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Library Review

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Knowledge sharing processes in Tunisian small ICT firms

This paper explores knowledge and information sharing in four small Tunisian ICT companies. As a developing country, Tunisia offers a particularly interesting context to explore the knowledge management processes of small knowledge intensive companies. Moreover, many small firms, especially small high tech firms (Chorev and Anderson, 2006b) with their limited resources, need to “share” to extend and develop their knowledge. Yet, despite the apparent importance of knowledge management within small firms, Davenport (2005) notes there is little research on the topic (McAdam and Reid, 2001). This gap seems especially important for knowledge intensive ICT firms because ICT is seen as a leading edge of the knowledge economy (McQuaid, 2002). The paper thus contributes to our understanding of knowledge sharing by describing the types and processes of knowledge sharing in a developing country. We consider the strengths and weaknesses of processes and highlight the limitations upon the types of knowledge that are shared. We are particularly interested in how information becomes usable knowledge and what constraints are experienced.

Knowledge sharing

Knowledge management seems to have gained prominence from around 1995 (Snowden, 2002). Moreover, Parirokh et al (2008) note how researchers from different disciplines have stressed the significance of knowledge management for organisational success. But there have been quite major shifts in how knowledge is conceived. For example, Stacey (2001) argues that knowledge is a process rather than a thing, and that it is an active process of relating. This process view was shaped by the seminal work of Nonaka and Konno (1998) who showed how the concept of *ba* is a shared space for the interaction that transforms information into knowledge. In this conceptualisation, codified (explicit) information is tangible, but lies in media outside the space of *ba*. In contrast, tacit knowledge is intangible but resides in *ba*. But critically, this transformation is a process of sharing within this knowledge space called *ba*. Thus for Nonaka and Konno (1998) knowledge creation is a process of interactions.

Of course this idea of a social space for knowledge creation and sharing is not new. Bourdieu's concept of *habitus* shows the conditions for the production and reproduction of some forms of knowledge. Dodd et al (2010) showed how small firms engaged in a particular *habitus* to share information that became practical knowledge. But more generally, what we see in the small firm literature is an increasing emphasis (Dodd and Anderson, 2007) on information sharing and collaborations often through networking (Dodd et al, 2002). Consequently this notion of sharing has a particular resonance: conceptually; in terms of the transformation of information into knowledge; theoretically, in explaining what small firms do and practically; in signalling the need for collaborative practices to help overcome the liability of smallness. Thus sharing has become central to understanding how information is

employed. Indeed, Patrick and Dotsika (2007) claim that sharing is key to adding value, whilst Lin (2007) argues that knowledge sharing creates opportunities to create competitive advantage. Accordingly in this paper we are specifically interested in what sort of information is shared, if and how knowledge is produced from this information and the processes that are involved.

Knowledge management in small firms

Small firms are characterised by their limited resources (Chorev and Anderson 2006a; Anderson et al, 2007), so the importance of links for sharing in small firms is well noted (Jack et al, 2004). Thus small firms are best seen as socially situated rather than isolated agents and a key part of this is learning from and with others. Linkages and social capital play an important role on facilitating knowledge acquisition through network relationships (Nahapiet and Ghoshal, 1998). Both Lin (2008) and Wang (2004) argue that knowledge sharing behaviour is critical (Stankosky, 2005; Kuo and Young, 2008). Knowledge becomes a “central value-adding resource of firms” (Renko and al, 2002; Grant, 1997) and a determinant of competitiveness (Mehra and Dhawan, 2003). However, several studies have recognized that the knowledge sharing process is complicated and not straightforward. Indeed, knowledge transfer can be costly, slow and uncertain (Zogut and Zander, 1992; Bock and Kim, 2002).

Knowledge sharing can be seen at three levels (i) an intra firm flow involving knowledge flow at individual and departmental levels between different countries within the same organization (ii) inter-firm flows between firms’ employees in different industries collaborating in the same product development (iii) inter institutional flows covering links with higher education institute, public research establishment and other research institutions. However, in practice intra-firm flow is generally more important than the other flows. Liu and Liu (2008), in the context of high tech Taiwanese companies, found that organization members prefer to acquire and deal with knowledge with their team members; they acquire knowledge internally via various channels rather than through professional communities. Preferences aside, the high tech sector is also highly dependent on the ability to communicate, form and maintain dense networks of supportive relationship which constitute new sources of knowledge (Bontis and al, 2002). This is especially true in the ICT sector, which is argued to be an interactive, inter-connected system organised as global production networks (Porter, 1985). Consequently many technological-based firms maintain inter organizational relationships since it facilitates access to new knowledge. Moreover, they can combine this with existing knowledge (Lane and Lubatkin, 1998; Larsson and al, 1998). Externally, organisations exploit their external network relationship to learn about new practices and technologies (Kogut, 1988).

Nonaka et al (2000) thus argue that the modern organization is not a "processing information machine", but, is an "entity that creates knowledge through action and interaction". Importantly, knowledge is essential for innovation. For innovative firms, knowledge sharing or knowledge transfer promotes innovation by creating and managing new information (Srivardhana and Pawlowski, 2007). Innovation is a process by which knowledge is transformed into new goods and services. For Subramaniam and Youndt (2005), innovation is a process based on creating new and unique knowledge. Tseng (2009) argues that knowledge is an important determinant

of technological innovation since firms use internal and external knowledge to sustain innovative capability. Thus Dalkir (2005) argues that a firm produces innovation through the combination and the sharing of tacit and explicit knowledge between individuals (Cohen and Levinthal, 1990). Accordingly, as Patrick and Dotsika (2007) acknowledge, the complexity of the social and the technical place an emphasis upon how the social shapes technological outcomes.

The Tunisian Context

Knowledge as process clearly does not operate in a vacuum; as Davenport (2005) notes, different national and institutional factors influence modes of knowledge acquisition. This view promotes the idea that knowledge is deeply embedded in the technological and social context of a community that creates and reproduces knowledge (Nonaka and Konno 1998; von Krogh et al. 2000). Tunisia is a case in point; defined as a middle income country (OECD,1997) with a GDP of US\$ 6,760 in 2002, it compares well with its Arab Mediterranean neighbours by most economic indicators. Harbi et al (2009) explain how access to scientific and technological knowledge, and the ability to exploit it, is becoming increasingly strategic and decisive for economic performance. However the thin institutional context does not favour the development and advancement of scientific knowledge (Harbi et al, 2009a). But Tunisia is striving to “catch up” with more developed nations in the post Fordist learning economy where Lundvall and Johnston (1994) consider ICT plays a dominant role.

This then is the context for our study of knowledge sharing in small ICT firms. We want to examine what and how knowledge is shared in four small Tunisian firms. We turn now to explain our methodology.

Methodology

The aim of our study is to explore whether knowledge transfer exists in small Tunisian ICT firms and, if so, to enhance our understanding of the mechanisms and procedures used to develop such behaviour. As we had noted earlier, there is a limited literature about knowledge sharing in emerging economies, so we take an exploratory approach based on the case study method. According to Yin (1994), this technique is appropriate because the boundaries between phenomenon and context are not clearly evident. Moreover, Eisenhardt (1991) points out that such a method is well suited because it allows us to understand the respondents' experience from their own perception (Gilmore and Carsen, 1996).

We adopt a multiple case study approach, since it is deemed to be more convincing than a single case study approach (Hamza and Isa, 2010), allowing more generalisation and transferability from the single case approach (Benbasat et al, 1987). Although results from this approach remain specific to the studied cases, Jack et al (2008) argue that conclusions may be generalizable at a conceptual level. We consider the case studies of four ICT small firm operating in software development, (see table 1). Data were collected in face to face extended interviews with the entrepreneurs and their employees. Secondary data was also collected from local press; websites and the local administration. We selected a purposeful sample, one

that had the characteristics that interested us. Such sampling is sometimes referred to as “theoretical” cases (Anderson and Smith, 2007), because they exemplify the qualities that we want to examine (Miles and Huberman 1994). It was also a convenient sample, in that we were already aware of the companies’ characteristics. The sample cases are all located in Tunisia and are small high technology companies working in ICT development. Table 1 below describes the cases.

Insert table 1 about here please

The interview schedule included open and flexible questions; this allowed respondents to express their views and experiences in their working environment. We conducted 15 face to face interviews, four with the entrepreneurs, 11 with the developers and technicians. Questions were principally about knowledge transfer practices and collaborative style, the means of knowledge acquisition inside and outside the company. We asked, for example: “*What are the most important knowledge resources that you use?*” “*Tell us about any collaboration or cooperation*”. “*Is there any collaboration between peers outside the firm?*” Further questions arose during the interviews, enriching the data and enabling us to obtain additional details about practices and processes.

The Tunisian case studies

Offshore Box:

Offshore Box is a software development company specialising in web solutions and software projects. A considerable part of its product is purchased by French, Swiss and Tunisian customers. They have accumulated extensive experience in software project development, both in the technical field and the management of externalized projects. The firm has specialised in the creation of dynamic software tools and the development of e-business.

Their business process begins with a technical study then engineers begin to develop the programs. Although some of their work is repetitive, new applications often require new techniques. Consequently, they have adopted a learning orientation to knowledge. This, they argue, is necessary because developing such applications require employees to maintain high core capabilities in the new knowledge intensive technologies.

Knowledge exchange process

Various kinds of knowledge are generated and shared in the firm. Sami, the entrepreneur who founded and now runs the firm, explains that both tacit and explicit knowledge are exchanged among employees. Internally, technicians and engineers share knowledge through a variety of mechanisms. Sami and several of his employees explained that knowledge diffusion can not evolve if valuable information is not exchanged rapidly and clearly between them. In order to facilitate such exchanges they hold regular and frequent meetings. The internal collaboration style in Offshore Box is very informal. Meetings are informally organised so that employees are invited to propose their new ideas and points of view. This is especially so when engaging in a new project.

New knowledge and capabilities are also acquired and developed through self learning practices. Indeed, staff members are encouraged to access the electronic platforms of computer system journals on which they can find developed solutions to software problems. Through open sources of software solutions, engineers can access new information such as solutions derived from electronic fora. These sites provide different techniques for designing, developing and maintaining websites and web-based applications. To obtain further information, Offshore Box staff sends questions and suggestions to these websites.

Another method that the Off Shore Box staff use to obtain new knowledge is the frequent purchase of books and journals related to new software applications and programs. Sami told us, "*I search around to produce a self training process. I acquire professional books, explore new themes about web resolution and new software systems and I have subscriptions with specialized journals*". He added, "*the technicians are always searching for new programs and new software technologies in open sources as well as specialized web sites, forums and electronic books.*" Sami find that the software technologies derived from these electronic sources are critical for the organisation because they can contribute to successful software applications.

Since the most important firm activity is the development of software projects, engineers often work on projects which are fully or partly customized to the customer's requirements. As a consequence, there are cases where customers propose the integration a particular new technology. Consequently sharing of new knowledge with customers is also another mechanism for knowledge acquisition.

During our interviews with staff, it appears clear that employees share a similar perception of their internal collaborative style and techniques. Staff are convinced that valuable knowledge must be transferred to all team members to allow the creation of new products. They believed that knowledge grows organically within the group and that this atmosphere supports innovation.

However when asking about inter-institutional flows, Sami (the entrepreneur) explained that there is a low level of interaction with the institutional environment since they have no university collaborations: "*our relationship with the university is restricted to supervising students' final projects*". Co-operation with the technological environment, especially with technological parks, is rare. Although the local Technology Park might seem a very appropriate forum for knowledge exchange, Sami told us that he thought that information exchange is restricted to ICT firms located in the Technopole. Nonetheless, Sami expressed his willing to exchange knowledge with peer firms if there is a clear additional benefit: "*we will cooperate with our competitors if they are able to add something new*".

Ciel Informatique

Ciel Informatique is a software development company which builds web sites and provides software solutions, specialising in accountancy and stock management. Its markets are local (Tunisian) and its most important customers are public authorities. Their production process is based on a set of interrelated phases. First the project is conceptualised. This aspect must be completed within a short period. This is followed

by the application of the software. Finally, engineers evaluate the results and the quality of the project.

Knowledge exchange process

The development process of the software solutions involves several interrelated phases that are divided between technicians. However, every technician has specific skills and knowledge, so a key issue is managing the interface between knowledge areas. In terms of attitude to learning, a critical aspect is the response from customers about new software. These are treated as a general learning opportunity, as well as a means to improve the project quality.

Tacit knowledge is well developed in the firm. Hichem the owner and entrepreneur explained that the firm constantly works towards building the knowledge of staff members. However, he also explained that there is no formalised method for acquiring new knowledge. Hichem refers to several kinds of practices such as continuous learning, experience accumulated from professional training in ICT development, participation in technological electronic forums, exchange of information and knowledge through an electronic library which contains a diversified books and manuals. Nevertheless, he also explained that in spite of efforts made to acquire new source of knowledge in the ICT field, Tunisian ICT firms cannot catch up easily all innovation sources. This seems to imply that, despite the access to what we assume are up to date electronic fora, being outside the main physical spaces of software development restricts access to the best sources of information.

Interaction between staff members is promoted through the organisation of regular meetings. Again these meetings are especially important when they are working on new software project. The meetings are used to inform staff about project requirements and customer's needs, but are also employed to advise about any new technologies or techniques. The staff report that there is considerable idea exchange and they deeply believe that this is an important means for developing skills as well as for the firm's success; *"we cannot progress without exchanging ideas, opinions and points of view"*. One technician explained, *"When one of us faces a technical problem we all discuss the issue, often through access to open sources, or via the specialized electronic forum where we report our problem."*

Concerning inter firm flows, Hichem reported that he had some informal cooperation with competitors. Nevertheless, he desires that this could be expanded. Although he was occasionally invited to technical conferences at the Technopole, he is disappointed about the very limited impact and usefulness of these for knowledge exchange. He thought that the most useful inter institutional flows comes from being involved in university students' final projects. Hichem explained: *"we take students preparing their final project and like to recruit the most talented"*. To date, they have recruited one student, but have adopted some of the projects. He also encourages employees to continue their formal education.

THY Data Center

THY Data Center is an autonomous subsidiary of a larger Danish software company. It is a Gold Certified partner of Microsoft and specialises in the conception and integration of software Enterprise Resource Planning solutions, Microsoft Dynamics AX and Microsoft Dynamics CRM. The implementation of ERP system is considered as the key element of the project management in the firm, because it enables the integration of information across the functional areas of a business.

Knowledge exchange process

Unlike the other cases, the engineers, rather than the firm owner, identify the project requirements and divide work between them. During the period when the project team progress the production process, a daily briefing is organised to evaluate the development of the project. This meeting is also used to motivate employees and propose and try out new solutions. In Thy Data Center, access and acquisition of knowledge is thought to be a crucial in building the firm's competitiveness in both national and the international ICT markets.

Knowledge acquisition is achieved through a combination of formal education, continuous learning with the partners and self- training. Moreover, use open sources such as electronic catalogues which often offer more innovative software applications. As part of the Microsoft network, the firm benefit from several advantages. These include access to (i) specific web sites,(ii) latest technical books, (iii) latest technological tools and (iv) have a direct access to Microsoft know how. The entrepreneur frequently participates in international technological workshop organized by the partner to acquire information about new products and new technologies used by competitors.

The managerial and collaborative style in THY data is based on flexibility with a team work system designed around knowledge and information sharing among the team members. Relationships between colleagues are characterised by considerable mutual help. The team members have adopted "Scroom", a Japanese approach involving daily briefings about goals, achievements, preparation of technical reports, talking about problems, proposing solutions and discussing new ideas and applications. Even though THY has developed some local relationships, Raouf, the owner, reported that collaboration with universities and research institutes remains limited. However, there is some information exchange with competitors and the company is willing to build networks with local ICT firms. Yessine, the general manager, explained that the national knowledge market is very limited. Nonetheless, encouraging talented people and creating ways to develop their skills and core capabilities is crucial for the creation of new sources of knowledge. He adds that whilst they receive some financial and technical support, close coordination with government agencies is still not sufficient to create the necessary conditions for free knowledge and information exchange.

Meca-Precis

Meca-Precis specialises in tools for 3D computer-aided design. When first started in 2001, it was located in the Sousse Technopole (Technology Park) but moved out in 2005. The production concept is based on 3D design integrated into a software program. The firm exports a large part of its products to the European market. It

currently has 2 engineers, 5 technicians and the entrepreneur, Moncif, who is also the general manager.

Knowledge exchange process

Meca-Precis work is team-based with extensive internal cooperation, informal communication and coordination. The entrepreneur, Moncif argues that team work facilitates knowledge share and thus plays a key role on fostering innovation and creativity, “*whilst we work as a team, we give workers the chance to develop their own models... When a mistake is made everyone treats this as a learning opportunity*”. To facilitate information sharing, regular briefings are organised about production process and new product development.

To acquire knowledge, Meca-Precis staff mainly employ (i) access to open sources tools (ii) technical collaboration with partners in Germany and (iii) access to specialised books. The entrepreneur stresses that while they benefit from partner knowledge transfer, the firm creates also new generations of products. Interestingly competitors are also a source of information. Moncif regularly searches for the latest software program used by competitor firms. Outside the firm, Moncif frequently participates in international workshops. He believes that such workshops are an excellent opportunity to found and maintain cooperative relationships.

However, regarding external national information flows, Moncif is very dissatisfied with the extent of collaboration. He reports that he has never been invited to participate in workshops held at the Technopole. He argues that in Sousse “*the Technopole was simply for getting a room, we had no technological support*”. He added that the access to technological and scientific resources is very limited and rarely meet the specific needs of the firms. Similar to the other case companies, co-operation with universities is essentially restricted to student projects. Nonetheless, Moncif would like to cooperate with competitors to gain greater access to knowledge.

Discussion

Based on four Tunisian ICT case studies, we investigated access to and methods for knowledge acquisition and sharing. We focused on the activities and practices adopted by managers to develop employees’ skills and how they sought to create a wider set of technological capability. Through interviews with engineers, managers and entrepreneurs, we identified the methods and types of knowledge exchanged between them and their national and international partners. We summarise this in Table 2.

Insert Table 2 about here please

Importantly, the case studies highlight the extent to which knowledge exchange is considered to be crucial for the success of the firms. We also note that there are several common factors shared by our four ICT companies. First, the importance placed on knowledge sharing within the boundaries of the firm. In cases where they have a partner organisation, the boundary is usefully extended to include the partner firm in information exchange. We saw a number of methods employed to facilitate this exchange, but typically the principle method was regular but informal meetings. It seemed that the information exchange, although a key output from the meetings, was

not presented as the main purpose of the meeting. Instead, the stated intent was to examine specific projects; knowledge exchange was a means of enabling the project.

Secondly we noted a similarity in approaches to acquiring new information. This was primarily self learning and access to open sources. We did see some differences with Meca-Precis and THY Data Center. These firms were able to tap into the information held by their partner organisations. However with these exceptions, the main source of new information was formal codified and public knowledge. Thirdly, we noted that all the case companies complained about the lack of national links to knowledge. This seemed true for all firms such that the primary national source was final year university students. Interesting, the lack of information flows from the Technopole seems significant. In Tunisia, as with many developing countries, Technology Parks are a major government investment. The idea is to concentrate knowledge based industries to generate cluster type benefits of sharing information. This does not seem to have worked very well. We can contrast this situation with the comments from the case companies with international links and collaborations. They told us about how more tacit information was available and also how they learned from the innovation values and culture of the partner.

Conclusions

It appears that information exchange systems within our case companies are not well developed. They are nonetheless useful, internally they provide an informal platform for sharing and applying both the tacit and formal knowledge held by staff. This works well but when we examine how and what new externally generated knowledge is acquired we see the process is primarily directed towards codified knowledge, with little opportunity to collect tacit knowledge.

The flows of information are very unbalanced. Tacit knowledge exchange takes place mainly internally and there is no evidence of tacit knowledge outflows (save in the products). Codified knowledge flows into the firms from external, but mainly public sources. Moreover this information seems driven by specific needs rather than anything more general.

It also appears that national information systems are very immature. We have no sense of a national knowledge hub. Indeed, we were struck by how often we were told about the “burdens of bureaucracy” in public administration and how this inhibits fertile exchanges and discourages involvement. Despite the investment in Technology Parks, there is no evidence of healthy national information flows. Although we cannot be certain about the reasons for this lack of national fora for knowledge exchange, we interpret this to indicate the early stages of national development. We note the emphasis placed by our respondents on competition and competitive advantage, rather than on how shared knowledge can open other avenues. Sharing of information requires a great deal of trust in the system but also, and importantly, a recognition that sharing brings mutual benefits. Given the early stages of development in Tunisia the conditions for sharing may not yet be in place.

We argue that the comments made by most of our entrepreneurial respondents about collaborations confirm this view. They told us they would like to collaborate more, but they required the incentive of obvious and immediate benefits. In many cases the

benefits of collaboration may only become manifest during the collaboration. The reciprocity of advantages for networked partners are founded on well established relationships of trust. Such relationships take time to develop and may therefore hold the future promise for small Tunisian ICT firms.

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Table 1, the case companies

Case company	Offshore Box	Aonis	Thy Data center	Meca-Precis
Location in Tunisia	Cyberparc, Monastir	Sousse	Sousse	Sousse
Company age	5 years	4 years	6 years	8 years
Number of employees	5	4	6	12
Products	Web design, software development, software integration	Java application, web design	E-learning: Enterprise Resource Planning (ERP) and software programmes	Technical tools designed in 3D , software programmes

	Information Sources	Methods	Knowledge Practices	Content and scope
Offshore Box	Journals, books, open sources and forums; occasional firm level exchanges	Problem sharing internally and seeking solutions externally	Knowledge and idea sharing; collective and team based but led by entrepreneur; “self training”	Technical, Problem solving. Codified, explicit knowledge; existing knowledge
Ciel Informatique	Open sources, electronic forum; rare inter firm exchange	No formal method, ad hoc sharing	Internal problem sharing	Technical and problem based. existing knowledge
THY Data Centre	Employees and Microsoft. Some local interaction	Heavily influenced by Microsoft link	Structured internal collaborations modeled on Microsoft	Transfer of existing knowledge, some may be more tacit
Meca-Precis	Open sources and one international Collaborator	Internal idea exchange and increasingly with one collaborator	Largely dependent on internal expertise	Transfer of existing knowledge but some implicit exchange with partner.

Table 2. Knowledge and Information