts in knowledge organizations", *Journal of Knowledge Management*, vol. 14, no. 4, pp. 592-610.
- Choo, C.W. 2003, "Perspectives on Managing Knowledge in Organizations", <http://choo.fis.utoronto.ca/FIS/respub/CCQ/CCQ.pdf>, pp. 205-220.
- Chen, C., Huang, J. & Hsiao, Y. 2010, "Knowledge management and innovativeness: The role of organizational climate and structure", *International Journal of Manpower*, vol. 31, no. 8, pp. 848-870.
- Cohen, D. & Laporte, B. 2004, *The evolution of the knowledge bank*, KM magazine, www.kmmagazine.com.
- Cohen, W.M. & Levinthal, D.A. 1990, "Absorptive capacity: A new perspective on learning and innovation", *Administrative Science Quarterly-Technology, Organizations, and*, vol. 35, no. 1, pp. 128-152.

- Comery A. & Lee H. 1992, *A First Course in Factor Analysis*, 2nd edn, Lawrence Erlbaum Associates, USA.
- Cooper, D.R. & Schindler, P.S. 2008, *Business Research Method*, Tenth edn, McGraw Hill-Irwin, UK.
- Cooper, J.R. 1998, "A multidimensional approach to the adoption of innovation", *Management Decision*, vol. 36, no. 8, pp. 493-502.
- Cooper, R.G. 1990, "Stage-gate systems: A new tool for managing new products", *Business Horizons*, vol. 33, no. 3, pp. 44-54.
- Cooper, R.G. 1994, "Perspective third-generation new product processes", *Journal of Product Innovation Management*, vol. 11, no. 1, pp. 3-14.
- Cooper, R.G. 2008, "Perspective: The stage-gate idea-to-launch process-update, what's new, and NexGen systems", *Journal of Product Innovation Management*, vol. 25, pp. 213-232.
- Curado, C. 2008, "Perceptions of knowledge management and intellectual capital in the banking industry", *Journal of Knowledge Management*, vol. 12, no. 3, pp. 141-155.
- Damanpour, F. 1996, "Organizational complexity and innovation: developing and testing multiple contingency models", *Management Science*, vol. 42, pp. 693-716.
- Damanpour, F. 1991, "Organizational innovation: A meta-analysis of effects of determinants and moderators", *The Academy of Management Journal*, vol. 34, no. 3, pp. 555-590.
- Damanpour, F. & Gopoolakrishnan, S. 2001, "The dynamics of the adoption of product and process innovations in organizations", *Journal of Management Studies*, vol. 38, no. 1, pp. 46-65.
- Darroch, J. 2005, "Knowledge management, innovation and firm performance", *Journal of Knowledge Management*, vol. 9, no. 3, pp. 101-115.
- Darroch, J. & McNaughton, R. 2002, "Examining the link between knowledge management practices and types of innovation", *Journal of Intellectual Capital*, vol. 3, no. 3, pp. 210-222.
- Davenport, T. & Prusak, L. 2000, *Working Knowledge*, Second edn, Harvard Business Press, USA.

- Davenport, T. & Prusak, L. 1998, *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, USA.
- Davies, F., Mountinho, L. & Curry, B. 1995, "Construction and testing of a knowledge-based system in retail bank marketing", *International Journal of Bank Marketing*, vol. 13, no. 2, pp. 4-14.
- Day, D. 1994, "Raising radicals: Different processes for championing innovative corporate cultures.", *Organization Science*, vol. 5, no. 2, pp. 148-172.
- de Vaus, D. 2002, *Analyzing Social Science Data: 50 Key Problems in Data Analysis*, First edn, SAGE, UK.
- Denning, S. 1998, *What is knowledge management?*, The World Development Report.
- Denton, T. 2004, "Cultural complexity revisited", *Cross-Cultural Research*, vol. 38, no. 1, pp. 3-26.
- Denzin, N.K. & Lincoln, Y.S. 2005, *The SAGE Handbook of Qualitative Research*, Third edn, SAGE, UK.
- Ding, L., Velicer, W. & Harlow, L. 1995, "Effective of estimation methods, number of indicators per factor and improper solutions on structural equation modeling fit indices", *Structure Equation Modeling*, vol. 2, pp. 119-134.
- Dougherty, D. 1999, "Organizational capacities for sustained product innovation." in *Advances in managerial cognition and organizational information processing*, eds. J.F. Porac & R. Garud, Stamford, CT: JAI, pp. 79-114.
- Dougherty, D. 1992, "Interpretive barriers to successful product innovation in large firms", *Organization Science*, vol. 3, no. 2, pp. 179-202.
- Dougherty, D. 2004, "Organizing practices in services: Capturing practice-based knowledge for innovation", *Strategic Organization*, vol. 2, no. 1, pp. 35-64.
- Dougherty, D., Munir, K. & Subramaniam, M. 2002, "Managing technology flows in practice aground theory of sustainable innovation", *Building effective networks*, Academy of Management, Denver, Colorado, USA, 11-14 August, pp. E1-E6.
- Drucker, P.F. 1993, *Post-Capitalist Society*, Harper Business, New York.
- Drucker, P.F. 1988, "The coming of the new organization", *Harvard Business Review*, , pp. 4-11.

- Drucker, P.F. 1985, "The discipline of innovation", *Harvard Business Review*, vol. May/June, pp. 111-127.
- du Plessis, M. & Boon, J.A. 2004, "The role of knowledge management in e-Business and customer relationship management: South African case study findings", *International Journal of Information*, vol. 24, no. 1, pp. 73-86.
- du Plessis, M. 2007, "The role of knowledge management in innovation", *Journal of Knowledge Management*, vol. 11, no. 4, pp. 20-29.
- Dulipovici, A. & Baskerville, R. 2007, "Conflicts between privacy and property: The discourse in personal and organizational knowledge", *The Journal of Strategic Information Systems*, vol. 16, no. 2, pp. 187-213.
- Duncan, M. 2009, *Islamic Finance 2009*, International Finance Service London (IFSL) Research, UK.
- Earl, M. 2001, "Knowledge management strategies: Toward a taxonomy", *Journal of Management Information Systems*, vol. 18, no. 1, pp. 215-233.
- Easterby-Smith, M. & Lyles, M. 2003, *Blackwell Handbook of Organizational Learning and Knowledge Management*, Blackwell, Oxford.
- Easterby-Smith, M. & Prieto, I.M. 2008, "Dynamic capabilities and knowledge management: an integrative role for learning?", *British Journal of Management*, vol. 19, no. 3, pp. 235-249.
- Easterby-Smith, M., Thorpe, R. & Jackson, P., R. 2008, *Management Research*, Third edn, SAGE Publication Ltd., UK.
- Egypt State Information Service 2009, "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.
- Eris, E. & Saatcioglu 2006, "A system look for technological innovation: Form based perspective", *European and Mediterranean Conference on Information Systems (AMCIS)* Sosta Blanca, Alicante, Spain, 6-7 July.
- Ettlie, J.E., 1995, "Product-process development integration in manufacturing", *Management Science*, vol. 41, no. 7, pp. 1224-1237.

- Ettlie, J.E. & Reza, E.M. 1992, "Organizational integration and process innovation", *Academy of Management Journal*, vol. 35, no. 4, pp. 795-827.
- Fagerberg, J., Mowery, D. & Nelson, R. 2005, *The Oxford Handbook of Innovation*, Oxford University Press, Oxford.
- Faniel, I.M. & Majchrzak, A. 2007, "Innovating by accessing knowledge across departments", *Decision Support Systems*, vol. 43, no. 4, pp. 1684-1691.
- Ferguson, P.R. & Ferguson, G.J. 1994, *Industrial Economics: Issues and Perspectives*, Second edn, Palgrave, New York.
- Field, A. 2009, *Discovering Statistics Using SPSS* Third edn, SAGE Publications Ltd, UK.
- Floyd, J. & Fowler, J. 2009, *Survey Research Methods*, Fourth edn, SAGE Publications Ltd., UK.
- Fourie, L. & Cloete, E. 2004, "The value of concept maps for knowledge management in the banking and insurance industry: A German case study", *The international Conference on Concept Mapping*, Pamplona- Spain.
- Frei, F., Harker, P. & Hunter, L. 1998, *Innovation in retail banking*, Financial Institute Center, The Wharton School, University of Pennsylvania, USA.
- Frenz, M. & Ietto-Gillies, G. 2009, "The impact on innovation performance of different sources of knowledge: Evidence from the UK Community Innovation Survey", *Research Policy*, vol. 38, no. 7, pp. 1125-1135.
- Fuller, S. 2002, *Knowledge management foundations*, MA: Butterworth-Heinemann, Boston.
- Gadrey, J., Gallouj, F. & Weinstein, O. 1995, " New modes of innovation: how services benefit industry ", *International Journal of Service Industry Management*, vol. 6, no. 3, pp. 4-16.
- Gandhi, S. 2004, "Knowledge management and reference services", *The Journal of Academic Librarianship*, vol. 30, no. 5, pp. 368-381.
- García-Muiña, F.E., Martián-de-Castro, G. & Lopez-Saez, P. 2002, "The knowledge - creation process, a critical examination of the SECI model", *The Third European Conference on Organizational Knowledge Learning and Capability*, 5-6 April.

- Garvey, B. & Williamson, B. 2002, *Beyond Knowledge Management: Dialogue, Creativity and the Corporate Curriculum*, First edn, Prentice Hall, UK.
- Ghuri, P. & Gronhaug, K. 2010, *Research Methods in Business Studies*, Fourth edn, Pearson Education Limited, UK.
- Gherardi, S. 2006, *Organizational Knowledge: The Texture of Workplace Learning*, Blackwell, UK.
- 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.
- Global Investment House 2008, *Egypt Banking Sector: Heating Competition*, Global Investment House, Kuwait.
- Goffin, K. & Pfeiffer, R. 1999, *Innovation Management in UK and German Manufacturing Companies*, Anglo-German Foundation for the Study of Industrial Society, London.
- Goman, C.K. 2004, "Five reasons people do not share", *HR Magazine*, vol. 49, no. 5.
- Gopalkrishnan, S. & Damanpour, F. 1997, "A review of innovation research in economics, sociology and technology", *International Journal of Management Science*, vol. 25, no. 1, pp. 15-28.
- Gourlay, S. 2006, "Conceptualizing knowledge creation: a critique of Nonaka's theory", *Journal of Management Studies*, vol. 43, no. 7, pp. 1415-1436.
- Grant, K. & Grant, C. 2008, "The knowledge management capabilities of the major Canadian financial institutions", *The international Conference on Knowledge Management*.
- Grant, R.M. 1996, "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, vol. 17, no. Special issue, pp. 109-122.
- Greiner, M., Böhmman, T. & Krcmar, H. 2007, "A strategy for knowledge management", *Journal of Knowledge Management*, vol. 11, no. 6, pp. 3-15.

- Groschl, S. & Doherty, L. 2006, "The complexity of culture: Using the appraisal process to compare French and British managers in a UK-based international hotel organisation", *Hospitality Management*, vol. 25, pp. 313-334.
- 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*, June, available from: <http://www.tlinc.com/articl51.htm>
- Hair, J.F., Black, W.C. & Babin, B.J. 2010, *Multivariate data analysis*, 7th edn, Upper Saddle River, NJ: Prentice Hall, New Jersey.
- Hall, R. & Andriani, P. 2002, "Managing knowledge for innovation", *Long Range Planning*, vol. 35, pp. 29-48.
- Handzic, M. & Chaimungkalanont, M. 2004, "Enhancing organisational creativity through socialisation", *Electronic Journal of Knowledge Management*, [Online], vol. 2, no. 1, pp. 57-64. Available from: www.eikm.com.
- Hansen, M.T., Nohria, N. & Tierney, T. 1999, "What's your strategy for managing knowledge", *Harvard Business Review*, vol. March-April, pp. 106-116.
- Hargadon, A. & Sutton, R. 1997, "Technology brokering and innovation in a product development firm", *Administrative Science Quarterly*, vol. 42, no. 4, pp. 716-749.
- Hatten, K. & Rosenthal, S. 2000, "Creating knowledge through experiments", *Knowledge Management Review*, vol. 3, no. 4, pp. 12-14.
- Heffner, M. & Sharif, N. 2008, "Knowledge fusion for technological innovation in organizations", *Journal of Knowledge Management*, vol. 12, no. 2, pp. 79-93.
- Helfat, C.E. & Raubitschek, R.S. 2003, "Product sequencing: Co-evolution of knowledge capabilities, and products" in *The SMS Blackwell Handbook of Organizational Capabilities: Emergence, Development, and Change*, ed. C.E. Helfat, Blackwell Publishing, Oxford, pp. 193-217.
- Herve, A. 2003, "Factor rotation in factor analyses", *Program in Cognition and Neuroscience*, The university of Taxes, USA.

- Hicks, R., Dattero, R. & Galup, S. 2007, "A metaphor for knowledge management: Explicit islands in a tacit sea", *Journal of Knowledge Management*, vol. 11, no. 1, pp. 5-16.
- Hobday, M. 2005, "Firm-level innovation models: Perspectives on research in developed and developing countries", *Technology Analysis & Strategic Management*, vol. 17, no. 2, pp. 121-146.
- Hofstede, G. & Hofstede, G. 2005, *Cultures and Organizations: Software of the Mind*. 2nd edn, McGraw-Hill, New York.
- Holland, J. 2010, "Banks, knowledge and crisis: A case of knowledge and learning failure", *Journal of Financial Regulation and Compliance*, vol. 18, no. 2, pp. 87-105.
- Holsapple, C.W. 2003, "Knowledge and its attributing" in *Handbook on Knowledge Management I Knowledge Matters*, ed. C.W. Holsapple, Volume 1 edn, Springer-Verlag, Berlin, pp. 165-189.
- Holt, D.T., Armenakis, A.A., Feild, H.S. & Harris, S.G. 2007, "Readiness for organizational change: The systematic development of a scale, 43(2): 232-255.", *Journal of Applied Behavioural Science*, vol. 43, no. 2, pp. 232-255.
- Hong, J. 2010, "Nonaka's knowledge creation model: Universal or particularistic?", *International Conference on Organizational Learning, Knowledge and Capabilities (OLKC)* Boston.
- Huang, J.C. & Wang, S.F. 2002, "Knowledge conversion abilities and knowledge creation and innovation: A new perspective on team composition", *The Third European Conference on Organizational Knowledge, Learning and Capabilities (OLKC)*, Athens Laboratory of Business Administration (ALBA), Athens, Greece, 5-6 April.
- 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.
- International Finance Corporation 2009, *The Middle East and North Africa Business Report*, International Finance Corporation (IFC), USA.
- Jantunen, A. 2005, "Knowledge-processing capabilities and innovative performance: an empirical study", *European Journal of Innovation Management*, vol. 8, no. 3, pp. 336-349.

- Jashapara, A. 2011, *Knowledge Management: An Integrated Approach*, Second edn, Pearson Education Limited, UK.
- Jason, O. & Waters, E. 2002, "Four Assumptions of Multiple Regression that Researchers Should Always Test", *Practical Assessment, Research & Evaluation*, [Online], vol. 8, no. 2. Available from: <http://pareonline.net/getvn.asp?v=8&n=2>. [October 17, 2011].
- Jayasundara, C. 2009, "Knowledge management in banking industries: Uses and opportunities", *Journal of the University Librarians Association of Sri Lanka*, vol. 12.
- Jesús, C., Florin, J., Perez, L. & Whitelock, J. 2011, "Inter-firm market orientation as antecedent of knowledge transfer, innovation and value creation in networks", *Management Decision*, vol. 49, no. 3, pp. 444-467.
- Johannessen, J.A., Olsen, B. & Olaisen, J. 1999, "Aspects of innovation theory based on knowledge management", *International Journal of Information Management*, vol. 19, no. 2, pp. 121-139.
- John, N. & Lee-Ross, D. 1998, *Research Methods in Services Industry Management*, Thomson Learning, USA.
- Johne, A. & Storey, C. 1998, "New service development: A review of the literature and annotated bibliography", *European Journal of Marketing*, vol. 32, no. 3/4, pp. 184-151.
- Johnson, B., Lorenz, E. & Lundvall, B. 2002, "Why all this fuss about codified and tacit knowledge?", *Industrial and Corporate Change*, vol. 11, no. 2, pp. 245-262.
- Jonsson, A. 2008, "A transnational perspective on knowledge sharing: Lessons learnt from IKEAs entry into Russia, China and Japan", *The International Review of Retail, Distribution and Consumer research*, vol. 18, no. 1, pp. 17-44.
- Kalling, T. 2003, "Knowledge management and the occasional links with performance", *Journal of Knowledge Management*, vol. 7, no. 3, pp. 67-81.
- Kamasak, R. & Füsün Bulutlar 2010, "The influence of knowledge sharing on innovation", *European Business Review*, vol. 22, no. 3, pp. 306-317.
- 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.

- Kao, S., Wu, C. & Su, P. 2011, "Which mode is better for knowledge creation?", *Management Decision*, vol. 49, no. 7, pp. 1037-1060.
- Karkouljian, 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.
- Kaufmann, G. 2004, "Two kinds of creativity - but which ones?", *Creativity & Innovation Management*, vol. 13, no. 3, pp. 154-165.
- Keizer, J. & Halman, J. 2007, "Diagnosing risk in radical innovation projects", *Research Technology Management*, vol. 50, no. 5, pp. 30-36.
- Khorakian, A. 2011, *Developing a Conceptual Framework for Integrating Risk Management in the Innovation*, PhD edn, University of Stirling, UK.
- Kleinbaum, D.G., Kupper, L.L., Nizam, A. & Muller, K.E. 2008, *Applied Regression Analysis and Other Multivariable Methods*, Fourth edn, Thomson Learning Inc., USA.
- Koberg, C.S., Detienne, D.R. & Heppard, K.A. 2003, "An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation", *Journal of High Technology Management Research*, vol. 14, no. 1, pp. 21-45.
- Konstantinou, E. 2008, *Knowledge Management in A Global Setting: A Critique of Knowledge Transfer and the Role of Knowledge Workers*, PhD edn, University of Stirling, UK.
- Kridan, A., Belaid & Goulding, J., Steven 2006, "A case study on knowledge management implementation in the banking sector", *The Journal of Information and Knowledge Management systems*, vol. 36, no. 2, pp. 211-222.
- Kruger, N. 2008, *Knowledge management and maturity from a strategic/managerial perspective*, PhD edn, University of Pretoria, South Africa.
- Krzanowski, W. 2000, *Principles of Multivariate Analysis: A User's Perspective*, Second edn, Oxford University Press, USA.
- Kubo, L. & Saka, A. 2002, "An inquiry into motivations of knowledge workers in the Japanese financial industry", *Journal of Knowledge Management*, vol. 6, no. 30, pp. 262-271.

- Kubo, L., Saka, A. & Pam, S., L. 2001, "Behind the scenes of knowledge sharing in a Japanese bank", *Human Resource Development International*, vol. 4, no. 4, pp. 465-485.
- 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.
- Lawson, B., Petersen, K.J., Cousins, P.D. & Handfield, R.B. 2009, "Knowledge sharing in inter organizational product development teams: The effect of formal and informal socialization mechanisms", *Journal of Product Innovation Management*, vol. 26, no. 2, pp. 156-172.
- Levina, N. 1999, *Knowledge and Organizations Literature Review: 1994-1999* [Homepage of SSRN], [Online]. Available: <http://ssrn.com/abstract=1269036> or doi:10.2139/ssrn.1269036.
- Li, M. & Gao, F. 2003, "Why Nonaka highlights tacit knowledge: A critical review", *Journal of Knowledge Management*, vol. 7, no. 4, pp. 6-14.
- 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.
- Lievens, A., Moenaert, R. & S'Jegers, R. 1999, "Linking communication to innovation success in the financial services industry: A case study analysis", *International Journal of Service*, vol. 10, no. 1, pp. 23-47.
- Lin, Y. & Lee, H. 2012, "Developing project communities of practice-based knowledge management system in construction", *Automation in Construction*, vol. 22, pp. 422-432.
- Lin, H.F 2007, "Knowledge sharing and firm innovation capability: An empirical study", *International Journal of Manpower*, vol. 28, no. 3, pp. 315-332.
- Lin, W.B. 2008, "The effect of knowledge sharing model", *Expert Systems with Application*, vol. 34, no. 2, pp. 1508-1521.
- Litwin, M., S 1995, *How to Measure Survey Reliability and Validity*, SAGE, UK.
- Liyanage, C., Elhag, T., Ballal, T. & Li, Q. 2009, "Knowledge communication and translation – a knowledge transfer model", *Journal of Knowledge Management*, vol. 13, no. 3, pp. 118-131.

- López-Sáez, P. José, E.N., Martín-de-Castro, G. & Cruz-González, J. 2010, "External knowledge acquisition processes in knowledge-intensive clusters", *Journal of Knowledge Management*, vol. 14, no. 5, pp. 690-707.
- Lundvall, B. & Nielsen, P. 2007, "Knowledge management and innovation performance", *International Journal of Manpower*, vol. 28, no. 3, pp. 207-223.
- Lyude, A. 2007, "Of knowledge creation literature: Some issues in theoretical and methodological foundation", Available from:
http://dspace.lib.niigatau.ac.jp:8080/dspace/bitstream/10191/6395/1/01_0049.pdf, vol. 38, pp. 165-177.
- Maier, R. & Remus, U. 2003, "Implementing process-oriented knowledge management strategies", *Journal of Knowledge Management*, vol. 7, no. 4, pp. 62-74.
- María, P.S. & Bueno, E. 2007, "Knowledge creation in strategy-making: Implications for theory and practice", *European Journal of Innovation Management*, vol. 10, no. 3, pp. 367-390.
- Mårtensson, M. 2000, "A critical review of knowledge management as a management tool", *Journal of Knowledge Management*, vol. 4, no. 3, pp. 204-216.
- Marjorie, A. 1997, *Nonparametric Statistics for Health Care Research*, SAGE Publications, London.
- Markatou, M. 2011, "Innovation and knowledge creation in Greece: An analysis based on patent data", *Journal of Innovation and Business Best Practice*, vol. 2011.
- Martín-de-Castro, G., López-Sáez, P. & Navas-López, J.E. 2007, *Knowledge Creation Processes: Theory and Empirical Evidence from Knowledge – Intensive Firms*, Palgrave Macmillan, New York.
- 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.
- May, T. 2011, *Social Research Issues, Methods and Process*, Fourth edn, Open University Press, UK.
- Maylor, H. & Blackmon, K. 2005, *Researching Business and Management*, Palgrave Macmillan, New York.

- McAdam, R. 2004, "Knowledge creation and idea generation: A critical quality perspective", *Technovation*, vol. 24, no. 9, pp. 697-705.
- McSweeney, B. 2002, "Hofstede's model of national cultural differences and their consequences: A triumph of faith – a failure of analysis", *Human Relations*, vol. 55, no. 1, pp. 89-118.
- Medibtikar 2009, *General Economic Profile of Egypt*, www.medibtikar.eu.
- Menon, T. & Pfeffer, J. 2003, "Valuing Internal vs. External Knowledge: Explaining the Preference for Outsiders", *Management Science*, vol. 49, no. 4, pp. 497-513.
- Merx-Chermin, M. & Nijhof, W.J. 2005, "Factors influencing knowledge creation and innovation in an organisation", *Journal of European Industrial Training*, vol. 29, no. 2, pp. 135-147.
- Mikic, S., White, G.R.T. & Abd Razak, A. 2009, "A knowledge review: Implications for future research and practical application", *International Journal of Business and Management*, vol. 4, no. 1, pp. 26-31.
- Miles, I. 2011, "From knowledge-intensive services to knowledge-intensive service systems", *International Journal of Services Technology and Management (IJSTM)*, vol. 16, no. 2, pp. 141-159.
- Miles, J. 2001, *Research Methods & Statistics*, First edn, Crucial, UK.
- Miller, J., Daly, J., Wood, M., Roper, M. & Brooks, A. 1997, "Statistical power and its subcomponents – missing and misunderstood concepts in empirical software engineering research", *Information Software Engineering Technology*, vol. 39, pp. 285-295.
- Ministry of Finance 2008, *Egypt Economic Outlook*, Macro Fiscal Policy Unit-Ministry of Finance, Egypt.
- 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.
- Mohieldin, M. & Nasr, S. 2007, "On bank privatization: The case of Egypt", *The Quarterly Review of Economics and Finance*, vol. 46, pp. 707-725.

- Moore, B. & Wüstenhagen, R. 2004, "Innovative and sustainable energy technologies: The role of venture capital", *Business Strategy and the Environment*, vol. 13, no. 4, pp. 235-245.
- Morgan, R., E., Cronin, E. & Severn, M. 1990, "Innovation in banking: New structures and systems", *Long Range Planning*, vol. 28, no. 3, pp. 91-100.
- Murray, P. & Myers, A. 1997, "The facts about knowledge", *Information Strategy*, vol. 2, no. 7, pp. 29-33.
- Myers, R.H. 2000, *Classical and Modern Regression with Applications*, Second edn, Duxbury Press, USA.
- National Bank of Egypt 2008, "Economic Bulletin", vol. 58, no. 3.
- Neuman, W.L. 2006, *Social Research Methods: Qualitative and Quantitative Approaches*, Sixth edn, Pearson Education, USA.
- Ng, P., Kiat, Goh, G., Guan & Eze, U., Cyril 2011, "The role of knowledge management in product development performance: A review", *Journal of Knowledge Management Practice*, vol. 12, no. 1.
- Nicolas, R. 2004, "Knowledge management impacts on decision making process", *Journal of Knowledge Management*, vol. 8, no. 1, pp. 20-31.
- Nieto, M. 2004, "Basic propositions for the study of the technological innovation process in the firm", *European Journal of Innovation Management*, vol. 7, no. 4, pp. 314-324.
- Nold III, H. 2011, "Merging knowledge creation theory with the six-sigma model for improving organizations: The continuous loop model", *International Journal of Management*, vol. 28, no. 2, pp. 469-477.
- Nonaka, I. 1994, "A dynamic theory of organizational knowledge creation", *Organization Science*, vol. 5, no. 1, pp. 14-37.
- Nonaka, I. 1991, "The knowledge creating company", *Harvard Business Review*, vol. 69, pp. 96-104.
- Nonaka, I. & Konno, N. 1998, "The concept of Ba: Building a foundation for knowledge creation", *California Management Review*, vol. 40, no. 3, pp. 40-54.

- 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. & Byosiere P. 2003, A Theory of Organizational Knowledge Creation: Understanding the Dynamic Process of Creating Knowledge. in *Handbook of Organizational Learning and Knowledge*, ed. M. Dierkers, Oxford University Press, Oxford, pp. 491-517.
- Nonaka, I. & Toyama, R. 2003, "The knowledge –creation theory revisited: Knowledge creation as a synthesizing process", *Knowledge management Research & Practice*, vol. 1, pp. 2-10.
- 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., von Krogh, G. & Voepel 2006, "Organizational knowledge creation theory: Evolutionary paths and future advances", *Organization Studies*, vol. 27, no. 8, pp. 1179-1208.
- Nunnally, J. 1978, *Psychometric Theory*, McGraw-Hill, New York.
- O' Conner, G.C. & McDermott, C.M. 2004, "The human side of radical innovation", *Journal of Engineering and Technology Management*, vol. 21, no. 1/2, pp. 11-30.
- O' Dell, C. & Grayson, C.J. 1998, *If only we knew what we know: The transfer of internal knowledge and best practice*, Free Press.
- Oke, A. 2007, "Innovation types and innovation management practices in service companies", *International Journal of Operations & Production Management*, vol. 27, no. 6, pp. 564-587.
- Oliver, S. & Kandadi, K.R. 2006, "How to develop knowledge culture in organizations? A multiple case study of large distributed organizations", *Journal of Knowledge Management*, vol. 10, no. 4, pp. 6-24.
- Oshri, I., Kotlarsky, J. & Willcocks, L.P. 2007, "Global software development: Exploring socialization and face-to-face meetings in distributed strategic projects", *Journal of Strategic Information Systems*, vol. 16, no. 1, pp. 25-49.

- Pan, S. & Scarborough, H. 1999, "Knowledge management in practice: An exploratory case study", *Technology Analysis & Strategic Management*, vol. 11, no. 3, pp. 359-374.
- Paulin, D. & Suneson, K. 2011, "Knowledge transfer, knowledge sharing and knowledge barriers - Three blurry terms in KM", *12th European Conference on Knowledge Management -ECKM*, ed. Franz Lehner and Klaus Bredl, Academic Publishing Limited, Reading, UK, 1-2 September, pp. 752-760.
- Peltokorpi, V., Nonaka, I. & Kodama, M. 2007, "NTT DoCoMo's Launch of I-Mode in the Japanese mobile phone market: A knowledge creation perspective ", *Journal of Management Studies*, vol. 44, no. 1, pp. 40-72.
- Petrescu, M., Popescu, D. & Sirbu, N. 2010, "Modelling a trust mechanism for knowledge sharing", *Review of International Comparative Management*, vol. 11, no. 5, pp. 779-806.
- Pham, T. 2008, *Intra-Organizational Knowledge Transfer Process in Vietnam's Information Technology Companies*, PhD edn, University of Fribourg, Switzerland.
- Ping, L. & Kebao, W. 2010, "Knowledge management in banks", *The International Conference on E-Business and E-Government (ICEE)*, Guangzhou, China, 7-9 May, pp. 1819-1822.
- Polanyi, M. 1966, *The Tacit Dimension*, Doubleday, New York.
- Polanyi, M. 1958, *Personal Knowledge: Towards a Post-Critical Philosophy*, Routledge & Kegan Paul Ltd, UK.
- 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.
- Ramalingam, B. 2005, "Implementing knowledge strategies: Lessons from international development agencies", *Overseas Development Institute: working paper 214* London, April.
- Reda, M. 2008, "Empirical study on efficiency and productivity of the banking industry in Egypt", *The African Economic Conference*, 16-18 December, pp. 55-88.
- Refaey, M. 2002, "Knowledge management: Evaluating the role of socialization, externalization, internalization and combination processes and its effect on the

- innovation process - An empirical study on the pharmaceutical sector in Egypt", *Commercial Studies & Researches Journal, Faculty of Commerce-Banha (Egypt)*, vol. 2, pp. 30-53.
- Render, B., Stair, R. & Hanna, M. 2011, *Qualitative Analysis for Management: Global Edition*, 11th edn, Pearson Education, UK.
- 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.
- Richardson, J. 2002, *Handbook of Qualitative Research Methods for psychology and Social Sciences*, Blackwell Publishing, USA.
- Richtnér, A. & Åhlström, P. 2010, "Top management control and knowledge creation in new product development", *International Journal of Operations & Production Management*, vol. 30, no. 10, pp. 1006-1031.
- Rodrigues, 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.
- Rogers, E.M. 2003, *Diffusion of Innovations*, Fifth edn, Free Press, New York.
- Rogers, M. 1998, "The definition and measurement of innovation", *Melbourne Institute Working Paper*, vol. 10/98, pp. 1-27.
- Rose, D. & Sullivan, O. 1993, *Introducing Data Analysis for Social Scientists*, Open University Press, Buckingham.
- Ruggles, R. & Little, R. 1997, *Knowledge management and innovation – an initial exploration*, White Paper edn, Ernst & Young LLP., London
- Saenz, J., Aramburu, N. & Rivera, O. 2009, "Knowledge sharing and innovation performance; A comparison between high-tech and low-tech companies", *Journal of Intellectual Capital*, vol. 10, no. 1, pp. 22-36.
- Sanchez, R. 2003, *Knowledge management and organizational competence*, Oxford University Press, London.

- Sarantakos, S. 2005, *Social Research*, Third edn, Palgrave Macmillan, USA.
- Saunders, M., Lewis, P. & Thornhill, A. 2009, *Research Methods for Business Students*, Fifth edn, Pearson Education Ltd, UK.
- Scarborough, H. & Lannon, R. 1989, "The management of innovation in the financial services sector", *Journal of Marketing Management*, vol. 5, no. 1, pp. 51-62.
- Scarborough, H. & Swan, J. 2001, " Explaining the diffusion of knowledge management: The role of fashion", *British Journal of Management*, vol. 12, no. 1, pp. 3-12.
- Schmickl, C. & Kieser, A. 2008, "How much do specialists have to learn from each other when they jointly develop radical product innovations? ", *Research Policy*, vol. 37, no. 3, pp. 473-491.
- Schulze, A. & Hoegl, M. 2008, "Organizational knowledge creation and the generation of new product ideas: A behavioral approach", *Research Policy*, vol. 37, no. 10, pp. 1742-1750.
- Seidler-de Alwis, R. & Hartmann, E. 2008, "The use of tacit knowledge within innovative companies: Knowledge management in innovative enterprises", *Journal of Knowledge Management*, vol. 12, no. 1, pp. 133-147.
- Sekaran, U. & Bougie, R. 2010, *Research Methods for Business: A Skill Building Approach*, Fifth edn, John Wiley & Sons, UK.
- 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.
- Silva Karkoulian, Leila A. Halawi & Richard V. McCarthy 2008, "Knowledge management formal and informal mentoring: An empirical investigation in Lebanese banks", *Learning Organization*, vol. 15, no. 5, pp. 409-420.
- Singh, M.D., Shankar, R., Narain, R. & Kumar, A. 2006, "Survey of knowledge management practices in Indian manufacturing industries", *Journal of Knowledge Management*, vol. 10, no. 6, pp. 110-118.
- Sirkin, R. 1995, *Statistics for the Social Science*, SAGE, UK.
- Smith, A. 2004, "Towards effective knowledge management: Choosing the right strategy", *Strategic Decision*, vol. 20, no. 11, pp. 14-16.

- Smith, D. 2006, "Designing an innovative Britain", *ESRC: The Edge*, vol. 22, pp. 2.
- Smith, E.A. 2001, "The role of tacit and explicit knowledge in the workplace", *Journal of Knowledge Management*, vol. 5, no. 4, pp. 311-321.
- Smith, K.G., Collins, C.J. & Clark, K.D. 2005, "Existing knowledge, knowledge creation, capability, and the rate of new product information in high-technology firms", *Academy of Management Journal*, vol. 48, no. 2, pp. 346-357.
- Snowden, D. 2003, "Complex acts of knowing: Paradox and descriptive self-awareness", *Bulletin of the American Society for Information Science and Technology*, vol. 29, no. 4, pp. 23-28.
- Song, X.M., di Benedetto, C.A & Zhao, Y.L. 1999, "Pioneering advantages in manufacturing and service industries: Empirical evidence from nine countries", *Strategic Management Journal*, vol. 20, no. 9, pp. 811-836.
- Soo, C.W., Midgley, D. & Devinney, T.M. 2002, "The process of knowledge creation in organizations", *Organization Science*, pp. 1-42.
- Sørensen, C. & Snis, U. 2001, "Innovation through knowledge codification", *Journal of Information Technology*, vol. 16, no. 2, pp. 83-97.
- Spithoven, A., Frantzen, D. & Clarysse, B. 2010, "Heterogeneous firm-effects of knowledge exchanges on product innovation: Differences between dynamic and lagging product innovators", *Journal of Product Innovation Management*, vol. 27, pp. 362-381.
- Squier, M. & Snyman, R. 2004, "Knowledge management in three financial organisations; A case study", *Aslib Proceedings: New Information Perspectives*, vol. 56, no. 4, pp. 234-242.
- Stephen A.W., D. 1995, "Accelerating innovation in financial services", *Long range planning*, vol. 28, no. 4, pp. 1-21.
- Stevens, J. 2009, *Applied Multivariate Statistics for the Social Sciences*, Fifth edn, Routledge Academic, UK.
- Stevens, J. 2002, *Applied Multivariate Statistics for The Social Sciences*, Fourth edn, Lawrence Erlbaum Associates (LEA), London.
- Storey, C. & Kelly, D. 2002, "Innovation in service: the need for knowledge management", *Australian Marketing Journal*, vol. 10, no. 1, pp. 59-79.

- Subramaniam, M. & Youndt, M. 2005, "The influence of intellectual capital on types of innovation capabilities", *Academy of Management Journal*, vol. 48, no. 3, pp. 450-463.
- Swan, J.A. 2007, "Managing Knowledge for Innovation: Production, Process and Practice" in *Re-thinking knowledge management: From knowledge objects to knowledge processes*, eds. C.R. McInerny & R. Day, Springer, USA, pp. 147-169.
- Swan, J.A., Scarbrough, H. & Preston, J. 1999, "Knowledge management – the next fad to forget people?", *7th European Conference on Information Systems* Copenhagen, Denmark, 23-25 June, pp. 668-678.
- Swan, J. & Newell, S. 2000, "Linking knowledge management and innovation", 8th *European Conference on Information Systems*, ed. H.R. Hansen, M. Bichler. & H. Mahrer, Vienna University, Vienna, pp. 591-608
- Tabachnick, B.G. & Fidell, L.S. 2007, *Using Multivariate Statistics*, Fifth edn, Pearson Education, USA.
- Tan, C.L. & Nasurdin, A.M. 2010, "Knowledge management effectiveness and technological innovation: An empirical study in the Malaysian manufacturing industry", *Journal of Mobile Technologies, Knowledge and Society*, 13 pages, <http://www.ibimapublishing.com/journals/JMTKS/2010/428053/428053.pdf>.
- Tan, N., Ling, L.Y., Ng, H.T. & Lim, Y.S. 2010, "Motivational factors in influencing knowledge sharing among banks in Malaysia", *International Research Journal of Finance and Economics*, no. 44, pp. 186-196.
- Teece, D.J. 1998, "Capturing value from knowledge assets: New economy, market for know-how and intangible assets", *California Management Review*, vol. 40, no. 3, pp. 55-79.
- Teece, D.J. 1986, "Profiting from technological innovation: Implications for the integration, collaboration, licensing and public policy", *Research Policy*, vol. 15, pp. 285-305.
- The Community Innovation Survey (CIS) 2006, Available: <http://www.forfas.ie/media/091221forfas-cso-community-innovation-survey-2006-2008-first-findings.pdf>.
- The Egyptian-British Chamber of Commerce 2009, *Report on Islamic Banking in the UK and Egypt*, The Egyptian-British Chamber of Commerce, London.

- The International Monetary Fund 2011, *World Economic Outlook*, International Monetary Fund, Publication Services, USA.
- The United Nations University- Institute for New Technology 2004, Available: <http://www.merit.unu.edu/>.
- Tian, J., Nakamori, Y. & Wierzbicki, A.P. 2009, "Knowledge management and knowledge creation in academia: A study based on surveys in a Japanese research university", *Journal of Knowledge Management*, vol. 13, no. 2, pp. 76-92.
- Tidd, J., Bassant, J. & Pavitt, K. 2005, *Managing Innovation: Integrating Technological, Market and Organizational Change*, Third edn, John Wiley & Sons., UK.
- Tong, J. & Mitra, A. 2009, "Chinese cultural influences on knowledge management practice", *Journal of Knowledge Management*, vol. 13, no. 2, pp. 49-62.
- Treiman, D., J. 2009, *Quantitative Data Analysis: Doing Social Research to Test Ideas*, Jossey-Bass, USA.
- Triki, A. & Mjahed, S. 2008, "Knowledge management practices in the business context: A focus on complaint management in the banking sector", *Equity and Economic Development- ERF 15th Annual Conference*, Economic Research Forum, Cairo, Egypt, pp. 1-21.
- Tsai, M. & Li, Y. 2007, "Knowledge creation process in new venture strategy and performance", *Journal of Business Research*, vol. 60, pp. 371-381.
- Tsai, M., Chuang, S. & Hsieh, W. 2008, "Using analytic hierarchy process to evaluate organizational innovativeness in high-tech industry", *Decision Sciences Institute 2008 Annual Meeting (DSI)*, vol. Nov. 25, no. Baltimore, Maryland, USA, pp. 1231-1236.
- Tsai, W. 2001, "Knowledge transfer in intra-organizational networks: Effect of networks: effects of network position and absorptive capacity on business innovation and performance", *Academy of Management Journal*, vol. 44, no. 5, pp. 966-1004.
- Tseng, M. 2009, "A study on customer, supplier, and competitor knowledge using the knowledge chain model", *International Journal of Information Management*, vol. 29, no. 6, pp. 488-496.

- Tsoukas, H. 2003, "Do we really understand tacit knowledge?" in *The Blackwell handbook of Organisational Learning and Knowledge Management.*, eds. M. Easterby-Smith & M.A. Lyles, Blackwell Publishing, Oxford, pp. 410-428.
- Tsoukas, H. 1996, "The firm as a distributed knowledge system: A constructionist approach", *Strategic Management Journal*, vol. 17, Winter Special Issue, pp. 11-25.
- Tsoukas, H. & Vladimirou, E. 2001, "What is organizational knowledge?", *Journal of Management Studies*, vol. 38, no. 7, pp. 973-993.
- Tuomi, I. 1999, "Data is more than knowledge: Implications of the reversed knowledge hierarchy to knowledge management and organizational memory", *The 32nd Hawaii International Conference on Systems Sciences*, Computer Society Press, USA.
- Tushman, M.L. & Anderson, P. 1986, "Technological discontinuities and organizational environments", *Administrative Science Quarterly*, vol. 31, no. 3, pp. 439-465.
- Tylecote, A. & Tarhan, S. 2000, *Innovation in banking: A review form the point of view of corporate governance*, Research Project edn, European Commission, University of Sheffield, Sheffield.
- UK Innovation Survey 2001, Available:
http://www.statistics.gov.uk/articles/economic_trends/UK_innovation_survey.pdf.
- Utterback, J.M. 1994, *Mastering the Dynamics of Innovation: How Companies Can Seize Opportunities in the Face of Technology Change*, Harvard Business School, Boston.
- Utterback, J.M. & Abernathy, W.J. 1975, "A dynamic model of process and product innovation", *Omega, The International Journal of Management Science*, vol. 3, no. 6, pp. 639-656.
- Vaccaro, A., Ve Loso, F. and Brusoni, S. 2009, "The impact of virtual technologies on knowledge-based processes: An empirical study", *Research Polices*, vol. 38, no. 8, pp. 1278-1287.
- Vencatachellum, I. & Jeetah, V. 2008, "The state of knowledge management among the commercial banks in Mauritius", *9th International Conferences on HRD Research and Practice across Europe*, Lille, France, May 2008.

- Vermeuln, p. & Dankbaar, B. 2002, "The organisation of product innovation in the financial sector", *The Service Industries Journal*, vol. 22, no. 3, pp. 77-98.
- von Krogh, G., Nonaka, I. & Rechsteiner, L. 2012, "Leadership in organisational knowledge creation: A review and framework", *The Journal of Management Studies*, vol. 49, no. 1, pp. 240-277.
- Wallace, D. 2007, *Knowledge Management: Historical and Cross-Disciplinary Themes*, Second edn, Libraries Unlimited Inc, USA.
- Weilemaker, M.W., Volberda, H.W., Elfring, T. & Baden, F.C. 2003, "The conditioning and knowledge-creating view: Managing strategic initiatives in large firms" in *Strategy Process: Shaping the Contours of the Field*, eds. B. Chakravarity & G. Mueller-Stevens, Blackwell Publishing, Oxford, pp. 164-190.
- Wenger, E., McDermott, W. & Snyder, W. 2002, *Cultivating communities of practice: A guide to managing knowledge*, Harvard Business School Press, Boston.
- 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.
- Wiig, K.M. 1997, "Knowledge Management: An Introduction and Perspective", *Journal of Knowledge Management*, vol. 1, no. 1, pp. 6-14.
- Williamson, D. 2002, "Forward from a critique of Hofstede's model of national culture", *Human relations*, vol. 55, no. 11, pp. 1373-1395.
- Winiwarter, W. 2011, "Automatic linguistic knowledge acquisition for the web", *International Journal of Web Information Systems*, vol. 7, no. 1, pp. 18-43.
- Winter, S.G. 1987, "Knowledge and competence as strategic assets" in *The competitive challenge Strategic for industrial innovation and renewal*, ed. D.J. Teece, Ballinger, Cambridge, pp. 159-184.
- World Bank 2008, *2008 Annual Report: The Investment Climate Advisory Service*, World Bank.
- Wu, C. 2008, "Knowledge creation in a supply chain", *Supply Chain Management: An international Journal*, vol. 13, no. 3, pp. 241-250.

- Xu, J., Rémy H., Caillaud, E. & Mickaël, G. 2010, "Macro process of knowledge management for continuous innovation", *Journal of Knowledge Management*, vol. 14, no. 4, pp. 573-591.
- Yamagata, K. 2002, *Knowledge Management in Banking Industry: Comparative Analysis between U.S. and Japan*, Master edn, Massachusetts Institute of Technology, USA.
- Yang, J. & Rui, M. 2009, "Turning knowledge into new product creativity: An empirical study", *Industrial Management & Data Systems*, vol. 109, no. 9, pp. 1197-1210.
- Yavuz, E.M. & Heidelman, D. 1999, *Knowledge management: The office water cooler of the 21st century*, 34th edn, Medical Marketing & Media (MM&M), New York.
- Yin, R., K. 2009, *Case Study Research Design and Methods*, Fourth edn, SAGE Ltd., UK.
- Zack, M.H. 1999, "Managing codified knowledge", *Sloan Management review*, vol. 40, no. 4, pp. 45-58.

Appendix1: Survey questionnaire

Dear sir/madam

I am Nasser Easa, PhD student, University of Stirling, UK, and assistant lecturer at Suez Canal University. I am currently conducting a survey on knowledge management and innovation in the Egyptian banking sector as the central part of my PhD research.

Interest in knowledge management has been growing rapidly. The ability to create and utilise knowledge in organisations is widely accepted as being important for competitiveness, and these central processes of knowledge management are likely to be important in banking as a major knowledge-intensive and customer oriented industry.

The survey is designed to examine some popular models of knowledge management and in particular its effect on innovation in Egyptian banks. The researcher aims to provide some suggestions for Egyptian banks to manage their knowledge more effectively and accordingly maximise innovation. These suggestions can also be used as a guide by banks or organisations in the Arab world or in developing countries.

I would be grateful if you could assist me in this effort by completing the attached copy of the questionnaire. This should only take approximately 20 minutes of your time. Please answer **all** questions in all sections by ticking the option that corresponds to the answer you deem the most appropriate.

Your responses should be based on your awareness of the present condition at your bank. Please avoid responding in terms of how things used to be or how they should be in the future. Your responses will be strictly confidential and individual participants will not be identified in any reports or publications. Only aggregate and average data will be used for statistical analysis. If you have any inquiry, please feel free contact me at: n.f.easa@stir.ac.uk.

Yours sincerely

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Questionnaire

Part one- Knowledge conversion processes

(A) Socialisation process: The following activities aim to increase and develop the personal (tacit) knowledge through others. Please show to what extent does your bank perform these activities?

	Activities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	The bank follows a systematic plan to rotate its staff across different departments.					
2	Detailed face-to-face discussions of work issues are encouraged in the bank.					
3	Involving the bank in joint projects supports staff's knowledge through face-to-face interaction with others.					
4	The bank conducts meetings, seminars, workshops to discuss the updating of work issues.					
5	The bank invites its qualified members and external experts to speak about their beliefs, values and culture.					
6	The bank encourages informal meetings for tea, coffee, having lunch and others.					
7	The bank encourages social activities outside the work place.					

(B) Externalisation process: The following activities aim to document the personal (tacit) knowledge. Please show to what extent does your bank perform these activities?

	Activities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	The bank documents its staff's point of view regarding relevant topics.					
2	The bank asks its staff to report results of negotiation with customers.					
3	The bank documents the findings of conducted meetings, seminars, workshops, conferences and training programmes					
4	The bank issues reports of externals based on its cumulated experience.					
5	The bank establishes the topics of training programmes and seminars based on its qualified members and external experts.					
6	The bank documents the useful experiences of its qualified members into reports.					

(C) Combination process: The following activities aim to transfer or reformulate the available documented knowledge into other frames to be more useful. Please show to what extent does your bank perform these activities?

	Activities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	The bank classifies information mentioned in, databases, networks and reports.					
2	The bank updates its databases.					
3	The bank considers information mentioned in databases, networks, and previous reports to develop its rules and decisions.					
4	The bank uses documented information as a mean of connection between its staff, each to other and with external bodies e.g. customers, competitors, partners, or the government.					
5	The bank collects, classifies and informs its staff with reports and decisions issued by external bodies.					
6	The bank depends on the relevant published research and reports to develop its policies and aims.					

(D) Internalisation process: The following activities aim to gain new/ or develop current personal knowledge through the available documented knowledge. Please show to what extent does your bank perform these activities?

	Activities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	The bank encourages its staff to join postgraduate courses e.g. Diploma, Masters or PhD.					
2	The bank facilitates the access to outcomes or recommendations of training programmes, workshops and seminars.					
3	The bank facilitates the access to its databases and the internet to get required information.					
4	The bank arranges meetings to explain the content of related reports or documents.					
5	The bank arranges meetings to explain and analyse the relevant reports issued by customers, suppliers, competitors, partners, or government.					
6	The bank believes that the available data and information strongly shape its point of view and culture					

Part two- innovation

(A) Product innovation: The following activities indicate the ability to initiate new ideas, services and technologies. Please show to what extent does your bank performs these activities?

	Activities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	The bank follows a formal process to generate and nurture new ideas.					
2	The bank initiates the development of new services based on customers' needs and market trends.					
3	The bank applies new technologies and software to add new services and improve the quality of current services.					
4	The bank adopts new / non-traditional solutions to solve problems.					
5	The bank produces new services to improve customers' access to goods or services					
6	The bank introduces new or significantly improved services into the market before its competitors.					

(B) Process innovation: The following activities indicate the ability to initiate new or significantly improved organisational operations. Please show to what extent does your bank performs these activities?

	Activities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	The bank follows a formal process to keep on improving its services to customers.					
2	The bank tracks the relevant research studies to improve its processes.					
3	The bank follows flexible management strategies to deal with unexpected changes.					
4	The bank provides significant improvements in its structures, practices and techniques.					
5	The bank introduces more developed and distinctive strategies to manage its processes, in a comparison with competitors' strategies.					
6	The bank adopts new/ non-traditional marketing strategies in its promotions and services.					

Part three-Personal information

Bank name:

Position status:

Academic background.....

Department

Years of experience

Gender Male Female

Any additional comments.....

.....
.....
.....
.....
.....

Appendix 2: Semi-structured interview questions

Section one- Personal questions

Bank name:

Job title:

Academic background:

Department:

The main duties:

.....

Years of experience:

Section two-Type of knowledge

1. What kind of knowledge do you need to achieve your work effectively?
2. Where do you obtain this knowledge?
3. Is it obtained easily?
4. Do people ever refuse your knowledge or withhold their knowledge?
5. What would cause this to happen?

Section three-Socialisation process (tacit-tacit)

1. How good would you rate the level of informal discussion & dialogue between staff and colleagues? Why?
2. Do people share their knowledge (between groups, departments, up and down the hierarchy) freely in the bank?
3. Does the bank invite external specialists to participate in its seminars and workshops? How is this process done?

4. To what extent do these participations develop your personal knowledge? Please explain with examples?
5. Does your bank have a system of personnel rotation across departments? If yes, how does it work? And explain how does this system improve staff's knowledge?
6. How good would you rate the level of involving in discussions & dialogue with external agents? Why?
7. In your opinion, to what extent do these activities support innovation in your bank? Explain with examples?

Section four-Externalisation process (tacit-explicit)

1. How would the bank databases work as a way of capturing people's expert knowledge and documenting it?
2. Is the experience from projects learned by the bank captured in procedures and documents for the future work?
3. Does your bank have a formal process to achieve this? Explain with examples
4. To what extent does the bank benefit from people's expert knowledge to develop its formal training programmes?
5. Does your bank follow a formal process to achieve this? Please explain with examples?
6. In your opinion, to what extent do these activities support innovation in your bank? Explain with examples?

Section five-Combination process (explicit-explicit)

1. How does the bank keep on developing & updating its databases?
2. What are the main sources that your bank depends on to do this?
3. How does the bank deal with reports issued by external agents e.g. customers, competitors and others? Give examples?
4. Does the bank issue these reports in another format to acknowledge its staff?
How- give examples?
5. Does the bank add these reports to its databases?
6. In your opinion, to what extent do these activities support innovation in your bank? Explain with examples?

Section six-Internalisation process (explicit-tacit)

1. Does the bank encourage its staff to access its databases and the related external reports?
2. How do you gain access to these?
3. Does this action add knowledge to you? How?
4. Do you think that joining postgraduate courses are important to improve the personal knowledge of staff? Explain with examples?
5. Does the bank encourage its staff to join these courses?
6. If yes, what kinds of support does it provide? Give examples?
7. In your opinion, to what extent do these activities support innovation in your bank? Explain with examples

Section seven-Product innovation

1. How good do you rate the sources of obtaining new ideas: within the bank, customers, competitors and other external sources? Explain with examples?
2. How frequently are formal meeting held to discuss new ideas or and software?
3. From what level in the bank are ideas usually taken up? Are these ideas taken from one department or from a number of departments?
4. Does your bank have a special unit/ department to deal with innovation? Does the bank have a storage facility (knowledge bank) for new ideas?
5. To what extent is this used to introduce new services? Please give examples
6. To what extent can the bank obtain new product opportunities from day contact with customers? Please give examples
7. Does the bank provide particular encouragement for ideas or software which is put forward on the basis of perceived market opportunities?
8. Has your bank introduced new or significantly improved services or technologies in the recent years? Please give examples?

Section eight-Process innovation

1. Does the bank introduce major changes in management structure or integration of different departments or activities?
2. If yes, could you please give examples of these changes in the resent years?
3. To what extent have these changes improved the organisational work within the bank?

4. In the recent years, did the bank provide new techniques to help its staff to achieve their tasks easily and efficiently? please give examples?
5. Does the bank keep on improving its relationship with external agents e.g. customers, competitors, partners and others? How?
6. Does the bank keep on improving its marketing strategies and customer services methods? Explain with examples?
7. In the recent years, did the bank provide new techniques so that customers can get services easily and efficiently? Explain with examples?

Any other comments:

.....

.....

.....

Appendix 3: Major Egyptian banks³

1-Public sector banks

National Bank of Egypt (NBE)

National bank of Egypt is the largest bank in Egypt. NBE is Egypt's oldest commercial bank. It was established in June 25, 1898, with Capital of GBP 1 mn. On February 11, 1960, it was nationalised; maintain a general banking division and acting as an investment company. In July, 2007, The banker magazine ranked NBE third place among Arab banks and a first ahead all Egyptian banks. The NBE currently operates 423 branches in Egypt and has branches in the UAE, UK, China, South Africa, and USA.

Banque Misr (BM)

Banque Misr is the second largest and oldest bank in Egypt. It was established in 1920 by the leading Egyptian economist: Talat Harb. Its operations include the mobilisation domestic investments with many branches in Egypt, Lebanon, Germany and France. At the end of 2007, Banque Misr held equities in 176 projects aimed to serving the national economy in various fields. It has also established one of the largest investment funds in Egypt: the Money Market Fund" Youm Byoum Account" in Egyptian pound, Euros and Sterling.

Banque du Caire (BC)

Bank du Caire was established in 1952 as private bank owned by the Egyptian Investors group and in 1957, it was nationalised. The bank operates over 230 branches in Egypt and it has other branches in the UAE, Bahrain and Jordan. It also has representative offices in Ukraine, as well as affiliates or subsidiaries in Saudi Arabia, Uganda and Jordan. Bank du Caire, is a leading participant in the introduction of the micro-lending programme, which was launched in 2001 to provide finance for small and micro enterprises.

³ Sources: The American Chambers of Commerce in Egypt (2008, pp. 26-30)

2- Private sector banks

Commercial International Bank (CIB)

CIB is currently the largest private bank in Egypt. CIB was established in 1975 as a joint-venture between NBE (51%) and Chase Manhattan Bank (49%) under the name “Chase national bank of Egypt”. In 1987, Chase sold its equity stake to NBE. The shareholding of NBE increased to 99% and the bank changed its name to CIB (Egypt), but in 1993, NBE sold 57% of the bank’s Capital to Egyptian, Arab, and multinational investors. The bank is one of largest Egyptian banks in investment banking, brokerage and insurance. Over the last few years, CIB has added Commercial International Life Insurance (CIL), Corplease for Financial Leasing, and Egypt Factors Company to its affiliates. CIB Recorded a 47% rise in its profits for 2007, making it the country’s most profitable bank.

National Societe Generale Bank (NSGB)

NSGB was established in 1978 as a joint-venture investment bank. It was created by the French group SG and the NBE with. In 1990s, NBE sold 30% of capital to staff and SC acquired a majority stakes in NSGB (51%). In November 2006, the bank acquired 90.7% of shares in MI Bank, which was one of the biggest deals ever in the Egyptian banking sector. The main target for the bank is corporate banking, investment banking, and retail banking. Now, the bank is one of the largest Egyptian banks in retail banking.

Arab African International Bank (AAIB)

AAIB was established in 1964 under a special law promulgated by the president of Egypt (Gamal Abdel-Nasser) with \$100 mn in paid up capital. The AAIB is the first Arab multinational bank in Egypt. Its majority shareholders are Central Bank of Egypt and Kuwait Investment Authority; each holds 94.37% stake. The based currency of AAIB is the US Dollar. The bank created Egypt’s first international foreign exchange dealing room. It was also, the first to introduce credit cards and Smart cards. In 2007, it was awarded the title best Bank in Egypt by the Euromoney awards for excellence.

Appendix 4: Factor Analysis output

1- SECI processes

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.915
Bartlett's Test of Sphericity Approx. Chi-Square	3275.097
Df	300
Sig.	.000

Total Variance Explained

Component	Initial Eigenvalues		
1	11.039	44.158	44.158
2	1.661	6.645	50.802
3	1.309	5.235	56.037
4	1.169	4.677	60.714
5	1.093	4.371	65.085

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared		
				Loadings			Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.039	44.158	44.158	11.039	44.158	44.158	5.217	20.866	20.866
2	1.661	6.645	50.802	1.661	6.645	50.802	3.759	15.035	35.901
3	1.309	5.235	56.037	1.309	5.235	56.037	3.304	13.217	49.118
4	1.169	4.677	60.714	1.169	4.677	60.714	2.616	10.462	59.581
5	1.093	4.371	65.085	1.093	4.371	65.085	1.376	5.505	65.085
6	.969	3.876	68.961						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix^a

	Component				
	1	2	3	4	5
Personnel rotation				.675	
Face to face discussion					
Co-operative discussion				.836	
Meetings and workshops				.552	
Experts discussion	.548			.618	
Informal meeting					
Social activities					.848
Staff's point of view					
Negotiation with customers			.875		
Findings of meetings			.587		
Reports about externals			.608		
Training topics			.563		
Experience of experts					
Classification internal information		.808			
Updating databases		.794			
Polices development		.614			
Documented communication					
External reports justification		.518			
Published research		.505			
Related courses	.753				
Meetings outcomes access	.797				
Databases access	.628				
Documents content explanation	.744				
External reports explanation	.713				
Shaping culture	.583				

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

2- Innovation

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.924
Bartlett's Test of Sphericity	Approx. Chi-Square
	1660.043
	Df
	66
	Sig.
	.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.061	58.838	58.838	7.061	58.838	58.838
2	.866	7.215	66.053			

Extraction Method: Principal Component Analysis.

Component Matrix^a

	Component
	1
New ideas	.708
New services	.779
New technologies	.694
Non-traditional solutions	.817
New facilities	.747
Market leadership	.815
Service methods	.696
Process improvement	.838
Strategies management	.821
Structure changes	.732
Competitors strategies	.775
Marketing strategies	.764

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix 5: Cronbach's Alpha output

Reliability Statistics (Socialisation)

Cronbach's Alpha	N of Items
.783	4

Reliability Statistics (Externalisations)

Cronbach's Alpha	N of Items
.800	4

Reliability Statistics (Combination)

Cronbach's Alpha	N of Items
.841	5

Reliability Statistics (Internalisation)

Cronbach's Alpha	N of Items
.917	6

Reliability Statistics (All SECI processes)

Cronbach's Alpha	N of Items
.934	19

Reliability Statistics (Product innovation)

Cronbach's Alpha	N of Items
.871	6

Reliability Statistics (Process innovation)

Cronbach's Alpha	N of Items
.890	6

Reliability Statistics (Innovation)

Cronbach's Alpha	N of Items
.933	12

Reliability Statistics (All research variables)

Cronbach's Alpha	N of Items
.962	31

Appendix 6: Normality distribution test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
	Socialisation	210	-2.83	1.93	.0000	1.00000	-.686	.168	-.242
Externalisation	210	-4.08	2.20	.0000	1.00000	-.878	.168	1.620	.334
Combination	210	-3.82	2.23	.0000	1.00000	-.615	.168	.603	.334
Internalisation	210	-3.43	1.96	.0000	1.00000	-.989	.168	1.179	.334
Innovation	210	-3.55	1.41	.0000	1.00000	-.874	.168	.591	.334
Valid N (listwise)	210								

Appendix 7: Regression output

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856 ^a	.733	.727	.52210

a. Predictors: (Constant), Socialisation, Externalisation, Combination, Internalisation

ANOVA^b

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	153.120	4	38.280	140.433	.000 ^a
	Residual	55.880	205	.273		
	Total	209.000	209			

a. Predictors: (Constant), Socialisation, Externalisation, Combination, Internalisation

b. Dependent Variable: Innovation

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.621E-16	.036		.000	1.000		
	Internalisation	.569	.036	.569	15.749	.000	1.000	.000
	Combination	.500	.036	.500	13.849	.000	1.000	.000
	Externalisation	.294	.036	.294	8.138	.000	1.000	.000
	Socialisation	.269	.036	.269	7.462	.000	1.000	.000

a. Dependent Variable: Innovation

Collinearity Diagnostics^a

Mode l	Dimensio n	Eigenval ue	Condition Index	Variance Proportions				
				(Constan t)	Internalisati on	Combinatio n	Externalisat ion	Socialisatio n
1	1	1.000	1.000	1.00	.00	.00	.00	.00
	2	1.000	1.000	.00	.00	.00	.00	1.00
	3	1.000	1.000	.00	.36	.43	.21	.00
	4	1.000	1.000	.00	.64	.29	.08	.00
	5	1.000	1.000	.00	.00	.28	.71	.00

a. Dependent Variable: Innovation

Appendix 8: Stepwise regression output

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Internalisation		Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Combination		Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Externalisation		Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	Socialisation		Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Innovation

Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.569 ^a	.323	.320	.82448
2	.757 ^b	.574	.570	.65612
3	.812 ^c	.660	.655	.58732
4	.856 ^d	.733	.727	.52210

a. Predictors: (Constant), Internalisation

b. Predictors: (Constant), Internalisation, Combination

c. Predictors: (Constant), Internalisation, Combination, Externalisation

d. Predictors: (Constant), Internalisation, Combination, Externalisation, Socialisation

Appendix 9: Pearson's correlation coefficients

Correlations

		Socialisation	Externalisation	Combination	Internalisation
Socialisation	Pearson Correlation	1	.517**	.486**	.596**
	Sig. (2-tailed)		.000	.000	.000
	N	210	210	210	210
Externalisation	Pearson Correlation	.517**	1	.629**	.631**
	Sig. (2-tailed)	.000		.000	.000
	N	210	210	210	210
Combination	Pearson Correlation	.486**	.629**	1	.763**
	Sig. (2-tailed)	.000	.000		.000
	N	210	210	210	210
Internalisation	Pearson Correlation	.596**	.631**	.763**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	210	210	210	210

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 10: Independent *t*-test output

Independent Samples Test (males-females)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Socialisation	Equal variances assumed	.297	.587	-.773	208	.440	-.16495	.21329	-.58544	.25554
	Equal variances not assumed			-.813	31.868	.422	-.16495	.20285	-.57820	.24830
Externalisation	Equal variances assumed	11.235	.001	-.800	208	.425	-.17062	.21327	-.59107	.24982
	Equal variances not assumed			-.603	27.141	.551	-.17062	.28293	-.75102	.40977
Combination	Equal variances assumed	.761	.384	1.024	208	.307	.21822	.21306	-.20181	.63826
	Equal variances not assumed			.844	28.036	.406	.21822	.25842	-.31111	.74755
Internalisation	Equal variances assumed	1.170	.281	-.139	208	.890	-.02966	.21359	-.45074	.39141
	Equal variances not assumed			-.172	36.525	.864	-.02966	.17238	-.37909	.31976
Innovation	Equal variances assumed	3.091	.080	.303	208	.762	.06468	.21355	-.35632	.48568
	Equal variances not assumed			.246	27.884	.807	.06468	.26264	-.47341	.60276

Independent Samples Test (public and private banks)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Socialisation	Equal variances assumed	.038	.845	.854	208	.394	.11921	.13953	-.15587	.39429
	Equal variances not assumed			.851	189.347	.396	.11921	.14002	-.15698	.39541
Externalisation	Equal variances assumed	.418	.518	-1.105	208	.270	-.15402	.13937	-.42878	.12074
	Equal variances not assumed			-1.092	182.526	.276	-.15402	.14109	-.43239	.12435
Combination	Equal variances assumed	5.670	.018	1.805	208	.072	.25040	.13870	-.02303	.52383
	Equal variances not assumed			1.877	207.968	.062	.25040	.13343	-.01264	.51345
Internalisation	Equal variances assumed	6.019	.015	4.077	208	.000	.54841	.13451	.28324	.81358
	Equal variances not assumed			4.232	207.880	.000	.54841	.12960	.29291	.80391
Innovation	Equal variances assumed	6.532	.011	3.117	208	.002	.42584	.13662	.15649	.69518
	Equal variances not assumed			3.238	207.940	.001	.42584	.13151	.16657	.68511

Appendix 11: One-way ANOVA output

ANOVA (Years of experience - five groups)

		Sum of Squares	df	Mean Square	F	Sig.
Socialisation	Between Groups	5.936	4	1.484	1.498	.204
	Within Groups	203.064	205	.991		
	Total	209.000	209			
Externalisation	Between Groups	8.550	4	2.137	2.186	.072
	Within Groups	200.450	205	.978		
	Total	209.000	209			
Combination	Between Groups	7.810	4	1.952	1.989	.097
	Within Groups	201.190	205	.981		
	Total	209.000	209			
Internalisation	Between Groups	7.127	4	1.782	1.809	.128
	Within Groups	201.873	205	.985		
	Total	209.000	209			
Innovation	Between Groups	4.538	4	1.134	1.137	.340
	Within Groups	204.462	205	.997		
	Total	209.000	209			

ANOVA (Academic background - three groups)

		Sum of Squares	df	Mean Square	F	Sig.
Socialisation	Between Groups	.545	2	.272	.270	.763
	Within Groups	208.455	207	1.007		
	Total	209.000	209			
Externalisation	Between Groups	3.795	2	1.898	1.914	.150
	Within Groups	205.205	207	.991		
	Total	209.000	209			
Combination	Between Groups	1.817	2	.909	.908	.405
	Within Groups	207.183	207	1.001		
	Total	209.000	209			
Internalisation	Between Groups	.789	2	.394	.392	.676
	Within Groups	208.211	207	1.006		
	Total	209.000	209			
Innovation	Between Groups	.256	2	.128	.127	.881
	Within Groups	208.744	207	1.008		
	Total	209.000	209			

ANOVA (Job title - six groups)

		Sum of Squares	df	Mean Square	F	Sig.
Socialisation	Between Groups	3.399	5	.680	.675	.643
	Within Groups	205.601	204	1.008		
	Total	209.000	209			
Externalisation	Between Groups	10.495	5	2.099	2.157	.060
	Within Groups	198.505	204	.973		
	Total	209.000	209			
Combination	Between Groups	9.498	5	1.900	1.943	.089
	Within Groups	199.502	204	.978		
	Total	209.000	209			
Internalisation	Between Groups	10.298	5	2.060	2.115	.065
	Within Groups	198.702	204	.974		
	Total	209.000	209			
Innovation	Between Groups	7.134	5	1.427	1.442	.211
	Within Groups	201.866	204	.990		
	Total	209.000	209			

Appendix 12: Post-hoc output

An example of multiple comparisons (Years of experiences - five groups)

Gabriel

Dependent Variable	(I) Years of experience	(J) Years of experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Externalisation	less than or 5yrs	6-10yrs	.59336	.22386	.079	-.0360-	1.2227
		11-15yrs	.23268	.22836	.973	-.4081-	.8735
		16-20yrs	.22416	.20440	.957	-.3537-	.8020
		more than 20yrs	.43423	.19407	.232	-.1146-	.9831
Combination	less than or 5yrs	6-10yrs	.15267	.22427	.999	-.4778-	.7832
		11-15yrs	.63540	.22878	.054	-.0066-	1.2774
		16-20yrs	.19105	.20478	.986	-.3879-	.7700
		more than 20yrs	.17010	.19443	.991	-.3798-	.7200

An example of multiple comparisons (Job title - six groups)

Gabriel

Dependent Variable	(I) Job title	(J) Job title	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Socialisation	Banker (B&A)	Excellent banker	.17062	.22269	1.000	-.4779-	.8191
		Head of department	-.18176	.19998	.999	-.7709-	.4073
		Auditor	-.21699	.20793	.994	-.8273-	.3933
		Vice manager	-.01706	.24081	1.000	-.7109-	.6768
		Manager	-.06625	.29663	1.000	-.8928-	.7603

