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Journal of International Business and Economic Affairs

Welcome to the 1st issue of Volume 4 of the *Journal of International Business and Economic Affairs*.

In this edition, we are delighted to be able to publish papers by Hadia FakhreIDin, Ahmed Salama and Dai Yun on the subjects of knowledge management and entrepreneurship. Knowledge management is a major emerging topic for both businesses and individuals. It is unlike the management of physical assets or legal rights, in that knowledge is not owned but only possessed. In the form of memory, it can be subject to loss and alteration in quite different ways from which physical assets and legal rights are subject to loss and alteration. It is, however, similar to physical and legal resources in that it is usually useless if it is not possessed not only in sufficient quantities but also in useful configurations. In knowledge management, it is not only the acquisition of knowledge that matters but also the organization of knowledge and the ability to make the possessors of different forms of knowledge work together, whether they are individuals, corporations, governments or universities. This has implications for both the individual and the organization, as in the present day world neither is able to work to any great effect in isolation from others.

This has implications not least for the border policies of nation states and transnational unions which control border crossings. While immigration policies may be governed by a number of different considerations, one consideration must be the need to enable the movement of labour to the places where it is best configured with complementary labour. The supposition that jobs taken by immigrant workers are invariably lost to indigenous workers is flawed, because no job can exist in isolation from other people, who are needed not only as customers but also as co-operating workers. The movement of people across boundaries, with proper controls to ensure that welfare, accommodation, services and infrastructure exist for both static and migrant populations, enriches not only society but also industry and the absence of immigrant population impoverishes not only the culture but also the economy of nation state.

There is also scope for co-operation between nation states. Hadia FakhreIDin discusses the strategy and experiences of the Canadian International Development Agency (CIDA) in the development of knowledge management in Egypt, with a discussion of the nature of knowledge management and of the methods which CIDA uses to promote it. The strategy involves tailoring processes to each organization and ensuring that it can be used to achieve organization goals. It also involves the analysis of existing systems and infrastructure, so that CIDA's efforts can be used to devise knowledge management blueprints which are appropriate to the organization.

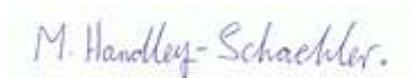
Ahmed Salama takes a macroeconomic view of the role of small and medium-sized businesses (SMEs) in the development of the economy. As well as presenting a balanced literature review on the role of the small business in economic development and how it differs from the role of big business, he presents evidence from Egypt that a focus on the development of smaller businesses is beneficial in encouraging economic growth. There is also evidence in the literature that SMEs manage knowledge differently from larger businesses and have incentives to be creative and develop new ideas, services and products, where established large businesses may have incentives to adopt a defensive stance.

In addition to the need to bring individuals with different specialized skills together, however, there is also a need to ensure co-operation between different organizations. Dai

Yun presents a model for knowledge exchange and do-operation, which draws no experience in Scotland to show how improved knowledge exchange channels can improve the quality of research and development in management can enhance research and development in high-tech companies.

Although physical and legal resources are vital for the application of knowledge, they are, in business terms, generally useless without proper knowledge. In addition, knowledge is generally useless without the intelligence, not only in its development but also in its application. It is therefore clearly in the interests of companies and other organizations to recruit people of appropriate calibre, identify partners of high quality and foster the willingness of staff to expend their best efforts on the application of knowledge and other resources and to develop good working relations with colleagues and business partners. This is borne out by the findings of the study presented here, which covers the full process from the identification of technological needs to the ongoing management of knowledge once it has been assimilated.

We hope that the reader will find these contributions of value in both intellectual and practical terms.



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Hadia FakhreIDin

A Balanced Participatory Knowledge Management Strategy in International Development Organizations: The Case of CIDA Egypt

Abstract

This study is focusing on developing and implementing KM strategies in the international development organizations. The aim of the research is to investigate whether there is an agreed upon model for developing a KM system that achieves an effective and successful implementation. It proposes a model based on examining some distinguished attempts made so far in that area world-wide, in addition to focusing on the experience of one international development agency, CIDA, Egypt. The study uses the case study method to examine thoroughly the experience of the Canadian Agency for International Development in Egypt, in designing and implementing a KM strategy. The model identifies new criteria for implementation in similar entities and emphasizes the importance of adopting a balanced participatory approach in designing and implementing a KM strategy in international development organizations in order to achieve a sustainable and effective implementation.

Keywords: Knowledge Management, International Development, Knowledge Management Strategy, Sustainability.

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1. Background

This study focuses on Knowledge Management (KM) in international development organizations. It analyses the importance of KM in general, and in these organizations, in particular, and it reviews the prior literature in this field in an attempt to reach a common framework, if any. After that, it uses the case study method to explore the experience of one international development organization, namely the Canadian Agency for International Development (CIDA)/ Egypt in KM, in an attempt to identify and explain the similarities and differences with other development organizations. Based on the above, the study aims at proposing and/or developing the/a model to be followed by similar organizations for effective KM development and implementation.

The discussion of KM began in the 1990s, when there was a realization that the foundations of modern economies had shifted from natural resources to intellectual assets (Perrot 2007). Sharing of knowledge has become a goal and a priority in today's organizations. "Knowledge is the most sustainable competitive advantage, organizations need to invest in and develop" (Mohamed et al. 2009, p. 271). This means that knowledge has now become "a strategic resource", which has to be managed effectively (Ho 2009).

The purpose of managing and leveraging an organization's knowledge is to maximize all its returns (Bose 2004). These returns are not only financial or economic. “KM promotes continuous improvement, facilitates innovation in business processes and products, embraces people as architects at the centre of the knowledge creation process, and enhances stakeholder relationship management” (Robinson et al. 2006, p. 749). Knowledge is information that has meaning. Therefore, a KM system (KMS) is a higher level than an Information System, where the object of sharing is “information with added meaning”. Thus, a KM system “ensures knowledge flow from the person(s) who know(s) to the person(s) who need(s) to know throughout the organization, while knowledge evolves and grows during the process” (Bose 2004, p. 458).

There are several benefits of KM as a strategy: it reduces the loss of Intellectual Capital (IC) from employees who leave; it reduces the cost of development of a new product/service; it increases the productivity of employees by making knowledge accessible throughout the organization and thus achieve employee satisfaction (Bose 2004). This means – and there is agreement in the literature about it – that KM leads to higher organizational effectiveness and efficiency.

With the rise of globalization and the increasing demand for sustainability, Knowledge Management (KM) has been implemented widely in multinational organizations and in the private sector during the last two decades. As a consequence, research in the field of KM in organizations has been focusing more on technologically intensive industries in the private and international domains (Dasgupta and Gupta, 2009). In the public sector and in the international development domain, attempts to undertake KM initiatives have been more modest and less recorded and examined. Therefore, it is time to move more intensively in other areas of research like KM in the public sector and KM in international development. This will add value to the existing body of knowledge, as it will make certain findings more generalizable (to all sectors; private, international, public and non-profit) while others will be only applicable to specific areas/sectors.

2. Literature Review

What is Knowledge Management (KM)?

One of the most comprehensive definitions of KM is that it is the identification, storage, protection of knowledge for future operational and strategic benefit of the organization; this may be implicit or explicit (Perrot 2007). This definition recognizes three aspects of KM; first that it is a process; second that there is a distinction between strategic and operational knowledge; third it acknowledges that knowledge contained in the organization may be implicit (tacit) or explicit (Perrot 2007). There seems to be reasonable agreement that it is a process that facilitates knowledge exchange and sharing and establishes learning as a continuous and growing process within the organization.

There are various steps/stages identified by scholars and researchers to describe the KM process. There are six steps identified by Bose (2004): creating knowledge; capturing knowledge; refining knowledge; storing knowledge; managing knowledge; and disseminating knowledge. There are five components of KM identified by Ho (2009); creation, accumulation, sharing, utilization and internalization of knowledge. Mohamed et al. propose a more comprehensive and sophisticated process: Knowledge discovery, knowledge analysis, knowledge classification, knowledge assimilation, and knowledge presentation (Mohamed et

al. 2009). The conclusion is that KM is a process that includes four main steps; they are sequential and sometimes overlapping: discovering, storing, disseminating and applying knowledge.

Knowledge itself is embedded and flows through multiple entities within the organization; including individuals with domain-expertise, groups with specific best known methods, lessons learned from similar experiences on the organizational level. There are also documents, routines, systems and processes and methods that support the sharing and dissemination of knowledge (Kulkarni et al. 2007). Much of the knowledge is also automatically managed and shared through the organization's culture. However, this is not enough and cannot be depended on without an integrated and institutionalized KM system.

To differentiate between types of knowledge, there is a profound distinction in the literature between tacit (sometimes called implicit) and explicit knowledge, as this division represents the biggest challenge in managing knowledge. Implicit knowledge is implied or inferred from observable behaviour or performance (Strang, 2010), it is the minds of individuals (Perrot 2007). Davenport (2000) believes that some tacit knowledge can be so complex that it cannot be taught. Explicit knowledge is obvious and easily coded and stored (FakhrEIDin 2006), and thus can be easily shared and externalized (Perrot 2007). The problem is with sharing and disseminating the tacit knowledge.

Nonaka and Takeuchi are the pioneers in developing a model describing the interaction of both types of knowledge and how this leads to continuous new and bigger knowledge. It is called the SECI (socialization-externalization-combination-internalization) model of knowledge creation (Nonaka and Takeuchi, 1995) and describes the four modes of interaction between the two forms of knowledge (Perrot 2007). It describes the process of transforming tacit into explicit (externalization); explicit to explicit (combination); explicit to tacit (internalization); tacit to tacit (socialization); and how these processes keep adding value to knowledge in a cyclic way (Nonaka and Takeuchi 1995). It should be noted, that this process is synergistic in nature and as a result more knowledge is created and applied.

Enablers/Pillars of KM

There is agreement in the literature that there are several factors which support/enable KM initiatives in organizations equally. Bose (2004) believes in 4 enablers which are essential and complementary (i.e. each is insufficient without the others): culture; technology; infrastructure; and measurement. Ho identifies 4 similar enablers of KM: strategy and leadership; organizational culture; organizational incentive system; and information technology (Ho 2009).

Another group of researchers stress a more important role of certain factors than others in the KM process. Lopez, et al. (2004) conclude that KM initiatives to be truly effective must take into account the social contexts in which learning takes place. Accordingly, culture is the most important aspect that needs to be re-examined in light of its role in managing the overall organizational learning structure (Ho 2009; Lopez et al. 2004, Bose 2004, Robinson et al. 2006). Gupta et al. (2000) show that organizational learning demands a high degree of commitment at all levels of the organization, i.e. it is a culture which entails that all members have a desire to improve and learn (as cited in Lopez et al. 2004). Therefore, one of the important tasks of a KM strategy is to instil a "knowledge culture" among the individuals in the organization (Kulkarni et al. 2007).

Robinson et al. (2006) state that top management support has proven to be one of the main reasons for effectiveness of KM initiatives in 8 UK construction companies which were used as case studies to examine sustainability based on KM. They also identify "intranet being the backbone of the KM infrastructure" (Robinson et al., 2006, p. 801). Liebowitz (1999 as cited by Ho, 2009) and Davenport (1998) confirm that support of senior management is crucial to the success of any KM project (Ho, 2009). So, leadership involvement and commitment is a corner-stone for KM implementation and success.

Ho (2009) cites Nonaka and Takeuchi (1995) stating that organizational structure can either promote or block KM. Good organizational KM incorporates a standardized system and flexible structure (Davenport and Prusak 1998). An organizational structure should also incorporate an incentive system in KM (Ho 2009). It is important to reward employees for being part of KM in their organizations (Kaplan and Thomson Reed 2007). There are specific steps that organizations should undertake on the HRM side of its operation to support KM. For example, reward knowledge sharing and reuse; provide training and development, awards and compensations reflecting KM goals (Kulkarni et al. 2007), and establish a performance evaluation system accommodating this aspect (Ho 2009).

Another group of researchers stress the importance of IT, as it has a profound effect on people's ability to share knowledge and practices effectively (Bose 2004, Ho 2009, Mohamed et al. 2009). This constitutes the infrastructure for IT, like databases, knowledge platforms, performance evaluation management systems and performance integration systems (Ho, 2009). The Internet, Intranets, data warehousing, decision support tools and groupware are some of the many technologies that make up a KM system (Bose 2004). Web-based technology is a popular and an effective enabler of KM, it facilitates the collaborative process and the wide distribution of knowledge for capture and re-use easily and cost-effectively (Perrot 2007).

However, technology and information management alone cannot be relied upon for the success of KM. Technology and tools cannot provide effective "context of use" and add value. The value comes from people and from their ability to efficiently reuse knowledge to improve performance, individually and organizationally (Kaplan and Thomson Reed 2007). Therefore, it is important to stress that designing KM systems can be more effective and wide-reaching when knowledge is viewed as a social and evolving artefact (Ardichvili and Yoon 2009). KM initiatives must be complemented by a set of organizational mechanisms that encourage and promote the sharing/reuse of organizational knowledge (Kulkarni et al. 2007) and which are not only technology-based.

The point is, in some environments, emphasis on IT may work better, in others it might be better to focus on social networks and mechanisms. "An emphasis on one aspect while overlooking others will result in sub-optimized development situation" (Mohamed et al. 2009, p. 276). Therefore, both approaches should be used to complement each other. Knowledge which can be codified and knowledge which is explicit should be stored relying on IT, i.e. in digital databases and made accessible to users through various electronic tools (Ardichvili and Yoon 2009). Knowledge which is tacit and implicit should be managed through a social approach, like the Communities of Practice (CoP) (Ardichvili and Yoon 2009). CoPs are valuable sources of knowledge sharing and knowledge creation. "They are informal, self-organized groups of people, who share knowledge (tacit and explicit), solve common problems and exchange insights and frustrations" (Strang 2010, p. 38). Therefore, it is important to integrate electronic and non-electronic approaches to achieve both formal and

informal workplace learning and support (Ardichvili and Yoon 2009), which leads to effectiveness and efficiency in the organizational outputs (FakhrEIDin 2006).

To sum up, four main supporting pillars of KM are identified in the literature: Organizational structure; organizational culture; technology; and leadership. All other aspects mentioned above can be placed under one of them. Dasgupta and Gupta (2009) propose a model highlighting the importance of a flexible and adaptive organization structure, a culture of trust and knowledge sharing, a strong technological network and a committed leadership to promote knowledge development and learning in the organization. So, managing knowledge is complex, as it involves managing several aspects (pillars) simultaneously, and on different levels (individual, group and organizational). This requires a systemized and comprehensive process that takes all conditions and factors into consideration, i.e. a strategy.

A KM Strategy

Developing a KM strategy is essential to achieve sustainability and to improve the way knowledge assets are managed and reported (Robinson et al. 2006). Ideally the KM strategy should include: the objectives of the project; the costs and the risks of doing and not doing it; an action plan; how it fits the current and future goals/objectives/plans of the organization; the effect on the organization; outputs expected when the plan/strategy is completed (Desouza 2010, p. 160).

The KM strategy should be based on the establishment of a strategic framework and conducting a knowledge map, which entails two major steps; infrastructural evaluation and a KM system analysis (Tiwana 2002). The knowledge map is important as it identifies the core knowledge assets and looks at the activities already taking place to identify where there is a gap of knowledge and/or information in the organization (Gilmoure and Stancliffe 2004). This is also called "identifying the knowledge gap" and the purpose is to develop the appropriate strategy to close or minimize this gap (Wang and Belardo 2009).

The mapping exercise is quite detailed and is unique for each organization. First, there is a visualisation of the main organizational objectives concerned with knowledge. Then these units are broken down to record who produces it, who needs to access it, what level of detail is required, how it is accessed at present and where and how it is stored (Gilmoure and Stancliffe 2004). This should enable "quick wins" to be identified and implemented. "It will also lead to the development of appropriate processes which will be embedded in the organization in order to have a lasting effect" (Gilmoure and Stancliffe 2004, p. 127).

Understanding the means available to support KM and explicitly designing and developing an appropriate KM infrastructure is of strategic significance (Wickermasinghe and Davison 2004). It is vital not to be tool or technology focused from the start (Desouza 2010) and to align the KM strategy with the overall organizational strategy (Ho 2009). The strategy should also take redundant knowledge into consideration, i.e. knowledge which is no longer needed may be a burden. There have to be tools to filter the knowledge before it is stored and is ready for dissemination (Perrot 2007). It remains important to make the KM effort as specific, detailed and clear as possible with a well-argued and logically structured and detailed plan for a course of action (Desouza 2010).

Top management commitment as well as stakeholders' involvement in the development process of the KM strategy are both essential. Stakeholders' input is important in the process, as they will develop an appreciation of the process, in addition to providing ideas and more

alternatives (Desouza 2010). They will also have a sense of "ownership" for the whole initiative, once it is put forward. Once this is achieved, the implementation process is more likely to succeed.

KM in international development

In a highly interconnected world with limited and even decreasing resources, the field of KM faces the challenge of making concrete and relevant contributions for the betterment of society (Laszlo and Laszlo 2002). There are many international development organizations and civil societies around the world which are exerting considerable effort towards achieving higher levels of sustainability in all countries (Mohamed et al. 2009). Of course, "KM is still important for the corporate environment, but it also adds value to the development sector and in particular it has a role to play in international development" (Gilmoure and Stancliffe 2004, p. 124). "Knowledge is now considered a critical foundation for sustainable development innovation" (Mohamed et al. 2009, p. 271).

KM is identified as one of four major factors having a critical role in achieving more effective sustainable development: Knowledge Management (KM), Integrated Information and Communication Technologies (IICT) infrastructure, ICT capacity building and ICT policy" (Mohamed et al. 2009, p. 272). According to the World Commission on Environment and Development (WCED), sustainable development is the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Mohamed et al. 2009, p. 272) Thus, to achieve sustainability, it is important to manage both the tangible and intangible assets (Robinson et al. 2006). This means that KM is needed to achieve sustainability in the world, in general, and in organizations, in particular. Managing the knowledge in that domain means "doing more with less, creating a sustainable economy where present and future human needs can be met without compromising the natural environment" (Laszlo and Laszlo 2002, p. 410). In the development sector, knowledge is a community-owned asset (Batra 2007). Developing a KM strategy – within the development context - is a way to "unlock and leverage the different types of knowledge to identify competencies required to become a forward thinking and learning organization with the ability to put sustainability principles into practice" (Robinson et al. 2006, p. 798).

International Development Organizations have specific characteristics: high staff mobility; projects that have a duration of 3 – 4 years and are then dissolved, mix of international and local staff leading to high diversity of staff; work in different areas in one country with different sub-cultures and mix of staff leading to more diversity of staff; and a very tight budget (Batra 2007, Ringel-Bickelmaier and Ringel 2010). In addition, all development organizations work within the restraint of a tight regular budget that needs to be managed as effectively and efficiently as possible (Ringel-Bickelmaier and Ringel, 2010). They also have various stakeholders. Stakeholders of a development project are those persons, groups or institutions, which have an interest in the project. These include direct beneficiaries, project implementing agencies, their partners, service providers, donor agencies, government officials concerned with the project theme and various technical experts and resource persons (Batra 2007).

Exchange of knowledge from successful projects helps ensure learning from both success stories and lessons learnt. Therefore accurate documentation is encouraged in the development sector, though not practiced regularly (Batra 2007). It is also important within that context to "avoid knowledge drain" (Ringel-Bickelmaier and Ringel 2010), when staff

change locations or totally leave the organization. The challenge in international development is that any KM initiative has to be inexpensive, implemented in an incremental way, and showing promise through testing the impact on pilots (Gilmoure and Stancliffe, 2004). A key issue with regard to development sector projects is how the development agencies can learn faster from the experiences of past projects (Batra 2007). The problem is that there is usually reluctance on the part of some implementing agencies to share their knowledge and information about a project and experience gained through its design and implementation (Batra 2007). They have a sense that it is their effort and their work and they do not want to give the knowledge away.

In the field of international development there are various successful attempts to manage information and knowledge. The World Bank (Laporte 2004) and various United Nation (UN) entities (UNDP, UNICEF) and some European Union organizations (OECD) are pioneers in that regard (Liebowitz 2000, Mohamed et al. 2009, Ringel-Bickelmaier and Ringel 2010). They are specially advanced in the IT area of managing knowledge and information (FakhrEIDin 2006), they also developed tailor-made systems that respond to their specific needs in terms of information and knowledge management (Ringel-Bickelmaier and Ringel 2010). What all these organizations have also in common, is that they implemented their KM initiative/strategy in steps, i.e. it is incremental. They started with Information management and developed gradually into KM.

The advancement in IT is important in the experiences of the international development agencies in the literature (Mohamed et al. 2009). To record and retrieve existing knowledge, they recur to IT solutions of document and information databases as well as data warehouses (Ringel-Bickelmaier and Ringel 2010). But KM is more than that; according to Mohamed et al. (2009), many of these organizations still have their knowledge and information in disconnected repositories and databases. They may even have an overflow of knowledge and knowledge that is not used as nobody is aware of it.

Knowledge sharing can be divided into two major modes, intra-organization sharing for domestic knowledge and inter-organization sharing for external knowledge. Mohamed et al.'s research (2009) shows that there is a significant linear association between inter-organization and intra-organization sharing of knowledge. KM in development requires a careful blending of local knowledge, largely tacit, with the external knowledge, which is to a high extent explicit (Batra 2007). Thus, both types of knowledge sharing have to take place and they complement each other. The strategic priority in international development should be to have intra-organizational activities must precede the inter-organizational efforts. There is a limited argument that the emphasis on ICT tools is more important than emphasis on KM practices (Mohamed et al. 2009), but many researchers tend to believe that when it comes to international development each step in the KM process requires a certain balance and is affected by the nature of the work of the organization and its stakeholders (Batra 2007).

The intranet is one of the effective tools to avoid duplication of efforts and to develop an effective knowledge and information-sharing environment in international development organizations (Gilmoure and Stancliffe 2004). It is suitable for managing explicit knowledge, in particular. Communities of Practice (CoP) are one way of sharing tacit and explicit knowledge in international development organizations. They are based on groups which are formed based on the thematic areas in which development agencies are specialized. Members of a CoP share concerns or a passion for something they do and learn how to do it better as they interact regularly (Batra 2007). The World Bank, for example, has 80 thematic groups,

they exchange information and transfer explicit and implicit knowledge through the ICT facilities, having access to databases and newsletters, using internal search engines, videoconferencing (Ringel-Bickelmaier and Ringel 2010).

The first step towards achieving KM in international development organizations (and which was undertaken by many of them adopting KM) is through designing and developing a KM strategy. A KM strategy starts with designing a "roadmap" which is intended to be used as a tool to identify weaknesses in the knowledge processes of organizations and develop appropriate action plans with appropriate measures to improve implementation of a KM strategy, i.e. the reform necessary, provide the resources to support KM and to evaluate the results of KM (Robinson et al. 2006). This way sustainability can be effectively achieved (Mohamed et al. 2009).

Previous research has agreed on the following with regard to international development organizations and KM: the necessity of creating an information sharing and managing culture via establishing information management systems and human resource policies that favour such a culture; creating thematic knowledge networks internally and externally; undertaking knowledge mapping activities; try to move gradually from information management to KM (Ringel-Bickelmaier and Ringel 2010). There are two other important factors identified in the literature in all cases of successful KM implementation in the field of international development: the "supportive leadership" and a "Knowledge Management Officer (Manager)" who is responsible for overlooking and administering the implementation of the KM strategy and the KM system as a whole, e.g. in the World Bank, the OECD, the UNDP (Laporte 2004, Liebowitz 2000, Ringel-Bickelmaier and Ringel 2010).

Measuring KM

"The long-term nature of returns makes it extremely difficult to measure the success of KM initiatives in terms of business benefits, which are presumed to reflect the effectiveness of a KM strategy" (Kulkarni et al. 2007, p. 310). However, without measurable success, support for KM is unlikely to continue. Therefore, there is wide agreement in the literature that it is important to measure the impact of KM efforts on the organization's performance (Bose 2004). Employees need to find value in the KM activities to continue to tap into the organization's intellectual resources (Kaplan and Thomson Reed 2007). In addition, after implementing the KM strategy, an organization needs to evaluate the effectiveness of KM.

In trying to deal with this problem, there are several ways identified by scholars reflecting evaluations based on specific criteria identified from the start have to be developed. There are performance indices that can be considered which include the frequency of solving obstacles and achieving certain results (Ho 2009). KM leads to changes in behaviour, approaches and methods, which should be mapped and traced to organizational processes, thus their impacts can be measured and articulated (Desouza 2010). Specific KM metrics will be tied to specific organizational contexts and will be based on the strategy adopted by each organization (Bose 2004).

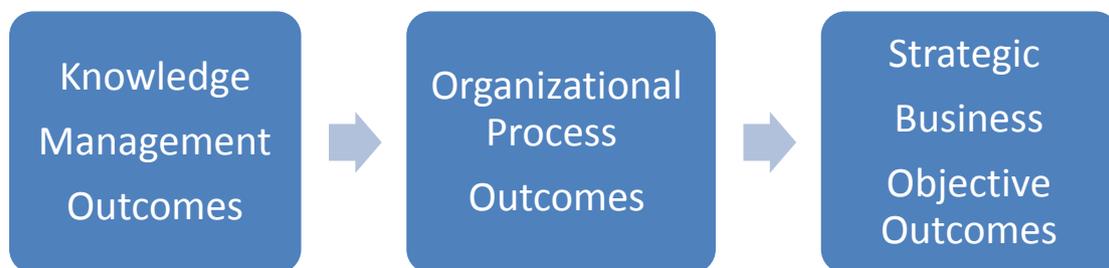
Robinson et al. (2006, p.805) believe that "to realise the full potential of KM if the necessary steps to maturity are translated into action plans." Their maturity roadmap is called STEPS standing for start-up, take-off, expansion, progression and sustainability. Each stage has specific characteristics ranging from increasing awareness of KM; developing the KM strategy and identifying barriers and risks; refining the KM strategy and increasing the KM leadership in addition to introducing performance measures; establishing evaluation criteria and introducing reward and incentive schemes; and ending with KM practices being diffused

in the whole organization and linked to all business objectives as well as being embedded in the organizational culture (Robinson et al. 2006).

Bose (2004) proposes a different evaluation technique through indexing, where the successful application of KM in the organization are measured. The index proposed by Bose (2004) is based on several steps: define the strategy of the organization; identify the critical success factors; choose key performance indicators; apply weights to the indicators (if necessary); use this metrics to focus management action on the key factors. The same indicators would serve for monitoring and evaluation purposes of the KM strategy.

In order to contribute to the higher level goals of the organization, Desouza (2010) proposes two steps. The first step is to tie KM outcomes to process-level outcomes. KM tools, techniques, strategies and procedures should show measurable changes to organizational processes. The second step is to tie these outcomes into the strategic-level outcomes (Desouza 2010), as shown in Figure 1 below.

Figure 1: KM, Process-Level and Strategic Level Outcomes



Source: Desouza (2010)

Following the above mentioned process makes certain that one can visualize the sequence and the connection to the KM strategy. The mapping of impacts to process-level outcomes helps identify roles and responsibilities and eventually facilitates monitoring and evaluation.

Summary

Based on the literature review on KM and the cases discussed of international development agencies adopting a KM strategy there is agreement that:

- The support of the leadership, the supportive organizational culture, the flexible and organic organizational structure and the appropriate information technology are important enablers that lead to an effective development and implementation of a KM system (Barnes 2002, Bose, 2004, Ho 2009, Robinson et al. 2006, Ardichvili and Yoon 2009, Mohamed et al. 2009).
- It is important to develop a KM strategy that takes into account the unique nature of each organization and a balance between the social aspect and the information technology component in the KM system adopted (Davenport and Prusak 1998, Kulkarni et al. 2007).
- There has to be ownership of KM by the organization and its stakeholders and an entity or a person should be responsible for the KM in the organization (Desouza 2010).

- Monitoring and evaluation of the KM strategy are a necessity to achieve KM success and continuation (Desouza 2010, Kaplan and Thomson Reed 2007, Ho 2009, Bose 2004).

Objectives of the Study

The study is examining one international development agency which is implementing KM based on a thorough strategy. CIDA/Egypt is the focus of this investigation in light of the literature review above. The study aims at answering the following questions:

1. Is the KM strategy at CIDA /Egypt enabled by its leadership, organizational culture, organizational structure and Information Technology (IT)?
2. Is there a balance between social and IT-based knowledge sharing techniques?
3. Who has ownership of the KM strategy implementation and is there an entity/a person responsible for the administration and development of the KM strategy?
4. Does the strategy and implementation of KM at CIDA/Egypt include a monitoring and evaluation component?
5. How does the strategy of CIDA/Egypt differ from KM strategies and initiatives adopted by other similar entities?

By answering the previous research questions, the case study aims at trying to test the following general hypothesis:

H₁: The KM initiative at CIDA/Egypt has the same elements/components as the international development organizations that adopted the concept previously.

3. Methodology

A case study method is chosen as it enables an understanding of the dynamics (of KM development and implementation) within a particular setting (Yin 2003). This took place for 12 months from January to December 2010. Several techniques were used; participant observation; semi structured interviews with employees and stakeholders, three focus group discussions with the Knowledge Management committee members, and examining reports of CIDA Egypt for the previous five years. A case study approach is also chosen for this study as it is responsive to research questions of why and how (Stake 1995). In a case study information is gathered about the unit of analysis over a long period of time with the aim of gaining in-depth knowledge. One can also examine and analyze a concept/ phenomenon thoroughly and in detail (Rowley 2002). This was achieved through the close interaction with the employees and stakeholders, who were all enthusiastic (though not always convinced of) with the idea of KM at CIDA Egypt.

The single holistic case study method is evaluated as the most appropriate for the study, as the case is seen as one unit in the analysis and it would be a pilot for further such studies (Yin 2003), where a field office is investigated before the head office. The case study is also most suitable for exploratory research (Wickermasinghe and Davison 2004), where not much literature is available about a certain phenomenon. Yin (2003) only favors exploratory case study when the available literature or existing knowledge base is poor, once the uncertainty has been investigated and resolved, the exploratory phase is complete and the real study should be taken place. This is the case with KM in international development organizations. As indicated in the literature review, the literature on KM is focusing mostly on private sector and international companies.

A major limitation of case studies is that it is difficult to generalize from one case to another. But case studies have been the target of overgeneralization. Therefore, Yin advises case study analysts to generalize findings to theories (Yin 2003). This is the method used in this study. Theoretical propositions derived from the literature (in section 2 above) are tested in this one case study. The aim is to examine whether the findings of this case can be generalized to theory, not to population, as in statistical research. However, Stake (1978) believes that it is normal to generalize in a case study approach, especially when the case is representative of some larger population, which is also considered when it comes to the findings.

Another limitation often mentioned of case studies is that they lack a systematic handling of data, in addition they might be subjective. This study has used a systematic reporting of all evidence which has been collected from various sources and recorded in detail over 12 months, where the researcher tries to get rid of bias and subjectivity as much as possible. Thus, to ensure validity and reliability, multiple sources of evidence were used, a case study database was created and a chain of evidence was maintained (Remenyi et al. 2000).

Data for the case study was collected from a variety of sources, archival records (documents and reports covering at least the previous 5 years), interviews (with staff of projects, program, and the program support unit), focus interviews (with staff members and partners), questionnaires (on-line and paper questionnaires to staff members of program and projects and Program Support Unit) as well as direct observations and participant-observation situations. The aim of the interviews was to understand the rationale, the background and explain some of the information derived from the records on KM. The focus interviews aimed at evaluating the KM strategy and understand how it is monitored and evaluated. The on-line and paper questionnaires targeted all stakeholders who were affected by the KM strategy of CIDA and focused on identifying their needs and compare them with the outcomes of the KM strategy.

A third limitation of the case study method is that it takes too long and it ends up with unreadable documents, which is avoided by setting a time limit and writing in a comprehensive but at the same time an understandable and interesting way, while providing as much in-depth information and analysis as possible.

4. The Case Study

The Canadian Agency for International Development (CIDA/Egypt) went through the exercise of initiating, designing and developing a KM strategy since 2008. The research aims at examining this strategy and identifying to what extent it reflects and/or deviates from the conclusions reached in the above analysis of the literature and past research. There is a main difference in this case, as it operates only in Egypt, whereas the examples of international development referred to above operate on a global (macro) level. This is a case of an international development organization working in one country, Egypt.

Background of the case study

CIDA has been an active partner with the Government of Egypt, Egyptian civil society and the Egyptian private sector for almost 30 years. Egypt is now considered by CIDA headquarters as a Country of Modest Presence, with considerably reduced budget allocations. CIDA Egypt therefore developed a KM strategy, to provide a unique opportunity to gain a greater understanding of the operation of the organization, its future direction and aims, as well as an evaluation of the challenges that confront it. By focusing on identifying staff needs

and issues, activities and initiatives are recommended with the confidence that these will have a clear and measurable impact upon the organization. Supplementing this 'bottom-up' analysis with a strategic focus ensures that the KM initiative is aligned with broader organizational directions, which is in alliance with the literature (Robinson et al. 2006) above. Taking this approach to the development of a KM strategy allows limited resources to be targeted to the key needs within the organization and delivering the greatest business benefits, while positioning the organization for long-term growth and stability, as indicated by Mohamed et al. (2009).

The KM initiative at CIDA/Egypt

The CIDA KM strategy adopts a "people-centred" approach and relies highly on human interaction (as this is where the wealth of knowledge of CIDA lies) and is supported by appropriate technical components to make it function as effectively as possible. It is designed to be flexible with a potential for expansion, to make adjustments/improvements and/or changes in direction/scope possible along its implementation process.

The strategy consists of five overlapping phases: infrastructural evaluation; KM system analysis, design and development; deployment; and evaluation and incremental refinement of the KM system. All CIDA stakeholders are involved in the development of the strategy through their initial suggestions and recommendations and later on through their feedback in various forms. This confirms with the findings of the literature (Desouza 2010, Laszlo and Laszlo 2002, Ringel-Bickelmaier and Ringel 2010, Robinson et al. 2006, Tiwana 2002).

The main key players for the execution of the strategy are the Knowledge Management Officer (KMO) and the KM Committee, like recommended by Davenport (1998). The first is the focal point of the KM strategy and is the one in charge of implementing and managing the system. S/he is guided and supported by the KM Committee which represents the various CIDA Egypt stakeholders.

For the KM strategy to achieve its goals and objectives, it requires the support and commitment of all stakeholders on all CIDA Egypt levels: the level of the projects, the program, Head Quarters (HQ) and to an extent also other donors and partners. The role of stakeholders is significant as identified by Batra (2007) and Desouza (2010).

The CIDA Egypt KM Strategy aims to fulfil the following objectives:

- Capturing and storing CIDA explicit and tacit knowledge with emphasis on the Egypt programme;
- sharing and disseminating knowledge between HQ, CIDA Embassy, the Program Support Unit (PSU), Projects and other stakeholders and beneficiaries;
- supporting and enhancing the development and application of further explicit and tacit knowledge by users of the system;
- enhancing visibility and public awareness of the CIDA Egypt program, through leveraging collected knowledge beyond CIDA; and
- keeping the knowledge repository and the KM system updated and up-to-date.

To achieve these objectives, the KM strategy is designed based on a thorough analysis of CIDA Egypt's current and future needs, requirements, experiences and achievements. The strategy is also based on information solicited from the CIDA Egypt Program internal documents and the current international state of the field of KM. This includes various

documents/tools/activities from the CIDA Egypt program and from various CIDA Egypt projects (e.g. CIDA Annual Work Plan 2009-2010; national and international best practices in the area of KM). It also includes the results of the "Knowledge for Change", CIDA Lessons Learned Workshop, January 26–28, 2010, including the questionnaire undertaken at the end of the Workshop, administered to most participants (a major source of input from all CIDA Egypt stakeholders). Out of 40 participants, 37 responded to the questionnaire (92.5% response rate). CIDA Egypt staff and partners were represented in the workshop, which aimed at fostering the need for KM and cultivating the knowledge and experience gained by CIDA Egypt in the last five years. Consequently, the final key message reached by all participants at this workshop was: "Access to information is a right that can be effectively implemented through systematically sharing knowledge on and between all levels of the organization (CIDA) and stakeholders according to a well-defined strategy with accountability measures." Thus, there was agreement and consensus for the obvious need for KM at CIDA Egypt in January 2010 by all staff members and stakeholders. They all went further and recommended the necessity of a well defined KM strategy with accountability measures.

In addition, the results of an online questionnaire administered to all CIDA Egypt employees on both the project and the program level, to complement the knowledge mapping/audit of KM needs mirrored the same conclusion. There was also collaboration with CIDA HQ regarding CIDA KM strategy and tools. It was sent out to 92 stakeholders, 52 responded, i.e. a response rate of 56.5%. Furthermore, the results of a second workshop on "Creating a Culture of Learning and Knowledge Sharing" Workshop, May 19-20, 2010 were extensively used in designing and formulating the KM strategy, where it used 5 focus groups (5 – 8 persons each) to achieve conclusions.

Thus, CIDA is unique in one aspect, compared with the cases examined in the literature; all employees, stakeholders and partners agreed on the necessity of a KM strategy to support the KM initiative in CIDA/Egypt. Most aspects of the KM strategy were achieved through various participatory approaches. This achieved ownership, relevance and sustainability of the strategy.

The details of the stages of the KM strategy of CIDA Egypt are based on the model introduced by Tiwana (2002), it consists of four main stages and ten steps as portrayed in Figure 2. To implement the strategy, the following approach outlined in Figure 3 is adopted.

The details of the KM strategy at CIDA are as follows:

Stage I: Infrastructural Evaluation

1. Analyse the Existing Infrastructure (Gilmoure & Stancliffe, 2004).
2. Align KM and the overall Organizational Strategy (which coincides with Tiwana, 2002; Gilmoure & Stancliffe, 2004; Wang & Belardo, 2009).

Stage II: KM System Analysis, Design and Development

3. Audit existing Knowledge Assets and Systems (Gilmoure & Stancliffe, 2004).

For example, there are some knowledge systems already in place like the periodical synergy group meetings. They have shown high effectiveness in the last two years.

The areas that need development in CIDA/Egypt: Methods used to search for information and acquire knowledge; Storing information for long-term use; Sharing and disseminating

information; Communicating with other CIDA Offices/Projects; and Lessons Learned and Good Practices; Managing tacit Knowledge.

In summary, the most important gaps identified in knowledge at CIDA Egypt are inaccessibility of simple delivery models and tools; insufficient and non-systematic information sharing/reporting at HQ/program/project/stakeholder/grass-root levels; end-of-Project reports/lessons learned are not properly taken into account/disseminated; they need proper format and process; lacking coordination, follow-up and recognition; not up-to-date/well-equipped websites, both on PSU and Projects levels; and, finally, slow dissemination processes.

4. Assign the KM team (Davenport & Prusak, 1998; Tiwana, 2002).

It is responsible for articulating the KM policy; planning and monitoring the implementation of the action plan; receiving feedback from users; monitoring the work of the Knowledge Management Officer (KMO); initiating corrective policies; and coordinating KM activities between the different stakeholders through the KMO. This is also supported by the literature in various studies (Laporte, 2004; Liebowitz, 2000; Ringel-Bickelmaier & Ringel, 2010). The team members should have the following characteristics: functional expertise; program/project expertise; ability to bring in a vision that correlates with the overall organizational wide vision; representation of core CIDA activities. At least one member should be in a position to commit the needed resources; there can be a combination between temporary and permanent team members. The KMO once appointed should also be part of the team.

Figure 2: Stages and Steps of the Knowledge Management Strategy at CIDA

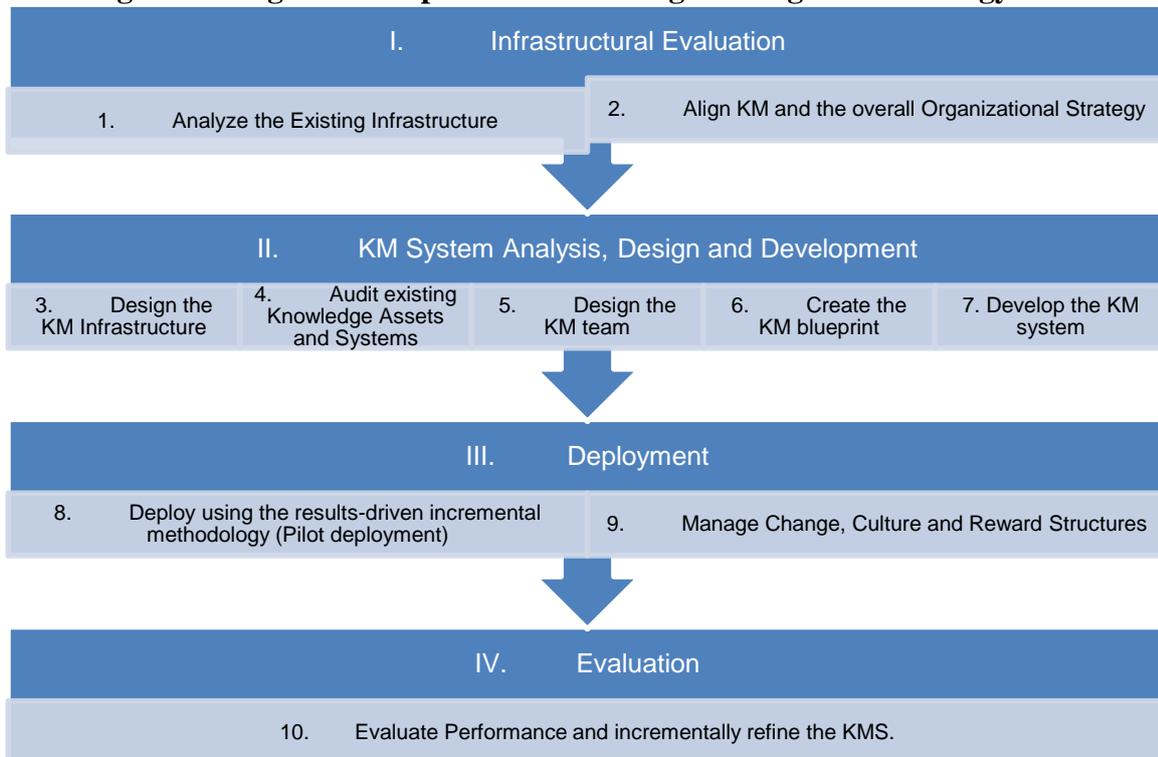
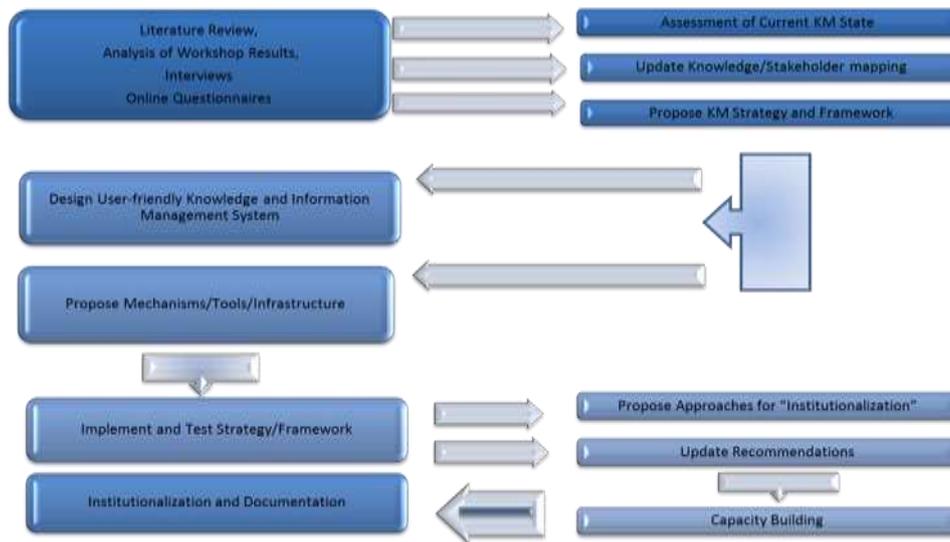


Figure 3: Approach of developing and implementing the Knowledge Management Strategy at CIDA/Egypt

Approach



Source: FakhrEIDin and El Agouz (2010)

5. Design the KM Infrastructure (Wickermasinghe & Davison, 2004;Tiwana, 2002).

There are five main components of the KM infrastructure: a supporting culture, an effective organizational structure, Common Knowledge, a suitable physical environment and an Information Technology Infrastructure. The design and implementation of the latter will necessitate the devotion of immediate resources, and should thus be the first step in this process.

In the CIDA Egypt case, the Web will be a key component of the KM network. This will enable initiating a "Web Protocol-based" intranet as a primary knowledge sharing platform, which is more practical in terms of direct cost, development costs, initial investment, legacy integration and cross-platform integration.

6. Create the KM Blueprint (Tiwana, 2002).

The main objectives of the Blueprint are to: develop the knowledge management architecture; explain and select the architectural components; allow for high levels of interoperability; optimize for performance and scalability; explain the repository management; explain and incorporate requisite user interface considerations; position and scope the knowledge management system; make the build-or-buy decision (based on understanding the trade-offs); and future-proof the knowledge management system.

7. Develop the KM system, which should allow for accessibility and easy retrieval of knowledge; be clear, systematic, applicable, transparent, participatory, simple and up-to-date; be relevant to various demands and needs; be comprehensive, catering to various stakeholders, including community level, capturing both project as well as non-project activities; include an effective storage system; include a monitoring and evaluation system; exhibit higher reliance on human interaction than on technology and still be innovative, not labor intensive; have the ability to create and strengthen learning loops; provide an

opportunity to work in groups (e.g. CoP); help participants to reach specific evidence of best practices/lessons learned; allow for sharing a variety of experiences and expertise; allow for the use of participatory, interactive and innovative methodologies; allow for synergies; have the potential and built-in mechanisms to evolve; and include simple show cases which can be documented in a variety of ways, including videos, pictures and posters (Nonaka & Takeuchi, 1995).

a. Create, Collect and Capture Knowledge at Program- and Project Levels

Creating Explicit Knowledge at Program-Level (e.g. Program Reporting and CoP related to Cross-Cutting Themes)

b. Creating Tacit Knowledge at Program-Level (e.g. shadowing or mentoring; knowledge maps to identify expertise; systematic exit interviews)

c. Create, Collect and Capture Knowledge at Projects-Level

It is important to improve knowledge sharing in a way that helps projects achieve better results and strengthens the CIDA Egypt Program as a whole, without creating an undue burden for the projects. This is partially done through the synergy meetings now.

d. Creating Explicit Knowledge at Projects-Level

Lessons learned and tools successfully used should be identified and documented at least on a yearly basis, and be posted on the website, to ensure that all team members as well as external partners gain access to it.

e. Creating Tacit Knowledge at Projects-Level: Systematic Project-Exit Documentation.

For starting projects, a section on the project's contribution to KM should be in the ToR. It should describe how each project is obliged to create, store and share its knowledge with CIDA, PSU and other projects.

f. Share and Disseminate Knowledge

The Web is a key component of the KM network. This will enable initiating a "Web Protocol-based" intranet as a primary knowledge sharing platform, which is more practical in terms of direct cost, development costs, initial investment, legacy integration and cross-platform integration. The Intranet and the Website have to be updated to support that.

Further areas are recommended for improvement: the site should include up-to-date information; it should ensure two main elements: search engines that are efficient/well thought-out navigation structure, and a continuous flow of new information as well as a well thought-out navigation structure and effective search.

Stage III. Deployment

8. Deploy using the results-driven incremental methodology.

A workshop was organized to discuss the details of the KM Strategy and Framework, and solicit feedback from various stakeholders. Following the workshop, an action plan is put forward, and an incremental operation of the system is introduced. It consists of two months pilot program focusing on two projects, followed by an evaluation which is followed by full implementation after corrective measures have been made.

9. Manage, Change, Culture and Reward Structures (e.g. through training and development and incentive system)

Stage IV. Evaluation (Lang, 2001; Kaplan & Thomson Reed, 2007; Kulkarni, Ravindarn, & Freeze, 2007).

10. Evaluate Performance and incrementally refine the KMS.

Following the deployment of the KM Strategy, an evaluation of the system will take place over two months, finally culminating in the introduction of adjustments and changes to refine the system. Documentation of the KMS, including recommendations for improvements and institutionalization are to be provided.

Using insights gained from secondary research and the case study, a model for managing knowledge in international development organizations is proposed (Figure 4), where the participatory approach is emphasized throughout all phases of the development of the KM strategy. This is important due to the specific nature of international development organizations, each has certain priorities and areas of focus. Therefore, the KM strategy will be different from one entity to the other, depending on the work process, the structure, the relationships between the different program components, the projects, the partners and the stakeholders.

The model of the development and implementation of the KM strategy at CIDA is portrayed in Figure 4 below.

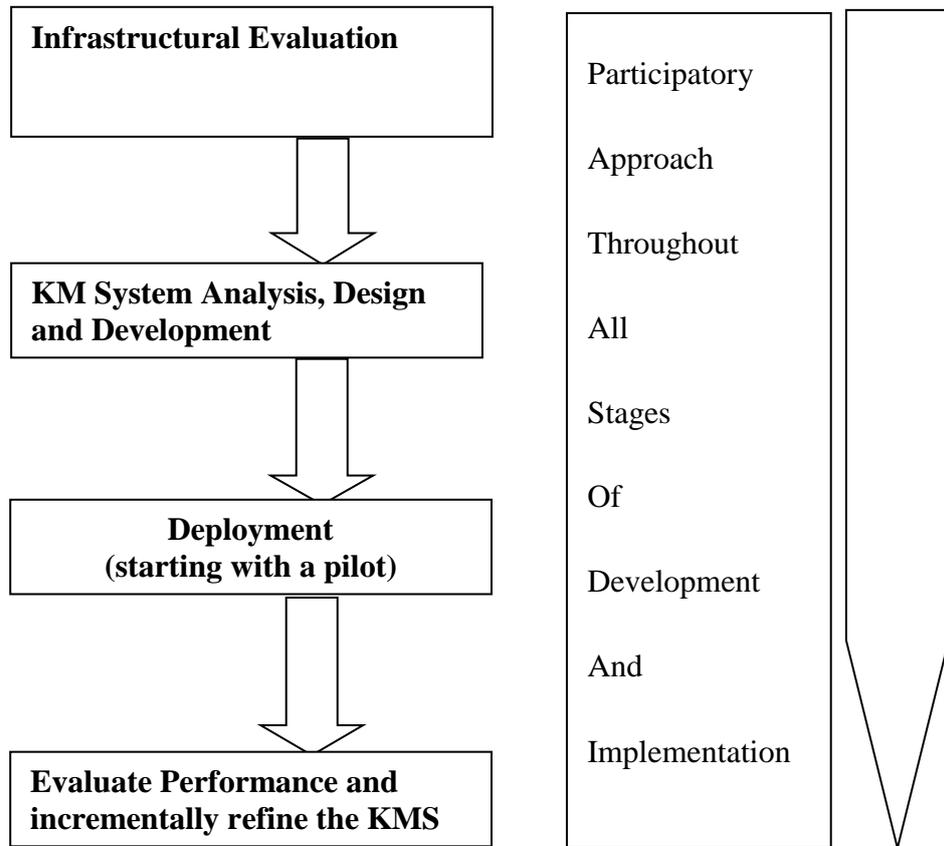
It is important to note, that, KM efforts must include identification of knowledge-intensive work processes and work flows that are important for the type of business, and the IT systems support needed to facilitate knowledge sharing (Kulkarni, Ravindarn, & Freeze, 2007). There also has to be complementarities between KM factors and organizational factors (Kulkarni, Ravindarn, & Freeze, 2007).

5. Discussion and Conclusions

The case study of CIDA/Egypt has proven to be exploratory and illustrative. It is illustrative in the sense that it showed a similar strategy to other international development organizations and illustrates in detail the steps, the phases and the frameworks necessary for KM development and implementation. It is also exploratory as it one of pioneer studies of organizations starting the KM initiative in the field before their head office. In addition, it portrays an aspect not used previously by other organizations in the field, which is the participatory approach throughout the development and the implementation of the strategy.

The KM strategy at CIDA /Egypt is supported by its leadership, which reflects the recommendations of the literature (Laporte, 2004; Liebowitz, 2000; Ringel-Bickelmaier & Ringel, 2010). Several workshops have been conducted to develop and reinforce an organizational culture that supports and encourages knowledge sharing and development, again confirming the findings in the literature (Ho, 2009; Lopez, Peon, & Ordas, 2004; Bose, 2004; Robinson, Anumba, Carrillo, & Al-Ghassani, 2006) . This has been initiated by the synergy group meetings already taking place for the last two years, but it is further encouraged through the various knowledge management tools and mechanisms, like KM cafes and round-table discussions. The organizational structure which is specific to CIDA Egypt is flexible, as it is quite organic (close to a starburst structure), with the program and its support unit as the centre nodes, which are connected with all projects. All the projects are connected through the synergy group meetings and the thematic groups. The Information Technology (IT) has been upgraded to support the KM initiative. In addition, a new software is installed to support a more advanced intranet system.

Figure 4 KM Strategy at CIDA/Egypt



There is a balance between social and IT-based knowledge sharing techniques, as the KM strategy at CIDA/Egypt is people-based. The IT is important to support the people, but it is not the focus of the strategy. There are various tools that are based on people interaction like the KM harvesting events and knowledge fairs. This is a point highly emphasized in the literature, especially in the writings of Mohamed et al. (2009)

There is a KM committee and a KM Officer. The committee oversees the development and implementation of the strategy. It is a group who represent the program and the projects of CIDA/Egypt. There is leadership, advisors, project directors, KM consultant, and the KM Officer. They make recommendations, help in solving problems that occur during development and implementation and give support and guidance to the KM Officer.

The monitoring and evaluation component is a corner stone in CIDA’s KM strategy. A logic model was developed out of the action plan. It includes the overall objectives of CIDA/Egypt and identifies ultimate, intermediate and immediate outcomes, which are reflected in activities; these ideas are reflected in several studies (Bose, 2004; Desouza, 2010; Kaplan & Thomson Reed, 2007; Ho, 2009; Kulkarni, Ravindarn, & Freeze, 2007). The latter are used to identify criteria for success for monitoring and evaluation purposes. Figure 5 is the first section of the performance measurement framework and shows how results are transformed into indicators and how they are eventually measured.

There is an additional component of the strategy which is specific to CIDA/Egypt. It is the participatory approach adopted throughout the development and the implementation of the strategy. This component has several effects; it is part of creating a supportive knowledge sharing culture, it leads to commitment and ownership of the strategy and its implementation by employees, it leads to more accuracy and relevance of the strategy, and is in itself a monitoring and evaluation measure along the development and implementation of the strategy.

The hypothesis is accepted and all research questions are answered. The KM initiative at CIDA/Egypt has the same elements/ components as the international development organizations that adopted the concept previously. It has additional components which could be used to enhance the success potential of similar organizations.

Limitations of the study

The strategy is still in the pilot phase. Results have not been achieved and evaluated fully yet, though it looks promising. The experience of CIDA/Egypt might be unique, as CIDA headquarters is still planning its KM strategy. In all other international organizations that implemented KM so far, the start of the initiative was in the headquarters, then it was transferred and implemented in the fields after being tried out and institutionalized.

Recommendations for future research

It would be recommended to conduct a follow up study, i.e. completing a longitudinal study to validate results after full implementation. This study should be considered as a “pilot study” and other case studies in similar organizations in Egypt and in the region should be conducted and results compared.

General recommendations

Applying KM should be a goal of international development organizations, as it is an important factor leading to sustainability, effectiveness and efficiency. A KM strategy reflecting the organization’s overall strategy is the first step towards achieving this goal. A participatory approach in developing and implementing the KM strategy is of particular significance due to the special nature of these organizations and their ultimate goal of being more sustainable in their operation and achieving human development and sustainability in the world.

Figure (5)
PERFORMANCE MEASUREMENT FRAMEWORK OF KM AT CIDA/EGYPT

Results Statements	Indicators	Baseline Outline current situation	Target Outline desired / expected situation	Data Sources People and /or records etc	Collection Methods	Frequency	Responsibility
ULTIMATE OUTCOME							
Enhanced Knowledge Management within the CIDA Egypt Program to become a learning organization, linked more effectively with CIDA/HQ and other Stakeholders	--Extent to which the KM system benefited the Egypt Program/ projects	None	High	Questionnaire	Questionnaire	annual	KMO/ KM committee
	-Extent to which knowledge is shared between program/ projects and HQ/ other stakeholders	None	High	Questionnaire			
INTERMEDIATE OUTCOMES							
1. Improved systems/processes of <u>capturing, collecting and storing</u> of knowledge at the Program and project levels	Level of satisfaction of the systems/processes of capturing, collecting and storing of knowledge	None	High	Questionnaire	Questionnaire addressed mainly to PSU and selected Program/Project staff	Bi-annual	KMO KMS
2. Enhanced <u>access, use and application</u> of knowledge at the Program and project levels	- Level of knowledge collected and used - Ease & accessibility of system processes	Limited	High	Questionnaire	Questionnaire	Bi-annual	KMO KMS
		None	High	Questionnaire			
IMMEDIATE OUTCOMES							
1.1 Knowledge Management mechanisms/tools developed and operational	- Usefulness of tools - level of satisfaction of users	None	High	Questionnaire	Questionnaire	annual	KMO KMS
		None	High				
1.2 Knowledge Management technologies developed and operational	- No. of visitors of website - No. of users logging into the intranet system	Limited	High	Software Program	Tracking system	Monthly	KMO
		None	e.g. 30 % increase in # of hits; # of users/ year	Software Program	Tracking system	Weekly	KMS
2.1 Knowledge Management System functioning and effectively used for the CIDA Egypt Program	- Extent to which the KM system benefited the user - Level of participation in the CoPs	None	High	Questionnaire	Questionnaire	Annual	KMO KMS
		None	High	CoP reports/documents Questionnaire	Reports/documents Questionnaire		
2.2 Knowledge Management Culture within the CIDA Egypt Program developed and maintained	The level of diversity of users being recognized for active participation in the system	None	High	Harvesting Workshop attendance	Records/reports of events	Annual	KMS

Table key: Results Statements: Desired outcome
 Indicator: Output
 Baseline current situation: The current state/level of this output
 Target Outline desired / expected situation: The state of the indicator
 Data Sources: From where will data be obtained
 Collection Methods: Which tool will be used to identify results
 Frequency: Number of occurrence
 Responsibility: Who is in charge of it

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Ahmed Salama

Small and Medium Enterprises as a Driving Force for Egyptian Economic Growth

Abstract

The main objective of this study is to investigate the impact of expanding SME sector on the economic growth using time series data from Egypt for the period (1980-2010). This study aims to fill the gap in the literature by providing the first empirical study with time series data to investigate the relationship between SMEs expansion and the economic growth for the Egyptian economy. The study proves a positive relationship between SMEs expansion and economic growth, suggesting that the Egyptian government should focus in boosting that sector.

Keywords: SMEs, Egypt, Economic Growth.

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1. Introduction

Several economies have been built up by a strong and dynamic Small and Medium-Sized Enterprise (SME) sector, like the Japanese and Italian economies, where the SME sector plays an important role in economic growth.

The role played by SMEs in achieving economic growth and social prosperity is an attractive topic in the economic arena especially today. The reason for that is that for a long period of time the economic literature was focused on the merits of large firms, believing that larger enterprises are much more efficient and a large enterprise in general is the only means to boost the economy. Even now some economists and academics still doubt that SMEs could boost an economy or solve some socio-economic problems. This raises arguments in the literature; actually it is an unresolved issue among economists till now.

Since the 1980s Egypt's SMEs have been under consideration by the government and attention was explicitly turned to them in the 1990s when government realized the need for a strong private sector, as SMEs are considered the main engine for job creation and increasing GDP. When Egypt developed its plan for poverty reduction in 2005, supported by the Ministry of Planning, the Economic Research Forum and the United Nations Development Programme (UNDP), a part of that plan was generating more jobs through SMEs. SMEs also help in increasing the average income of women in Egypt.

The Egyptian government does not only announce its total support for the SME sector, it also declares that it depends on this sector to achieve the country's goals for the next years. In fact, SMEs are one of the main components of Egypt's agenda for social and economic development. The Egyptian government promised to support and encourage a healthy environment for SMEs to perform competitively and efficiently.

Most studies that investigate the impact of SMEs use cross sectional data from many countries. Only a little research has been done using time series data tracing the performance of SMEs in a single economy. The main objective of this study is to investigate the impact of SMEs' expansion on Egyptian economic growth. A brief discussion about what SMEs are and what has been said about them in the literature is an essential step before describing the empirical study.

2. Definition of SMEs

Actually, it is impossible to have a unified single definition of SMEs that fits all countries and all economic sectors, as the definition depends on who is defining the term and where and when the definition is made. However, there are some criteria that are used to define SMEs. Talking about Egypt, there are three criteria for defining SMEs in Egypt, which could be used individually or in combination: the definition according to capital, the definition according to employment and the definition according to turnover.

Even inside Egypt, different sectors and institutions define SMEs in different ways. For example:

- SMEs definition according to Law 41 for Small Enterprises defines SMEs according to capital and employment:

A small enterprise is any enterprise whose capital is more than fifty thousand Egyptian pounds and less than one million Egyptian pounds employing less than fifty employees, and a medium enterprise is any enterprise whose capital is more than one million Egyptian pounds and less than five million Egyptian pounds employing less than hundred workers.

- The Egyptian Central Bank defines a small enterprise in terms of capital and turnover. A firm is considered to be an SME if its capital is not less than fifty thousand and not more than five million Egyptian pound and its annual turnover is more than one million and is less than twenty million Egyptian pounds.
- The Nilex, which is the SMEs stock exchange, whose main aim is to provide adequate funds for SMEs, defines SMEs in terms of capital only; for a company to enter NILEX its capital should not be less than five hundred thousand Egyptian pounds and not greater than twenty five million Egyptian pounds.
- The World Bank, one of the most important institutions that support SMEs in Egypt and in all developing countries, defines SMEs in terms of employment and turnover; no matter what the capital is, a firm is to be considered a small one when it employs from eleven to fifty employees and its annual sales are from three to fifteen million dollars, while it is considered to be a medium enterprise if it employs from fifty to three hundred employees and the annual total sales are between fifty million and a hundred million dollars.

In fact, different countries have different definitions for SMEs according to sectors and institutions and also according to how developed the country is.

3. Literature Review

In Egypt, believing in the important role played by the SME sector in achieving economic growth, ministries form units and institutions in order to support the SME sector.

The General Authority for Investment (GAFI) under the Ministry of Investment initiated a Small and Medium Investment (SMI) strategy in November 2008. It focuses on four pillars and a monitoring activity aiming to create jobs (OECD 2010). The four pillars are

1. Improving the SME's access to funds
2. Encouraging business development services
3. Promoting entrepreneurial culture in Egypt and
4. Forming competitiveness poles.

Three bodies (the Industrial Modernization Center, the Egypt Technology Transfer and Innovation Centers (ETTICs) and the Industrial Development Authority (IDA)) under The Ministry of Trade and Industry apply policies supporting the development of the SME sector. The ministry has also a sector for SME development policies.

The Ministry of Finance established an SME development unit in 2000, which concentrates on policy development and research.

All these efforts prove that Egypt is serious in supporting and encouraging the SMEs sector.

Before the importance of SMEs in boosting economic growth was realized, the role played by smaller firms was undefined and misinterpreted in the literature for a long period of time.

In past, small enterprises were seen to be hindering economic growth by absorbing the resources that could have been used more efficiently by larger enterprises (Audretsch et al. 2002).

Schumpeter, Galbraith and Ace believed that larger enterprises are more efficient than smaller ones.

Schumpeter argued that economic growth could be achieved only through large enterprises due to the advantage of economies of scale that larger enterprises enjoy in the production of economic and technological knowledge, which he believed were the engine for economic growth. (Schumpeter 1934).

Schumpeter was more concerned about the monopolistic market structure – as large firms monopolize the technological process - not the market size.

Galbraith (1956) argued that larger firms are dominant in almost all the aspects of economic behaviour, so the idea that larger enterprises have the potential to succeed more than smaller ones could be attributed to Galbraith.

Schumpeter and Galbraith build their arguments on the belief that in a global world it is extremely difficult for small firms to survive and compete with larger firms.

In the late 1970s and the beginning of the 1980s economists started to look at SMEs in a different way as they traced a change in the underlying determinants of industrial structure. From the industrial revolution took place until the 1960s, large enterprises which monopolize economies of scale were seen to be the dominant engine for economic development but after the appearance of computer based technology in production, information and administration the importance of economies of scale has been reduced and SMEs have become more innovative and more efficient in producing intermediate goods (Gebremariam et al. 2004).

Several studies done by Loveman and Sengenberger (1991), Acs et al. (1990) and Acs and Audretsch (1993) reported a restructuring in industry which caused a shift towards an increase in the role in of smaller firms due to changes in labour supply, higher levels of education, consumer demand, production technology and the need for flexibility and efficiency. These studies also found that the shift's extent and timing are the same in all countries (Loveman and Sengenberger 1991, Acs et al. 1990, Acs and Audretsch 1993).

According to Wennekers et al. (2005), studies that use data from developed countries suggest a positive relationship between SMEs and economic growth while studies done using data from developing countries suggests a negative relationship between SMEs and economic growth. Those differences were explained by Acs et al. (2008) as occurring in empirical results due to the different responses of entrepreneurship to the institutional arrangements.

One of the most important studies in this topic was provided by Beck et al. (2005), as it provided the first cross-sectional evidence on the linkages between SMEs, economic growth and poverty alleviation. A regression of GDP per capita growth on SMEs was done based on the 1990s data from forty-five countries. The share of the manufacturing labour force was used to measure the relative size of SMEs. The study yields three results:

- There is a significant positive relationship between the relative size of SMEs and GDP per capita growth even after controlling for other characteristics in the countries involved that might account for differences in economic growth.
- The study failed to support the idea that SMEs exert a casual impact on growth (this supports the idea that a larger SMEs sector is a characteristic of a growing economy not a cause for this rapid growth).
- No evidence was found about the contribution of SMEs in reducing poverty or decreasing income inequality.

It should be said that this study examines SME employment not SME subsidization, which means that even if it is proved that SMEs increase economic growth, enhance economic development and reduce poverty that does not mean that subsidizing SMEs by government would have those beneficial effects (Beck et al. 2005).

A limitation in the existing empirical studies examining SMEs and their impact in economic growth is that most of these studies are based on data from developed countries. One of the few studies examining SMEs in developing countries is by Hu and Liu (2003). The study provides an empirical study using data from thirty-seven countries both developed and developing over the period from the 1960s to the 1990s to examine how the SMEs sector affects economic growth. The study

reported a positive relationship between SMEs and economic growth and they also concluded that in mature economies the SMEs' contribution to growth is driven by inherited entrepreneurship, while in less developed countries SMEs enhance economic growth through job formation, so each economy needs its own SMEs policies according to its structure and size (Hu and Liu 2003).

One of the recent studies on the impact of SMEs on economic growth (Cravo et al. 2010) was carried out at Loughborough university to examine the relationship between the SMEs sector and economic growth in Brazil. They used the employment share of the SME sector and the level capital in SMEs to examine the importance of the SMEs sector, using annual panel data of Brazilian states during the period 1985-2004. The study found a negative relationship between relative size of SMEs and economic growth and they reach a conclusion based on the study indicating that the level of human capital in SMEs is more important for economic growth than the relative level of SMEs.

In this paper the researcher will also depend on time series data as the main objective is to examine the impact of SMEs in enhancing Egyptian economic growth and poverty reduction.

The other limitation in the existing empirical studies is that, while most studies examining the impact of SMEs on economic growth provide cross-sectional data of several countries, very few provide time series data. This paper needs a time series study because it aims at investigating the relationship of the SMEs sector in Egypt with Egyptian economic growth, so it would be more effective to use time series data than to use data from many countries.

Gebremariam et al. (2004) examined the role played by small firms in economic growth and poverty alleviation in West Virginia. The paper tried to establish a statistical relationship between the development of small business and economic growth using state-specific time series data. The study also attempted to test the evidence from time-series-based poverty literature on the linkage between macroeconomic performance and poverty by using Virginia's aggregate time series data. The objective of the study was to evaluate the role of small business in economic growth and poverty alleviation in West Virginia, so they used time series data for the period 1980 to 2001, using four econometric equations to find the following results:

- There is a robust, positive relationship between the size of small firms and economic growth even after controlling for many other growth determinants.
- There is an intense inverse relationship between the relative size of small firms and the presence of poverty.
- There is a negative relationship between per capita real gross state product growth and the existence of poverty.
- the impact of the relative size of small business on the poverty rate is weak and insignificant, which suggests that the inverse relationship between the size of small firms and the existence of poverty existence is not a direct one, but indirect, as it could be achieved through economic growth, so the impact of small business on poverty alleviation is obtained mainly through economic growth.

In this paper I will modify the first equation to be more adaptable to the Egyptian economy in order to investigate the impact of SMEs' expansion on economic growth. This will be discussed in section 4.

As previously explained, SMEs boost the economic growth in developed and developing countries through different ways, as they enhance the economic growth in developed countries through inherited entrepreneurship and in developing countries through creating jobs (Hu and Liu 2003).

As a developing country, Egypt mainly benefits from SMEs' through the jobs created by this sector, which contribute to economic prosperity through raising GDP and social and political prosperity and through reducing poverty and redistributing income in favor of the lower income group.

However, it is a debatable issue among scholars whether SMEs provide better job opportunities in the economy or not, as some economists have argued that large firms are better in job formation (Armington and Odle 1982; Dunne et al. 1989, Brown et al. 1990, Acs and Audretsch 1993, Duncan and Handler 1994, Harrison 1994, as cited in Beck et al. 2005), while others (Birch 1979, Miller 1990, Thurik 1996, Carree and Thurik 1998) referred to SMEs as the best sector to generate jobs.

Birch (1979) believed that small firms are important in job creation. His study examined the American economy in the period between 1969 and 1979. He reported that firms which are employing less than 100 employees contributed 80% of jobs created in the American economy over the period 1969 to 1979, while Miller (1990) found that in the period between 1980 and 1986 net employment growth in existing small rural firms was much faster than in large firms.

Thurik (1996) applied data from twelve of the European Union countries to test whether the growth of small firms exerted a significant higher effect on GNP growth than large firms' growth. He found smaller firms to be more influential in solving the European unemployment problem and the weak competitiveness problem.

On the basis of the evidence from 13 European countries, Carree and Thurik (1998) argued that in the 1990s the increase in the share of large firms' employment in the overall employment level led to negative effects on economic growth, meaning that SMEs' employment leads to better effects on economic growth.

Other studies do not agree that SMEs create jobs, enhance economic growth or reduce poverty (Armington and Odle 1982, Dunne et al. 1989, Brown et al. 1990, Acs and Audretsch 1993, Duncan and Handler 1994, Harrison 1994, as cited in Beck et al 2005). These studies show that despite of the large growth rate in percentage terms most of the new firms do not grow.

For example, Biggs et al (1998) found that in sub Saharan Africa larger firms were the main source of net job creation in the manufacturing sector.

One of the main points made against the SMEs sector is the quality of jobs it provides. Rosenzweig (1988) and Brown et al. (1990) have proved by empirical evidence that larger firms provide more stable employment, higher non-wage benefits and higher wages than small firms in both developed and developing countries.

Some empirical evidence has shown that firm size does not well predict labour intensity, as it differs more across industries than across firm size groups within industries. It could be that some small firms are more capital intensive than large firms in the same industry (Little et al. 1987, Snodgrass and Biggs 1996).

Davis et al. (1993, as cited in Beck et al 2005) argued that while it is true that the gross rates of job creation and destruction are larger in small firms there is no systematic relationship between net job creation and firm size.

Besides job creation, innovation is one of the main important forces for economic growth as it increases the potential GDP that the economy could reach. As discussed above, Schumpeter (1934) referred to larger firms as more innovative and thus more useful to the economy than smaller ones which are less innovative. However, many arguments have been raised claiming the small firms could be more innovative.

While Pagano and Schivardi (2001) used samples of European industries and show that large firms perform faster innovation than smaller firms, Arrow (1983) and Reynolds (1999) on the other hand pointed out that large firms may depend on their monopoly power to postpone the outcomes of innovations and they also lack the motivation and incentives to increase their productivity, so their contribution to economic growth could be less than the contribution of SMEs, which are always motivated to improve their productivity.

The existing literature does not include any empirical study done to examine the impact of SMEs on economic growth with Egyptian data. The reason for that is the unavailability of SMEs data in Egypt. In some cases is impossible to obtain accurate or semi accurate data for a large number of years. This is also a limitation in the existing empirical study.

The aim of this paper is fill the gaps in the current literature by providing an empirical study investigating the relationship between the expansion of SMEs and economic growth using data from Egypt for the period 1980-2009.

4. Model Specification

As previously mentioned, the main objective of this study is to investigate the impact of SMEs' expansion on the economic growth of Egypt while simultaneously controlling for other macroeconomic factors that affect economic growth.

Most of the studies done to examine the impact of SMEs on economic growth use cross-sectional models but the main aim of this study is to specify the impact of SMEs' expansion on economic growth in Egypt specifically, so a time series model with Egyptian data will be much more effective to test paper's hypothesis, that the expansion of SMEs and economic growth have a positive relationship.

One of the very interesting models relating to this topic is a model adopted by Gebremariam et al. (2004) to investigate the link between SMEs' expansion, economic growth and the incidence of poverty in West Virginia. The first equation used in the model examines the impact of SMEs' expansion on economic growth in West Virginia.

The study actually includes other models to examine the impact of SMEs in the incidence of poverty but this paper is interested in examining the impact of an expanding SMEs sector on economic growth only.

After reading and studying most – if not all - models developed to address that topic, it was found that this model is the most suitable model to study the impact of SMEs on Egyptian economic growth for many reasons. Unlike most studies, this study is one of the very few models that uses time series cross-sectional data, so it is relevant to the hypothesis that the researcher is aiming to test.

The model adopted in the study is a time series regression that uses real gross domestic product per capita (RGDPC) as a dependent variable, while using the employment created by small and medium enterprises (SME) as a proxy for SMEs’ expansion, and it also uses the unemployment rate as a proxy for the effect of the business cycle on the rate of growth of real GDP per Capita. The model will use the Consumer Price Index (CPI) to control for inflation. In the model adopted by Gebremeriam et al. (2004) they use government transfers to persons per capita and rate of inflation as control variables but in the model adopted by this study the researcher tried to find a proxy for the government transfers that is of more relevance to Egypt, so subsidies per capita is the best Egyptian alternative for the American transfers. It also includes trend variable T to reflect the aggregate trend in the real GDP per capita, Finally the error term is represented by u_t .

This relationship is depicted in the following equation for time t:

$$GDPC_t = \alpha + \beta_1 LSME_t + \beta_2 LCPI_t + \beta_3 UNMP_t + \beta_4 LSUBC_t + \beta_5 t \varepsilon_t \quad (1)$$

Table 1 shows the expected signs of the variables.

Table 1. Expected signs

Variable	Description	Expected sign
LSME	Log of SMEs’ employment	Positive
LSUBC	Log of subsidies per capita	Positive
LUNMP	Log of unemployment rate	Negative
LCPI	Log of Consumer Price Indices	Negative

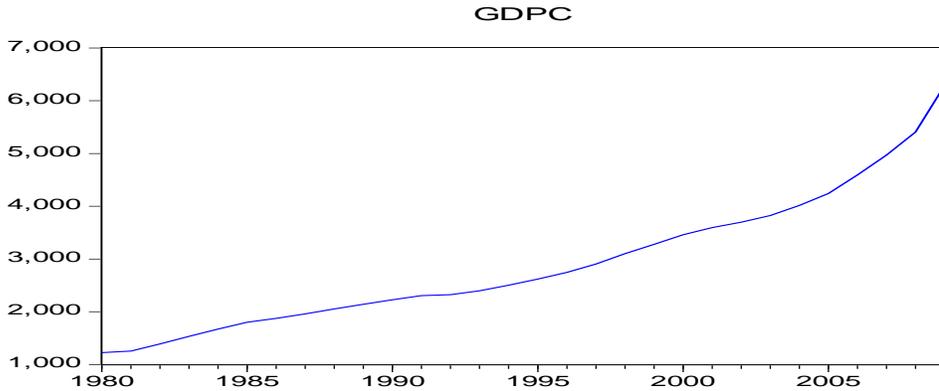
5. Data Analysis

Real GDP Per Capita (GDPC)

Real GDP per capita is used as a dependent variable to measure the impact of SMEs’ expansion on economic growth. It is calculated by dividing the real GDP by the total population. Real terms, not nominal terms, are used in the model, as they are more efficient to measure real changes, because they are adjusted to consider changes in the price level.

The data of Real GDP per capita for the period (1980-2009) are extracted from the World Development Indicator (World Bank) and the Central Agency for Public Mobilization Statistics (CAPMAS), expressed in dollar terms, using the Purchasing Power Parity (PPP) approach with the year 2000 as a base year.

Figure 1. GDPC (\$)

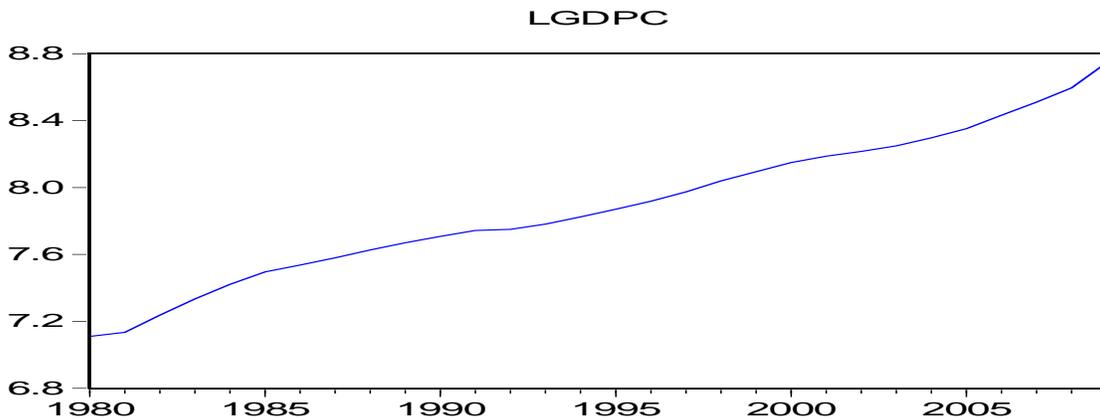


Source: World Bank and CAPMAS

As shown in Figure 1, GDP per capita has an upward sloping trend but with a magnitude of less than that of the population growth. It varies between \$1,223.856 (minimum) and \$,6300 (maximum) with a mean of \$2,913.432, a median of \$2,560.433 and a standard deviation of \$260.1438.

Log of GDPC (LGDPC) will be used in the model (represented in the Figure 2).

Figure 2. LGDPC



Source: World Bank and CAPMAS

LGDPC varies between 8.74 (maximum) and 7.1 (minimum), with a mean of 7.886, a median of 7.84 and a standard deviation of 0.43.

Using the unit root test to test for stationarity it was found that including the intercept the data found to be stationary at the 1st difference (I1).

Small and Medium Enterprises' Employment

In their model Gebremariam et al. (2004) used the employment share of private firms employing less than 500 workers as a measure of SMES's share of employment. However, because Egypt is different from the USA, the same definition could not be used.

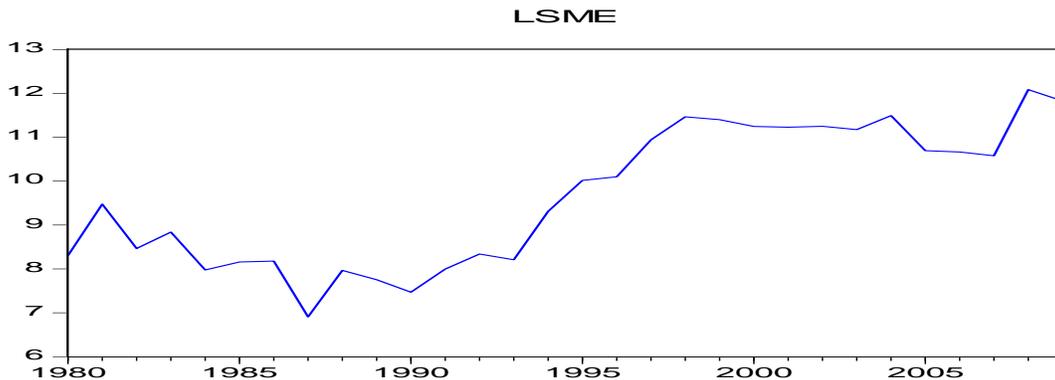
After talking to Mrs. Reem El Saïdy, the Manager of the SMEs Unit in GAFI and some other officials in CAPMAS and the Ministry of Economic Development, based on what they all confirmed, it was concluded that it is impossible to find yearly data on SMEs using the employment definition. So, as a proxy for SMEs' employment, an excellent alternative will be used in the study which is: the total expected employees that are recorded at GAFI at the time of the firm's foundation at GAFI (SME).

The data was extracted from GAFI, the general authority for investment. The cutoff definition of SMEs (based on the best available data and the Egyptian Law 43) is according to the capital.

Based on their capital, small firms are defined as firms whose capital is more than five hundred thousand Egyptian Pounds and less than one million Egyptian Pounds and medium enterprises are defined as firms with capital more than one million Egyptian Pounds and less than five million Egyptian Pounds.

The log of SME will be used as a proxy for the expansion of the SMEs sector (represented in Figure 3).

Figure 3. LSME



Source: GAFI

As shown in the graph, the SME has increased sharply since 1990, when new economic reforms were adopted, and increased more after 2005, when new economic reforms that encourage investments took place, but it decreased again after 2007, due to the effect of financial crises that hit the whole world.

The logs of SME vary between 12.08577 (maximum) and 6.906755 (minimum), with a mean of 9.650700, a median of 9.746687 and standard deviation of 1.574.

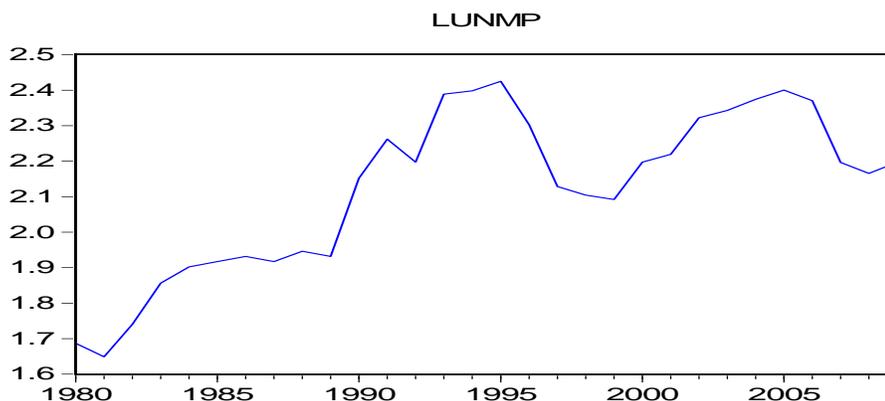
A unit root test was used to test for stationarity; including the intercept it was found that LSME is stationary at the 1st. difference (I1).

Unemployment Rate (UNMP)

The unemployment rate is used in the model as a proxy for the business cycle effect on real GDP per capita. The unemployment rate could be calculated using two methods (Hassan and Sassanpour 2008), the narrow one, which is the percentage share of unemployed people of the labour force, given that the unemployed people are defined as people who are of working age (15-65) and are actively seeking jobs and cannot find one, and the broad one, which is the share of unemployed people including both those who are searching for a job and those who are not. The definition used in this study is the narrow one.

Data for unemployment rates for the period (1980-2009) are extracted from the World Development Indicator (World Bank) and the missing data are extracted from CAPMAS and world financial statistics (IMF). The log of unemployment LUNMP will be used in the model (represented in the Figure 4).

Figure 4. LUNMP (%)



Source: CAPMAS and World Bank

Unemployment in Egypt in the period 1980-2009 ranged between 5.3% and 11.02%, with a mean of 8.4322% and a median of 8.76%. It reached its maximum (11.02%) in 2005, while in 1980 it was at its minimum (5.3%). The standard deviation for the unemployment data set is 1.747%.

The log of unemployment in Egypt for the period 1980-2009 ranges between 1.65 (minimum) and 2.42 (maximum), with a mean of 2.12, a median of 2.18 and a standard deviation of 0.226. As shown in Figure 4, although showing some fluctuations over that period, unemployment tended to adopt an upward trend.

When the government was publicly investing in heavy industries and was exercising import substitution activities until the mid-1970s Egypt experienced high growth and employment. In fact the government adoption of a guaranteed employment policy helped more in the absorption of unemployed people as the unemployment rate ranged between 2% and 3% but when Sadat came to adopt more liberal and open market activities in the mid-1970s, although achieving high investments the positive effects of which are reflected in more growth and productivity, it did not help that much in creating employment opportunities (unemployment rates increased to range between 5% and 7%), because, as suggested by Hassan and Sassanpour (2008, citing an unpublished manuscript by El Ehwany dated 2004 and entitled “Labor Market Analysis and Macroeconomic Framework: Policies and Incentives for Increasing Employment in Egypt”), there was a high rate of inflation, the currency was highly overvalued and the monetary policy was expansionary. All these factors led to high capital intensity in Egypt at that time (Hassan and Sassanpour 2008).

As shown in Figure 4, ever since the 1990s the unemployment rates has been high (ranging from 8% to 11%). The economic reforms that took place from the beginning of 1990 to the mid-1990s increased growth but their impact on employment creation was not that great.

In the early 2000s the Egyptian economy stagnated, so, as shown in the curve, the unemployment rose significantly.

In mid-2004 Egypt adopted an economic reform programme and the external economic environment was so healthy that in 2005 economic growth rose sharply. This rise in the economic growth that occurred obviously in end of 2004 sharply drove the unemployment rate down, because the characteristics of growth had changed, being more broadly based and job rich, as between the end of 2004 and 2007 the unemployment rate fell by about 1%.

In 2008 and 2009, employment dropped due to the effect of the global financial crisis that was rooted from the USA.

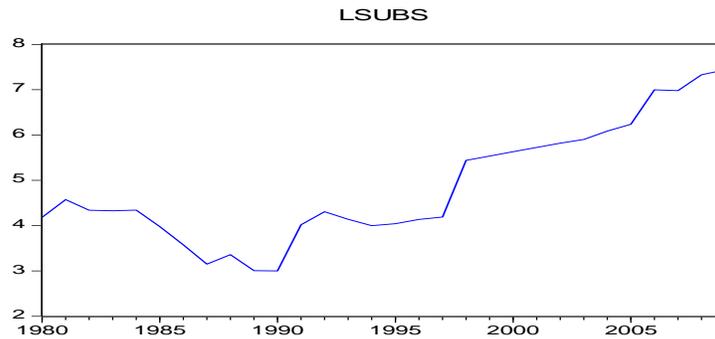
A unit root test was performed to test for stationarity of the data and including intercept it was found that LUNMP is stationary at the 1st. difference (I1).

Subsidies per Capita

Subsidies could be considered as financial aid, given by the government to poor people.

In the model a subsidies per capita were included to control for the effect of subsidies offered by government on the real GDP per capita. Logs were taken to smooth the graph (Figure 5).

Figure 5. LSUBS



Source: IMF, World Bank World Development Indicator, IMF International Financial Statistics Ministry of Economic Development and CAPMAS

LSUBS varies between 3 (minimum) and 7.4 (maximum), with a mean of 4.9, a median of 4.33 and a standard deviation of 1.3.

Data for total subsidies and other transfers are expressed in dollar terms and are extracted from many sources due to the unavailability of data for some years in any one source. Those sources were CAPMAS, World Bank World Development Indicator, IMF International Financial Statistics and the Ministry of Economic Development.

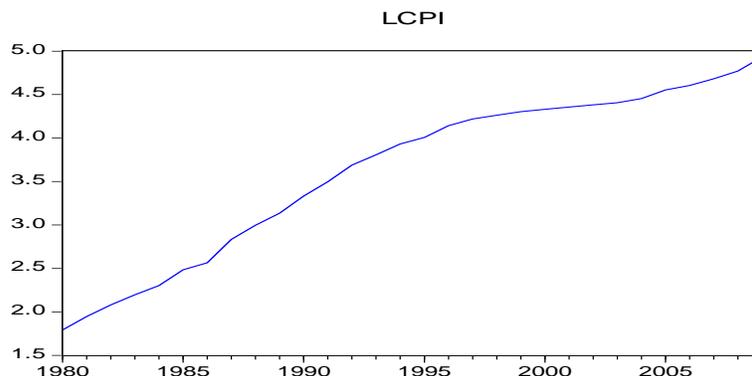
To test for stationarity, a unit root rest was used and the result was that including the intercept the data was found to be stationary at the 1st. difference (I1).

Consumer Price Index

The CPI is used in order to control for the effect of price changes on the real GDP per Capita. Consumer price index is an inflationary indicator used to measure price changes of a fixed basket containing a set of necessary goods and services.

The model will use the log of CPI data (reflected in Figure 6).

Figure 6. LCPI



Source: World Bank World Development Indicator

As shown in Figure 6, LCPI for the period (1980-2009) tends to have an upward sloping trend indicating a continuous increase in the general price level. Data for log CPI for the period (1980-2009) range between 4.9 (maximum) and 1.7 (minimum) with a mean of 3.63363, a median of 3.969579 and a standard deviation of 0.69.

Data for CPI are extracted from the World Development Indicator with base year 2005.

In order to test for stationarity, a unit root test was used and the result was that including the intercept the data were found to be stationary at the 1st difference (I1).

6. Empirical Results

Before running the model a co-integration test is used to determine whether there is at least one long-run relationship between the variables or not. In fact it was found that at most there are four long term relationships between the variables.

The model uses dummy variables or exogenous factors for two years (2005 and 2008), as the economy stagnated in 2005 and a global financial crisis happened in 2008. Both could be considered as exogenous factors affecting the real LGDPC.

After running the model, the following results were found (see Table 2).

Table 2. Results

Variable	Coefficient	Standard Error	t-statistic
Constant	7.347923		
LSME	0.024670 []	0.00489	5.04025
LUNMP	-0.079053 []	0.00948	-8.33834
LSUBC	- 0.015870 []	0.00272	-5.83923
LCPI	-0.034785	0.00876	-3.96895
Trend	0.053302		
ADJUSTED R-SQAURED	0.907668		

Table 2 shows the results of the model. In fact the model is expressed in double log form so the coefficients represent how elastic the dependent variable is in relation to the independent ones. The form of the model is

$$LGDP C_t = 7.347923 + 0.024670 LSME_t - 0.034785 LCPI_t - 0.079053 LUNMP_t - 0.015870LSUBC_t + 0.05302t + \varepsilon_t$$

LSME is a significant variable. The economic growth elasticity in relation to LSME is +0.025, which indicates a positive relationship between economic growth and SMEs' expansion.

For unemployment, the negative sign for the coefficient proves its counter-cyclical effect on real GDP Per Capita, meaning that if unemployment rate increases by one percent, it will cause the real GDP Per Capita to fall by 0.07%.

For subsidies per capita, the coefficient does not come with the expected positive sign. A reason for that is that in some cases subsidies and other transfers act as a disincentive for people to work as they depend more on those aids.

CPI also proved its counter-cyclical effect on economic growth, as its coefficient has a negative sign, meaning that if the log of prices increases by one percent this will lead to a fall in the log of GDP per capita of 0.03 percent.

Based on the result shown in the above table, the coefficient of the trend variable has a positive sign reflecting the fact that real GDP per capita is increasing over time.

These results indicate a positive relationship between SMEs' expansion and the economic growth, which is the thesis of this study.

The adjusted r-squared is 0.90 indicating that this model is a strong one, meaning that 90% of the variability in the dependent variable (LGDPC) is explained by the variability of the independent variables included in the model.

7. Conclusion and Policy Recommendations

The impact of SMEs' expansion on economic growth is one of the debatable issues among economists and policy makers. This paper provides an empirical study to examine the impact of SMEs' expansion on economic growth; it proves that the expansion of the SME sector has a positive impact.

In fact, the SME sector in Egypt suffers many problems that hinder its development and performance. Before recommending solutions and policies to be adopted it is essential to present the most important problems in the SMEs sector, which are:

1. The huge informal sector:

One of the most important problems that hinder the SME sector from exercising a strong influence on society is that most SMEs are informal. According to Attia (2009) about 82% of total economic units are informal ones and about 40% of total employment is in the informal sector. The huge volume of the informal sector is a disaster for the SME sector as it distorts competition in the SME sector and reduces the efficiency of the policies taken by the government.

2. Data Unavailability:

One of the most difficult steps in this research was collecting the data. The data about SMEs are almost unavailable. Although many institutions and ministries are working to support SMEs, none of these institutions possesses accurate or near to accurate annual data about the employment share of SMEs, the capital or the annual sales.

All the officials complained about the unavailability of a strong database collecting all data related to the SME sector.

3. The weak connection and co-operation between institutions supporting the SME sector:

Although many institutions are working to support SMEs, they suffer a huge problem, as there is no coordination or cooperation among these institutions.

In fact the set-up of the SME sector is too complicated in Egypt, as many parties are involved in its policies. For example the institutional framework for SME policy comprises:

- GAFI from the Ministry of Investment
- The Industrial Modernization Center, the Industrial Development Authority (IDA) and the Ministry of Trade and Industry
- The SME Development Unit of the Ministry of Finance
- The Research, Development and Innovation (RDI) programme of the Ministry of Higher Education and Research

All these institutions issuing policies without a bond connecting them altogether reduces the effectiveness of policies adopted by each of them.

4. Lack of monitoring of SMEs:

According to Mrs. Reem El Saily, the Manager of the SMEs Unit in GAFI, there is no unit in Egypt to monitor the performance of SMEs after their initiation; the government is actually unaware of what these firms are doing and how they develop.

5. Difficulty in obtaining access to funds:

In fact, many SMEs shut down because of the failure to access funds. In general banks prefer lending to large corporations with a strong credit history. The bank will not take the risk of lending to a small or medium enterprise and they cannot issue shares on the Cairo and Alexandria stock exchange market. So they suffer a huge problem in finance.

Those are the weak points in the Egyptian SME sector. The researcher will now try to find solutions for those problems.

Policy recommendations:

In order to solve the informality problem, the researcher suggests that the government should attract the informal sector to join the formal sector by aiding tax compliance and granting more privileges and aids to the formal firms in order to convince the owners of the informal businesses that the benefits of being a formal SME outweigh the costs. The government should also aggressively penalize those who are caught running an informal business.

In order to solve the data unavailability problem, the Canadian International Development Agency (CIDA) arranged with CAPMAS a database that would collect all possible information about the SME sector. Data should be updated annually in order to help policy makers to take decisions based on a scientific basis to make sure that policies adopted are realistic ones to achieve the targeted goals and if not they are changed quickly in order to save wasted resources.

There should be a separate unit which is independent from all involved parties, with a mission to put a unified framework in place for all involved institutions to follow and to make sure that they are working in harmony with each other, to avoid the weak connection and poor co-operation between parties involved in the sector.

Basically SMEs should be supported; moreover monitoring firms of that sector over their life time is important in order to be aware of the changes, problems and challenges facing SMEs in order to support them with aids not only at their initiation but also during several stages of operation.

The problem of financing SMEs in Egypt is partially addressed by the establishment of the NILEX exchange market, which is supposed to help SMEs to access funds, but what is equally important to the establishment of such an institution is to convince investors to invest in this market, because if the stock market is established and people are still uncomfortable about investing in SMEs, it will be useless; so campaigns and advertising should be used to attract investors and make them aware of the potential gains they could have.

In conclusion, the study found a positive relationship between the expansion of the SME sector and economic growth. This result suggests that the government should directly encourage the SME sector to achieve higher economic growth.

The government should rationalize the efforts to support the SME sector. Aids and policies should be implemented wisely to identify the problems and solve them professionally. Then this sector will be a strong base to overcome the socio-economic problems facing Egypt.

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Dai Yun

A Route Map of Successful Knowledge Exchanges

Abstract

Knowledge creation and knowledge sharing play an important role in the life science industry, particularly in the new product development and innovation. It is helpful to develop a deep understanding of how life science companies exchange knowledge. Based on interviews, postal questionnaire survey and a case study with the Scottish life science companies, this paper develops a route map of successful knowledge exchanges which provides a checklist in each step of a knowledge exchange. The checklist includes the most important KE channels and the most influential KE success factors in the life science industry. The results may enhance the management of knowledge exchange and consequently improve the research and development performance in life science companies.

Key Words: Knowledge Exchange, Knowledge Exchange Process, Knowledge Exchange Channels, KE Success Factors, Life Science Industry

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1. Introduction

Knowledge is considered as one of the valuable assets for firms (Grant, 1996). The maintenance of a firm's competitive advantage would largely depend on its capability of developing, capturing and applying new sources of knowledge (Tsang, 2002). It has been widely recognized that the creation, exploitation or dissemination of knowledge is beneficial for innovation and new product development (Hoegl and Schulze, 2005) as the access and exchange of knowledge can lead to increased efficiency (Ruggles, 1998). Perhaps the two most active areas of knowledge flow are the biotechnology/life science and electronics (Agrawal, 2001). In the field of life

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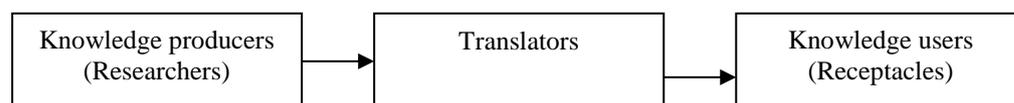
the biotechnology/life science and electronics (Agrawal, 2001). In the field of life science, it is hard for life science companies to develop all the technology they need in house. Thus, some life science companies have turned to knowledge exchange (KE) with other companies in the same industry or universities as a route to gain access to new knowledge (Cho and Pucil, 2005). Therefore, it is important to develop a deep understanding of the Knowledge Exchange (KE) mechanisms in the life science industry. This research aims to identify the existing KE channels of knowledge exchange (KE) operating in the Scottish life science sector, to identify the variables which may affect knowledge exchange and to develop a route map of successful knowledge exchanges.

This paper proceeds as follows. Section 2 reviews the literature on the knowledge exchange models. Section 3 explains the design of the research methodology. Section 4 summarizes the results from the interview and the questionnaire survey. Section 5 uses a case study to describe the knowledge exchange mechanisms and the key variables that are likely to affect the success of a KE. Based on the results from the interviews, the questionnaires and the case study, a route map of a successful KE is developed. Section 6 summarizes the findings and points out the limitations of the research.

2. Knowledge Exchange Models

Previous research has proposed various models of knowledge exchange. A linear model treats knowledge exchange as a linear process flowing from the knowledge sender to the knowledge receiver (Newell, 1999).

Figure 1 A linear model of knowledge exchange



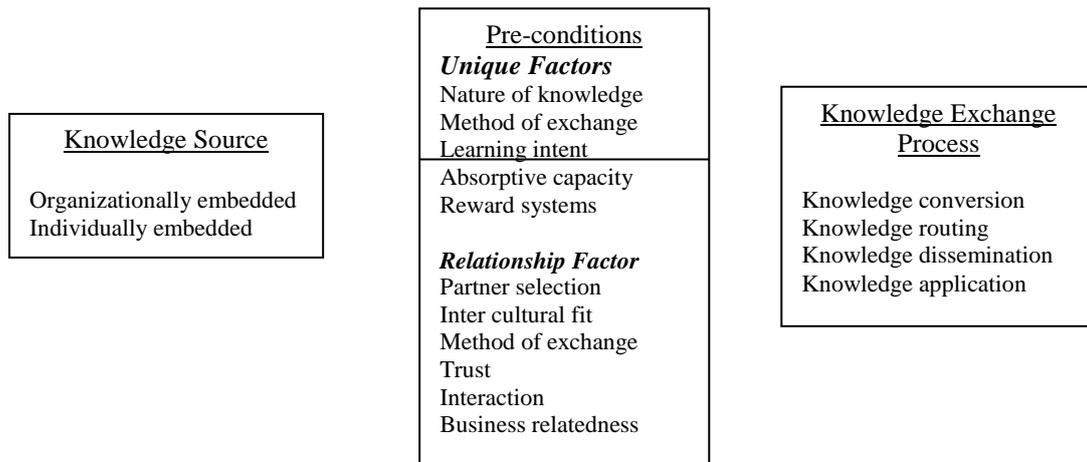
This model is criticized for ignoring the context in which the new knowledge was generated and will be used (Frambach, 1993). Narteh (2008) develops the linear model by adding two sets of factors which would impact on the outcome of knowledge exchange (see Figure 2).

By contrast, social construction models view knowledge as the result of everyday interaction and thus the relationship between humans and the society that produces and uses knowledge is circular rather than linear (Parent et al., 2007). Parent et al. (2007) argue that knowledge exchange is linked to the relationships between and within systems such as the need for knowledge, how knowledge gets exchanged (the process) and the capacities a system should possess for a successful knowledge exchange, i.e. generative (the ability to discover or improve knowledge), disseminative (the ability to translate and diffuse knowledge), absorptive (the ability

to assimilate and apply knowledge) and responsive capacity (the ability to learn and adjust).

Despite the difference in the form of the models, the researchers (e.g. Cohen and Levinthal, 1990; Mansfield, 1995; Cockburn and Henderson, 1998; Khamseh and Jolly, 2008) have agreed that some factors would affect the effectiveness and the channel of knowledge exchange. These factors can be grouped into the following categories: the nature and characteristics of the knowledge transferred; the absorptive capacity of partners; the strategies, policies and culture of partners; the relational characteristics of partners; and the geographic location of partners.

Figure 2 Knowledge Exchange Model



Source: Narteh (2008)

Nature of knowledge exchanged

Winter (1987) proposes four dimensions of knowledge: tacit versus explicit, teachable versus unteachable, complexity versus simplicity, observable versus unobservable. Tacit knowledge is defined as knowledge that cannot be articulated or verbalized and that resides in an intuitive realm. Explicit knowledge is knowledge that is codified and transferred in a formal and systemic language (Polanyi, 1966). Winter (1987) points out that knowledge is more easily transferred when it is teachable, articulated, observable and simple. Tacit knowledge is subjective and derived from personal experience or company culture and shared routines. Therefore it is often learned via shared and collaborative experience (Nonaka and Takeuchi, 1995). The complexity of knowledge might affect the comprehension of an asset and impair its transferability. Also, core knowledge, which is central to a firm’s success, is more difficult to transfer as a firm is more likely to limit the diffusion of valuable knowledge (Khamseh and Jolly, 2008).

Absorptive capacity of partners

Cohen and Levinthal (1990) introduced the concept of absorptive capacity which refers to a firm’s ability to evaluate, assimilate and use outside knowledge for commercial ends. They argue that absorptive capacity is a function of its investment in R & D. Further research shows that the existence of prior and familiar knowledge

(Inkpen, 1998), the similarity of resources bases, organizational structures and processes (Lane and Lubatkin, 1998), and the connectedness between firm and university such as research collaboration and share of research results (Cockburn and Henderson, 1998) are also important for a firm to utilize externally generated scientific knowledge.

Strategies, policies and culture of partners

Thursby and Thursby (2000) indicate that professors' propensity to patent (on the supply side) and firms' propensity to outsource R & D by licensing (on the demand side) is the primary drive for the growth in licensing patented university inventions. It is also known that university policies such as intellectual property policies are related to the degree of production and licensing of patents (Agrawal, 2001).

Culture is defined as the values and attitudes shared by a society. Culture is likely to have an impact on knowledge exchange because people would carry their corporate and ethnic backgrounds into their collaborative relationships (Taylor and Osland, 2003). The differences between the knowledge source and the destination, such as languages, communication styles and value orientations, might cause misunderstanding and thus affect the exchange of message. A strong culture of collaboration would encourage individuals to work together and facilitate the flow of information (Goh, 2002).

Relational characteristics of partners

Here the factors are derived from the interaction and relations between the transferors and the transferees. These factors include quality of people, experience of technology transfer office and interpersonal relationships including trust and shared goals.

Quality of people. All learning in the organization starts at the individual level (Crossan et al., 1999). Wright et al. (2001) argue that individuals would have different absorptive capacities which depend on the qualifications and experience of the transferees.

Trust. Relationships are important for acquiring information. Social network theorist, Granovetter (1973), introduced the concept of tie strength to describe the closeness and interaction frequency of a relationship between two parties. Weak ties, typified as distant and infrequent interaction, can be instrumental to the diffusion of ideas and technical advice (Constant et al., 1996) and are more likely to be the sources of novel information (Granovetter, 1973). Weak ties are advantageous for the receipt of explicit knowledge because they are less costly to maintain (Hansen, 1999). On the other hand, strong ties are also important because they are more accessible and willing to be helpful (Krackhardt, 1992). Strong ties lead to greater knowledge exchange (Hansen, 1999) because trust is more likely to occur among strong ties (Glaeser et al., 2000). Trust would reduce inter partner conflicts (Ring and Van de Ven, 1994), make people more willing to give useful knowledge (Andrews and Delahay, 2000) and make knowledge exchange less costly (Zaheer et al., 1998). Close relationships favour tacit knowledge transfer which would develop sustained competitive advantage of a firm (Cavusgil et al., 2003).

Openness. Interaction between individuals is crucial for innovation (Cohen and Levinthal, 1990), particularly for alliances separated by wide geographical distance

(Tsang, 2002). Regular contact between partners will facilitate the sharing of information (Khamseh and Jolly, 2008). The exchange of information has to be frank and accurate. Openness is a necessity for the exchange of tacit knowledge (Cavusgil et al., 2003).

Learning intent. Collaborative objectives of partners are a key element in knowledge creation. Firms will not learn and acquire the needed knowledge from their partners unless they possess clear learning intent and allocate adequate resources to support the learning process (Inkpen, 2000). A reward system could enhance the learning intent because they would shape the way the learners perceive their task (Harvey and Denton, 1999). In order to promote knowledge exchange, it is important for the collaborating organizations to have trust, shared goals, commitment to these goals and a corporate culture to support knowledge exchange (Coleman, 1999; Kalman, 1999; Cress et al., 2005).

Support structure. Here the factors include information technology, staff training and skill development and organisational design. The use of electronic or computer-aided system is a good way to facilitate knowledge exchange. However, it requires a collaborative culture to create a learning environment of information sharing. Also, a horizontal organisational design that encourages teamwork or cross-functional communication can encourage the flow of information (Goh, 2002).

Geographic location of partners

As knowledge transfer requires direct interaction among collaborators, it often remains geographically local (Agrawal, 2001). Mansfield (1995) demonstrates that knowledge flows from universities tend to be mitigated by geographic distance. Agrawal (2000) reports that geographic distance has a negative effect on the commercial success of the licensed invention as geographic distance increases the transport costs. Rothaermel and Thursby's (2005) research seems to indicate some benefits of being closely located to the sponsoring university on firm performance. Audretsch and Feldman (1996) found that innovative activity will cluster in regions where industry R & D, university research and skilled labour are prevalent. Zucker et al. (2000) found that the concentration of researchers and universities will affect the geographic distribution of biotech firms. However, with the development of the internet, email has become one of the main knowledge exchange channels in the construction industry (Lin et al., 2006). The influence of geographic location on the knowledge exchange channels might reduce. Todtling et al. (2006) found that high-tech firms rely more on international knowledge sources than on regional ones.

Knowledge Exchange Process

The knowledge exchange process deals with the actual movement of knowledge from the knowledge holder to the knowledge receiver and its subsequent application in the knowledge receiver's firm (Narteh, 2008). Some researchers propose that the process includes the codification, interpretation, routing, dissemination and application of the exchanged knowledge. Codification means that knowledge is represented in a code that can be transferred, which ranges from language to numbers, and from analytical models to images (Ruggles, 1997). Subsequently, the codified information would be interpreted by the user of the knowledge. Different individuals might have different interpretations of the information (Albino et al., 2004). Nonaka and Takeuchi (1995)

argue that the process involves the conversion of tacit knowledge to explicit knowledge and the subsequent re-conversion of explicit knowledge into tacit knowledge. Knowledge routing refers to the channels of knowledge exchange, which will be explained in details below. Knowledge dissemination means to diffuse knowledge from individual level to the group level. Apprenticeship is one of the major modes to disseminate knowledge in a firm (Narteh, 2008). The final stage of the process is the application of the knowledge exchanged. When the recipient is able to apply the knowledge the exchange process ends.

Knowledge Exchange Channels

Based on literature review, the common channels used to exchange knowledge between universities and firms fall into two categories (e.g. Cohen et al., 2000; Powell, 1998; Oliver, 2004; Cress et al., 2005; Hoegl and Schulze, 2005; Rothaermel and Thursby, 2005; Salman and Saives, 2005; Lin et al., 2006):

Strong ties: patents, licences, joint ventures, research contracts, formal networks

Weak ties: academic publications, informal scientific meetings, consulting, informal personal networks, research grants, recruitment of students, email, shared databases, experience workshops and communities of practice

However, the use of knowledge exchange channels may vary with industries (e.g. Cohen et al., 2000; Powell, 1998; Oliver, 2004; Lin et al., 2006), with firms (Agrawal and Henderson, 2000) and with different circumstances such as the stage of business (Colyvas et al., 2000). Cohen et al. (2000) state that publications, public meetings and conference, informal and personal information, and consulting contracts appear to be the four most important KE channels from a survey in the manufacturing sector. However, there is a lack of research on what the most popular KE channels and the KE mechanisms are in the life science industry or in Scotland. Life science industry plays an important role in Scotland's economic performance. This paper focuses on the Scottish life science companies.

3. Research Methodology

Interviews and questionnaire survey were used in the research. In both interviews and questionnaires, all the companies were provided tables to indicate the drivers of KE/Choice of KE partners, the KE channels used and the key success factors of KE. The variables included in the tables were the most common ones identified from literature review. The companies were free to add more variables into the tables but no companies added anything. The companies were also asked to indicate the importance of these variables from 1 not important at all to 5 very important. Interviews would be appropriate when the questions are complex and a long time is involved while questionnaires are suitable for a larger number of samples (Saunders et al., 2000). Both the interview and questionnaire survey included 26 questions. The open-ended interview questions were developed first. In the interviews further questions were raised on the company background, the KE steps, the KE process and the key issues/questions in each KE step. 3 local life science companies were approached and interviewed to explore the variables, which included one drug development, one drug manufacture and one drug testing company. In each company a director (either the business development director or the chief executive director)

was interviewed because the person was in charge of the KE process in the company. Then the interview questions were adjusted to a format that was appropriate for questionnaire survey. 105 Scottish life science companies listed in *Life Science Scotland Source Book 2004/05* (Scottish Enterprise, 2004) were contacted between May 2006 and March 2007. 17 companies completed the questionnaire in addition to the 3 companies interviewed. Excluding 15 companies who have changed their address, closed down or have no KE activities, the response rate is 22%. Based on the interview with and the tables filled in by the business development director of the drug development company, this paper develops a case study to describe the KE mechanisms in a framework of company background, drivers of KE/Choice of KE partners, the KE process, the KE success factors and the outcomes of KE. The purpose of the case study is to give a deeper insight into the KE process and to generate a route map of successful KE. Case study allows investigation of a contemporary phenomenon within its real context (Yin, 2003). A theoretical framework first emerges through the inductive approach of studying an empirical case or object (Hamel, 1993). In this paper, only one company was selected for the case study because the knowledge exchange process was found to be largely similar in the 3 companies interviewed but the drug development company was willing to provide more detailed information. For case studies, the generalization is determined by the strength of the description of the context. The degree of detail in the description of the case study can ensure the representativeness of the case (Hamel, 1993). The case selected for study would be the one that the researcher can learn most from (Patton, 2002). The strength of case study does not rely on the amount of repetitions performed. Selecting a case that is pertinent to the object of study will allow the subject to be investigated fully (Patton and Appelbaum, 2003). Based on the results from the interviews, the questionnaire survey and the case study, a route map of successful knowledge exchanges is developed which includes the steps in a KE process, a checklist of important issues and common KE channels at each step.

4. Findings and Discussions

Based on the results of 3 interviews and 17 questionnaires, it is found that the KE channels used in the Scottish biotechnology industry include: personal exchange, consulting/expert advice, joint ventures, material transfer agreements, scientific meetings, licensing, research contracts, publications, patents, studentship, confidentiality agreement, service contract and copy right. Based on literature review (e.g. Cohen et al., 2000; Cress et al., 2005; Hoegl and Schulze, 2005; Rothaermel and Thursby, 2005; Lin et al., 2006), material transfer agreements and confidentiality agreement could be specific to the life science industry as they are not common in other industries. Moreover, these KE channels are not of the same importance and their relative importance varies with firms. As a general rule, confidentiality agreement, patents, consulting, licensing, personal exchange, research contracts and joint ventures are the most important KE channels. The results indicate that the Scottish life science companies prefer formal means to exchange knowledge although personal relationships are important in their R & D activities and knowledge creation. The results are different from Cohen et al.'s (2000) which show that informal channels such as meetings, conference and publication are of most significance. Also, it is found that a number of variables may have an impact on the results of knowledge exchanges, of which communication / openness between the partners, technology fit,

commitment of partners and quality of people involved are likely to be the most influential ones. . By contrast, geographical distance and organisational cultures are not likely to have great influence on the KE outcomes. A majority of the KE partners are non-local. Life science companies no longer rely on the geographic location for the attainment of knowledge as previous research states (e.g. Mansfield, 1995; Zucker et al., 2000; Agrawal, 2000, 2001; Rothaermel and Thursby, 2005). The widely acceptance of internet has enabled people to work with partners from a long distance. Since life science companies tend to choose partners whom they are familiar with, this might imply that the culture of the two parties is compatible and would cause few problems in the KE process. This could be an explanation that culture has little impact on the KE outcomes.

As far as the knowledge exchange process is concerned, it is found from the interviews that Scottish life science companies have a similar KE process although the use of KE channels and the key KE success factors vary greatly with firms. The case study in Section 5 gives an example of how knowledge exchanges are carried out in a company. From the interviews, the steps of a knowledge exchange process could be identified as follows.

Step 1: Identify the technology needs

First, a company has to identify in what area of science they need to strengthen their expertise and technology which they cannot develop in house. Technology need is the primary driver of a knowledge exchange.

Step 2: Select the KE partners

Relationship network is important in this stage. Usually, a company would consider a relationship that has been existed first. They would like to look for someone who they have worked with or have known. However, they would not limit to local networking. Publications, scientific meetings or studentships are the other channels through which a company would find a KE partner with the expertise or skills in that area of technology need.

Step 3: Make initial contacts

After the identification of the potential KE partners, the company would then contact them via emails, phone calls or scientific meetings. The purpose of the initial contact is to find out if the potential partners would be willing to do a project together. The company should make sure that:

- The candidate has the expertise required.
- The candidate would be interested in the project.
- The two parties would have an alignment on the goals of the project.
- The candidate has high quality IP.
- The two parties can establish a good working relationship and be comfortable with each other.

Step 4: Exchange knowledge

If the two KE parties are interested in the project, they would sign a legal contract and recruit people for the project. The forms of the collaboration could be consultancy, licensing, research contracts, patenting, joint development, material transfer agreements, informal meeting, personal exchange, service contract, studentship, copy right, etc. Confidentiality agreements would be used in almost every collaboration in order to protect data. In the process of knowledge exchange, communication / openness between the KE parties and the commitment to the project is very important. Communications and informal meetings would allow the partners to know the progress and the problems of the project and ensure that the two parties still have the same goals.

Step 5: Monitor the outcomes

The outcomes of the knowledge should be monitored regularly, usually on a weekly basis. The actual results should be compared with the targets to ensure that there are no big problems with the project. If it is found that the objectives are not practical the objectives should be revised. It is not unusual that the partners could not overcome a technical hurdle but in general there should be positive outcomes from the project. For example, the company could access to the technology that they could not develop in house; they learn a know how; they have more publications or they could launch a new product more quickly.

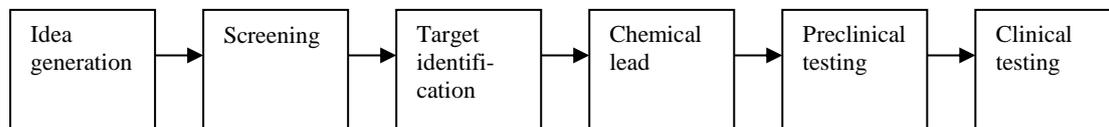
The findings from the interviews and questionnaires could be exemplified in the case study below.

5. Case Study - Company A

Company background

Company A is a drug development company which has been in business for 11 years. Company A has not yet had a product to sell although to launch its own products is its eventual goal. Thus, Company A is actually loss making and does not have a sales figure. What it is doing is product development, drug discovery research and clinical development. Its main areas of drug research and development are in oncology, in diabetes, in virology and some types of inflammation. The stages of their drug development/R&D process can be identified as: idea generation, screening, target identification, chemical lead, preclinical testing and clinical testing (see Figure 3).

Figure 3. Company A Drug Development Process



Screening means to screen the compounds of potential candidates in order to match the molecular structure of potential medicines with the patterns found in human genes; target identification means to study the effectiveness of the potential drug candidates against the specific disease; chemical lead means the mapping of the compound's structure (Alshawi et al., 2003).

Company A has knowledge exchange (KE) activities almost from the beginning of its business. Company A is looking for strategic commercial partnerships by licensing its

partly developed products to a pharmaceutical company or large biotechnology companies and collaborating with them on the further development of those products. About 70% of company projects are involved in KE. Knowledge exchange occurs through all the stages of R & D process but the majority of it happens in the earlier stages of drug discovery. About 75% of the KE partners are outside Scotland.

Drivers of KE/Choice of KE partners

There are a number of reasons to exchange knowledge. Mostly it is for the access to particular capabilities or a particular field of know how or expertise that is available. The main factors that will be considered in the selection of KE partners are the know-how and the reputation of the potential partners and the relationship with them. It is important to deal with the relationship with the partners to ensure that all the KE parties have an alignment of interests in the project.

The KE process

If there is a need to strengthen its expertise in one particular field, Company A would consider knowledge exchange to obtain the technology required. To start a KE, Company A would either go and look for somebody with expertise and get to know them and then select the partners or get approached by the partners because they have got a particular project in mind. In most cases, Company A would approach someone with whom a personal relationship has been existed. They might have worked together or known each other. Other ways to find a suitable candidate could be publications, scientific meetings or studentships. Publications would allow a two way flow of information. On one hand Company A could access to other people's expertise and skills and thus use it as a way of identifying partners. On the other hand Company A could publish its own work which would attract people to it with proposals of ideas. Studentship is a very cost effective way of doing research in an area of science which is not a critical path for the company and thus the company would not want to develop a big capability in it but the company would like to do a project in that area. Studentships would usually happen at a fairly early stage of R & D process such as screening, target identification and chemical lead.

Initially, Company A would contact the candidates via emails, phone calls or scientific meetings and find out if they would be willing to do a project together. They would talk to the potential partners and ideas come out from that which is not formal. These contacts are important and not limited to local networking. If the two parties are both interested in the project, they might set up a legal contract around a research programme. The forms of the collaboration could be consultancy, licensing, research contracts, patenting, joint development, material transfer agreements, studentship, service contract, copy right, etc. Confidentiality agreements would be used in almost every collaboration because that is the way to protect data. During the knowledge exchange, Company A often has informal meeting with the KE partners to understand the problems and the progress of the project. It should be noted that these channels of knowledge exchange are not mutually exclusive and often several of them are used at the same time. Moreover, a certain KE channel is likely to be more suitable at a certain stage of R & D process than at the others. In Company A, publications are important at every stage of R & D process. In the chemical lead and the preclinical testing stages, research contracts are most frequently used and the company also uses

a lot of informal meetings to get to know the progress of partners. But in the clinical stage, consultancies would be the most important KE channel.

The KE success factors

It is really important to establish each party's goals from entering into the relationship because the collaborating parties might have a slightly different view of the goals and will be trying to go in different directions. One of the biggest obstacles that Company A has come against in knowledge exchanges is that it changed its priorities when it is in a KE relationship. Realising that there is actually no alignment on the goals of the project once it has started is a big problem.

It is also important to establish a good working relationship and be comfortable with the people you are working with so that if there are any problems the partners would be able to deal with them effectively and make an agreement. Communication is helpful to understand what is needed.

As the primary driver of KE is technology need, the technology fit between the KE parties, the expertise and the quality of the people involved and the quality of intellectual property (IP) can affect the outcomes of KE. Also, both of the KE parties should agree upon IP treatments. Agreeing on the rights to exploit the data coming from a partnership can sometimes be very lengthy and it can delay the start.

Funding is a difficult question sometimes. As a company may only be able to fund a certain amount into a collaborating relationship, this can constraint the KE activities.

The outcomes of KE

The main benefit of KE is to develop or generate specific data and chemical materials that the company could not develop in house. The second benefit is to produce publications which help to demonstrate an area that the company is working in to the general community and to the customers. The third benefit is know how, learning a process or a methodology that the company can then bring back and apply. Knowledge exchange can also help the company to launch a new product more quickly as a result of the attainment of technology or expertise.

Company A measures the outcomes of KE. It looks at what has happened according to the objectives that were set up at the beginning of the collaboration. The objectives include the number of compounds made, the number of chemical series or assay methods generated, the number of publications, etc. The company does not always realise its expected outcomes because it is science. People cannot necessarily predict the outcomes of doing a particular activity but the activity has been achieved anyway.

Based on the results from the interviews, the case study and the questionnaires, a route map of a successful knowledge exchange can be developed in Figure 4.

6. Conclusions

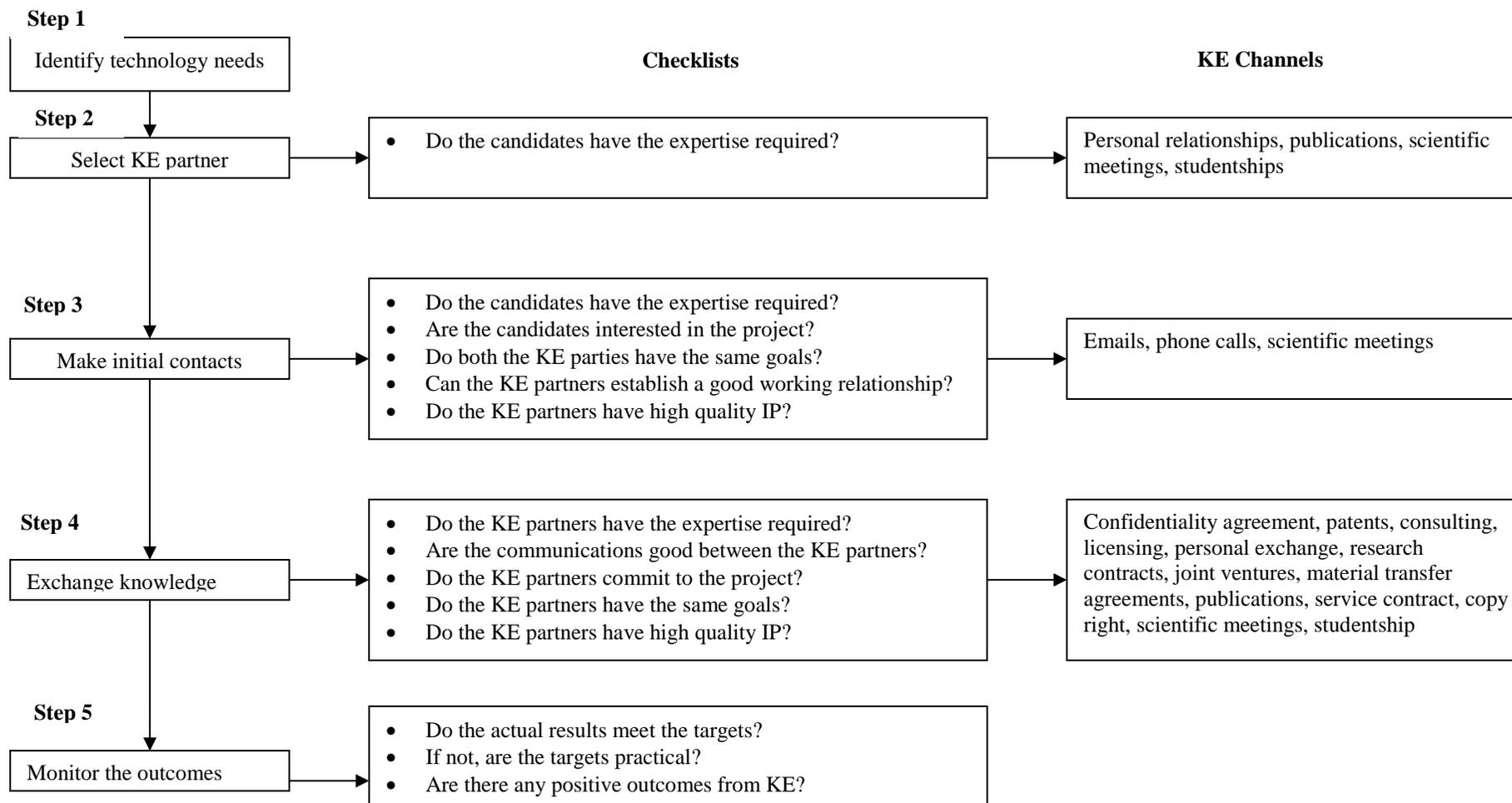
This paper explores how Scottish life science companies exchange knowledge and aims to develop a route map of successful knowledge exchanges. Taking account of the common KE channels used in the Scottish life science companies and the key variables that may affect the outcomes of knowledge exchanges, this research study identifies the steps that a knowledge exchange will go through and the key points in each step to produce a successful knowledge exchange. The results show that

A Route Map of Successful Knowledge Exchanges

technology fit is vital for the selection of KE partners and the communication between the partners, quality of people and the commitment of the partners are critical for the success of knowledge exchanges. Different KE channels are used in the different stages of KE process. However, the Scottish life science companies prefer formal KE channels such as patents and licenses. The results may enhance the management of knowledge exchange and consequently improve the R & D performance in life science companies.

One limitation of the research is that it is based on Scottish life science companies. Further research can be expanded to the UK life science / biotechnology companies or even to the USA where the life science / biotechnology industry has a leading place in the world. Moreover, as the use of KE channels and the relative importance of KE success factor vary greatly with firms, the results of this research only provide a general guideline to the successful knowledge exchanges. Life science companies should choose the KE channels that most suitable for them and take some specific considerations according to their specific circumstances such as the age of business and the stages of R & D process.

Figure 4. A route map of successful knowledge exchanges



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