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Notes from an 'Intelligent Island'

Towards Strategic Knowledge Management in Singapore's Small Business Sector*

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Introduction

We are currently witnessing a major transition from the old type of industrial society with its traditional dominance of manufacturing work and old industrial classes to an information and knowledge-based society (Albrow and King 1981; Drucker 1994; Dutrenit 2000; Stehr 1994; Baber 1998; Evers 2000, 2000a,b; Evers 2003; Evers and Menkhoff 2004) with the following characteristics:

- Its members have attained a higher average standard of education in comparison to other societies and a growing proportion of its labour force is employed as knowledge workers. There is a significant reduction in the number of people working in operational roles, while employment in professional, knowledge-based positions has risen.
- Its industry produces products with integrated artificial intelligence (usually with the help of IT as in the case of JIT production) such as voice-recognition software and technology, which is used increasingly in smart cars.
- Service-based industries, retailing etc. are undergoing dramatic changes as indicated by e-commerce and an increasing number of virtual stores such as Amazon.com or CD World.

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- Its organizations – private, government and civil society – are transformed into intelligent organizations able to leverage on lessons learnt from past experiences as well as intellectual capital resources.
- There are multiple centres of expertise and knowledge production as well as distinct epistemic cultures of knowledge generation and knowledge utilization (Knorr-Cetina 1998).
- We witness the growing importance of so-called communicates of practice in and between organizations, i.e. self-organizing informal social structures which have the capacity to create and use organizational knowledge through informal learning and mutual engagement to leverage both internal and external stakeholders.

Singapore is a good example of a country which is successfully transforming itself into a knowledge-based economy. As a response to the country's rapid development progress on the basis of export-led growth and the inputs by multinational companies, Singapore's government unveiled a new policy framework in 1991 that would take the country to the 'next lap' of its development trajectory. The next lap strategy called for more ambitious industrialization programs in order to take Singapore to a higher level of technological sophistication and a shift towards knowledge-intensive industries. The computerization of Singapore's civil service which can be traced back to 1981, the remarkable IT literacy of local students, the systematic recruitment of foreign talents for new growth areas such as biotechnology and life sciences or the wireless technology-enabled lecture rooms of local universities such as the new Singapore Management University (SMU) underline the commitment and gravity of respective policy implementations.

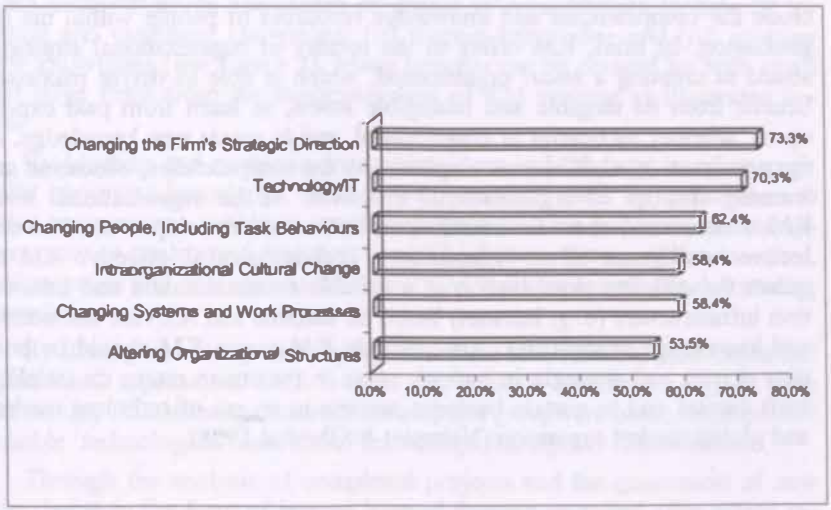
Singapore's vision of the city-state as an intelligent island was spelled out in the National IT Plan (1986) and the IT2000 blueprint, a rolling plan developed in 1992. Due to continuous IT investments, an increasing number of households have a PC. Singapore's internet penetration rate is very high, and more and more Singapore homes have access to the republic's nationwide broadband network. The World Competitiveness Yearbook has ranked Singapore among the top nations in the world for strategic exploitation of IT (National Computer Board 1997a + b; Mah 1999).

The k-economy policy goals of Singapore's government represent both opportunities and challenges for the local small- and medium-sized enterprise (SME) sector which has been recognized as "an indigenous base [that] is more permanent and durable than a foreign one" (Lee and Low 1990:23). SMEs are increasingly seen as important vehicles for increasing the economy's competitiveness in the global market system and essential for sustained long-term economic stability. In April 2000, a 10-year strategic SME 21 Plan was set up to prepare Singapore's SMEs for the new paradigm of

the knowledge-based economy and to enable these companies to gain the required expertise to undertake knowledge-intensive activities (Singapore Productivity and Standards Board 2000: 4). In line with the ongoing transition towards a truly knowledge-based society, more and more private sector companies in the lion city (following the lead of Singapore's public sector organizations) are proactively embracing knowledge management concepts.

A recent survey of change management practices of 101 local SMEs conducted by the authors (Menkhoff, Chay and Loh 2002) revealed that Singaporean SME owners implement organizational change measures on a routine basis. Changing the firm's strategic direction and technology, IT-related changes, and changes related to people and their task behavior were the most frequently adopted measures. (See Figure 1)

Figure 1: Most frequently adopted change measures



Further evidence for the increasing attractiveness of KM is provided by numerous case studies of organizations published in Singapore's local media such as the *Straits Times/Computer Times* that succeeded in learning from past experiences and leveraging upon human capital assets through effective KM systems built upon conducive cultures of interaction, collaboration, and mutual enrichment.

This essay outlines some of the potential benefits and challenges of implementing strategic knowledge management systems in SMEs. Research

questions include: What is knowledge management and why has it become an issue? Why should SMEs adopt strategic KM? What are the potential benefits and pitfalls of KM in SMEs? What are the main drivers and tools of KM? How do KM systems for SMEs look in reality? The latter will be illustrated by a local case-study, namely a small pest control firm whose owners implemented various smart KM tools aimed at increasing operational effectiveness and customer service quality.

What is KM?

Knowledge management can be defined as the task of developing and exploiting both tangible and intangible knowledge resources of an organization. Tangible assets include information and experience-based knowledge about customers, suppliers, products, competitors etc. Intangible assets include the competencies and knowledge resources of people within the organization. In brief, KM refers to the totality of organizational strategies aimed at creating a *smart* organization, which is able to derive maximum benefit from its tangible and intangible assets, to learn from past experiences, whether successful or unsuccessful, and to create new knowledge. At the personnel level, KM puts emphasis on the competencies, education and learning abilities of organizational members. At the organizational level, KM is concerned about the creation, utilization and development of the collective intelligence of an organization. Technologically, effective KM requires the efficient organization of a suitable communication and information infrastructure (e. g. intranet) based on suitable and relevant taxonomies and knowledge repositories. According to KM gurus, KM should be business driven and strategic in outlook so as to maximize return on (intellectual) capital and to sustain business success in an era of turbulent markets and global market expansion (Nahapiet & Ghoshal 1998).

Why KM has become an issue?

The process of globalization – driven by the explosive growth of new information and communication technologies – has increased competition and thereby the need to make more effective use of both individual and organizational knowledge assets. Another factor in the emergence of KM concepts is the continuous 'rightsizing' trend. Starting in the 1980s, corporate downsizing measures led to the loss of valuable information and knowledge resources and subsequently to the emergence of KM as a strategic counter-

measure. These developments saw an increased emphasis on technology and KM systems to capture knowledge residing in employees' minds (tacit knowledge) and to turn it into explicit knowledge. In view of the explosive growth of information sources (e. g. internet) and the accelerated pace of technological change, KM was propagated as an effective coping strategy. KM gurus often regard technology as a crucial "enabler" of information and knowledge sharing across platforms and continents. Within an organization it enables the more effective use of knowledge. Enlightened leadership and a strategic outlook, a "high care culture" (Von Krogh 1998), supportive human resource management practices and reward systems represent other important KM constituents.

How SMEs can benefit from KM?

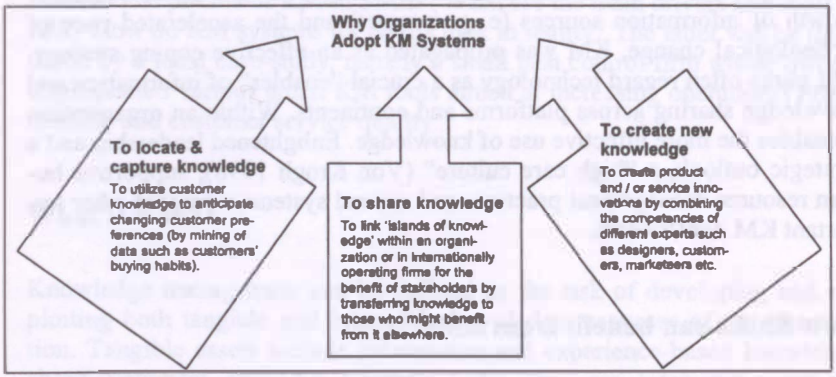
Core business-driven knowledge processes in organizations include (i) locating and capturing knowledge; (ii) sharing knowledge and (iii) creating new knowledge (see Figure 2). Many benefits can be derived by both small and large firms from the implementation of KM systems as illustrated below.

By locating and capturing innovative ideas and other types of strategically important knowledge such as best practices used by technicians to solve maintenance problems, small entrepreneurs can improve innovativeness, service quality and response time. The documentation of 'war stories', yellow pages and data mining are useful KM tools for locating and capturing knowledge.

By sharing knowledge and experiences about cost-effective procedures and operational approaches, SME owners can achieve substantial savings. Tea gatherings, TGF meetings, intranet systems and groupware platforms represent suitable 'technological' enablers of knowledge sharing and collaboration.

Through the analysis of completed projects and the generation of new knowledge in the form of lessons learned through so-called after-action reviews, small entrepreneurs can avoid potentially costly future mistakes (Carlsen & Skaret 1999; Groom & David 2001). Creating new knowledge, for example within small teams whose members share a mutual context of experience and collaborate on a joint task bonded by a common sense of purpose and the need to know what the other 'community members' know, can lead to profitable product and service innovations.

Figure 2: Steps in the KM Event Chain and Benefits of KM Systems



Sources: Von Krogh (1998); Von Krogh, G., Ichijo, K. and Nonaka, I. (2000); Von Krogh, G., Nonaka, I. and Nishiguchi, T. (2000)

Knowledge management challenges in SMEs

Challenge No. 1: One of the objectives of KM is to maximize return on an organization's tangible and intangible knowledge assets and resources such as customer-related information or the tacit knowledge, competencies and experiences resident in the minds of employees. KM aims at creating a 'smart' organization, which is able to learn from experience-based knowledge and to transfer it into new knowledge in the form of product and/or service innovations. One example is the set-up and use of computerized files to record and keep track of customers' preferences, as well as inquiries etc. aimed at improving customer relationships. Many firms integrate such KM strategies into their CRM systems.

Many SME owner-managers, however, are not familiar with the conceptual basis and potential benefit of KM models, the latest KM software tools and so forth. To develop people's capacity to learn as well as the collective intelligence of an organization requires KM competencies, visionary leader-

Table 1: Knowledge sharing gaps in SMEs

KM instruments found in KM literature	Found in SMEs?
Appointment of information agents	No
Facilitation of a "consultation culture"	No
Facilitation of private chats	No
Holding internal (information and/or knowledge) audits	No
Internal secondment	No
Knowledge management system	No
Job rotation	No
Theme and task groups with various employees	No
Working in autonomous work groups	No

Source: Beijerse (2000)

ship, a "high organizational care culture" (Von Krogh 1998) so that they are willing to share ideas, information, knowledge and space (Schrage 1997) and, last but not least, an efficient and suitable communication and information infrastructure. A survey of KM practices adopted by SMEs in the Netherlands by Beijerse (2000) revealed a surprisingly long list of knowledge sharing practices but also significant gaps as shown in Table 1.

Challenge No. 2: SMEs do make use of various KM tools (see Figure 3) in their day-to-day business such as maintaining CV databanks, having discussions with customers, conducting market inventories and so forth. However, the development of a truly visionary KM strategy and creation of a business-driven, IT-based knowledge information system are often neglected. SMEs seldom have a systematic KM policy on the strategic level with regard to the monitoring and evaluation of available, 'nice to have' and 'must have knowledge' or the development, acquisition, organization, sharing, utilization and/or creation of (innovative) knowledge.

Challenge No. 3: SME owners do not always create facilitative structures for simple KM activities such as capturing existing knowledge or more complex ones such as the continuous creation of new knowledge. Very often cultural barriers such as distrust, lack of recognition and communication, 'knowledge is power' mindsets, retrenchment concerns and so forth act as demotivators with regard to effective knowledge sharing and utilization of 'what we know'.

Figure 3: Knowledge management tools

KM tools for locating & capturing knowledge	KM tools for transferring & sharing knowledge	KM tools for creating knowledge
• Balanced scorecard • Business information systems • Data mining • Knowledge audits • Knowledge mapping • Yellow pages	• Benchmarking • Best practice transfer units • Internet/Intranet • Knowledge gap analysis • Knowledge sharing culture • Lotus notes/Groupware	• Communities of interest/practice • Innovation networks • Knowledge champions • Knowledge visioning activities • Learning organization • Study groups

Sources: Schrage (1997); Von Krogh (1998); Von Krogh, G., Ichijo, K. and Nonaka, I. (2000); Von Krogh, G., Nonaka, I. and Nishiguchi, T. (2000)

Strategic imperatives of KM in SMEs

The particular implementation needs of a SME depend on the size, needs, market position, strategic outlook and resources/assets of the respective firm. Potential strategic business objectives of KM include risk management, improvement of operational efficiency and innovativeness, customer-driven learning through fully integrated customer feedback systems etc. (Von Krogh 1998; Von Krogh, G., Ichijo, K. and Nonaka, I. 2000; Von Krogh, G., Nonaka, I. and Nishiguchi, T. 2000).

Firms which put emphasis on risk management and uncertainty reduction, often integrate KM into scenario planning activities aimed at assessing the impact of external factors such as changing government policies and regulations on the particular business. SWOT analyses are suitable means to generate knowledge about competitors' behavior, possible reactions and counter strategies.

Most organizations are eager to improve operational efficiency. KM can be a great help here by initiating activities aimed at sharing knowledge about intra-organizational best practices (e. g. in the field of sales and marketing or technical support), e. g. through institutionalized best practice forums, share fairs etc. In many organizations, islands of knowledge (silos) exist that

could be effectively linked with the help of a KM system so as to improve knowledge exchange, learning and performance.

Strategy goals with regard to innovation can be attained through the pro-active creation of new knowledge (e. g. in the form of new ideas, service forms etc.) by exploiting potential synergies between different types of experts and their tacit knowledge assets in the context of communities of interest, dedicated study groups etc. Very often management does little to facilitate such endeavors. According to the Japanese KM gurus Nonaka and Takeuchi (1995), the "combination" of different knowledge resources is a key modus for the generation of new knowledge. Innovations on the basis of real collective learning are often created in small teams whose members share a mutual context of experience and collaborate on a joint task bonded by a common sense of purpose and the need to know what the other 'community members' know.

Do small and large firms require different KM approaches?

Whether firms require specific KM systems depends on their size and other issues which have to be systematized during a 'KM needs assessment exercise'. By default many SMEs already have in place what experts call 'facilitating structural requirements for successful KM implementation' such as a flexible and flat organizational structure. Real challenges for SMEs in the field of KM include delegation of decision-making authority, the creation of an open culture, the use of more sophisticated KM tools such as knowledge mapping techniques, benchmarking, scenario planning, IT-based KM tools etc. on the basis of a pro-active KM strategy embedded in a motivating culture (Von Krogh 1998). Many large organizations cannot be classified as intelligent organizations. Size matters but is not the main issue. E-learning, for example, is a valuable option for both small and large firms. SMEs which want to 'go shopping' for the right vendor or tool should consult business associations, IT promotion agencies, Chambers of Commerce etc. in order to contact vendors and consultants who have successfully implemented KM systems in small firms. Before purchasing any specific KM system, KM needs should be assessed thoroughly (e. g. with the help of a consultant). SMEs should also check whether they are eligible for IT/KM-related SME grants.

In Singapore, assistance for the setting up of corporate KM systems comes under the Local Enterprise Computerization Programme (LECP), which is administered by the Singapore Productivity and Innovation Board (SPRING). This program aims at encouraging local enterprises to achieve a

higher level of competitiveness through more effective use of information technology (IT). SMEs can obtain assistance under LECP to defray the cost of engaging qualified and reputable IT consultants for their computerization project in the following areas:

- Feasibility Study: includes fact-finding, definition and documentation of user requirements, short-listing of computer vendors and preparation of 'Request for Proposal' (RFP), evaluation and recommendation of hardware and software as well as the development of an implementation plan.
- Implementation Consultancy: includes initial fact finding, definition and documentation of user requirements, initial project schedule planning, project monitoring and control, procedure streamlining and formalization, assistance in data conversion, planning and conduct of user acceptance test, planning for post-implementation review etc.

The LEC program subsidizes the costs of a feasibility study and implementation consultancy but does not cover the cost of the KM software.

Towards effective KM in SMEs

Beijerse's (2000) survey of KM practices of SMEs in the Netherlands found that SMEs lack (i) systematic KM policies on a strategic level with regard to the monitoring of available/necessary knowledge or the development, acquisition, locking, sharing, utilization or evaluation of knowledge (strategy); (ii) policies on a tactical level to make the structure facilitative of development, acquisition and locking of knowledge (structure) and (iii) policies to enable a motivating culture with regard to sharing and utilizing knowledge (culture).

As in the context of change management, the mindset of small entrepreneurs is often a major hindrance for implementing new KM systems (Menkhoff, Kay and Loh 2002). Based on research on change management practices of SMEs in Singapore, we argue that entrepreneurs with a tertiary education in business management or engineering and certain personality traits such as change propensity will find it easier to appreciate and embrace KM concepts, provided they are not too impatient when it comes to measuring the return on investment (ROI) in KM systems. With a good strategy, suitable KM policies, a caring leadership behavior and a proper performance management system as well as the right KM tools, it can be expected that more and more SME owners will succeed in making internal/external knowledge assets more productive so as to leverage organizational core competencies.

We will now examine the case study of a Singaporean SME, which overcame these challenges and implemented a knowledge management solution for its business operations.

Case study: pest control knowledge management at Origin Exterminators (Singapore) Pte Ltd

Origin Exterminators Pte. Ltd. is a Singapore pest control firm that uses knowledge management technology to improve its pest control methods and operations. The small and medium-size enterprise (SME) provides an array of pest management and consultancy services such as subterranean termite inspection and treatment, rodent baiting and trapping, mosquito larvaciding and fogging, and specialized termite management programs. It serves over 2000 clients in hotels, condominiums, commercial properties, industrial estates, residential homes, restaurants, clubs, schools, places of worship and government sites.

Recognizing the imperatives and benefits of adopting IT in order to retain a leading position in the knowledge-based economy, Origin's director Carl Baptista teamed up with an Internet business solutions provider, iBase Technology Pte. Ltd., to develop and implement a web-based Enterprise Resource Planning (ERP) solution to integrate information between major functions such as human resources, operations and sales. Previously loaded with manual paperwork and discontinued knowledge flows between front-end and back-end operations, Origins is now web-enabled with a customer-oriented online interface where clients can log in to check the status of pest control, make online payments, and obtain cost estimates for other services.

A wireless and convergence technology system was also part of the ERP solution at Origins. Armed with a wireless GSM-enabled Palm handheld with barcode reader, each of Origin's field operators is able to coordinate concurrent task operations at the pest control site. For example, after laying down several baits in a large rat-infested area, the field operators subsequently scan the tags attached to the bait and input information on how much bait has been consumed. The information is then transmitted to the base-station at Origin's headquarters where the data can be processed by pest management experts who now have real-time and consolidated knowledge of the infestation condition of the entire site. This allows the experts to react and rectify problems, issue detailed and customized procedures, and communicate with their teams on the field.

This wireless solution also saw an increase in productivity and efficiency in scheduling and operations. Previously Origin's management had no con-

trol over staff activities on the field and could therefore not ensure their clients of a uniform quality service. The only mode of communication upon completion of a job was by public telephone. With the wireless convergence system in place, a Short-Message-Service (SMS) is sent through the Palm handheld when a job is begun, and another when it is completed. This allows Origin's management and pest experts at the headquarters to track the precise duration of the job, how well it was accomplished, and to issue subsequent job orders.

Over 70% of the cost of implementing the ERP and wireless solution was subsidized by a LETAS grant from the then Singapore Productivity and Standards Board (now the Singapore Productivity and Innovation Board). With such positive endorsement of knowledge and IT-led upgrading for SMEs, Origins is now considering plans to introduce Global Positioning Satellite (GPS) technology into its knowledge-enabled pest-control business.

Conclusion

SMEs can benefit from knowledge management concepts and tools. As economies and businesses shift towards a new world configuration of digital information and knowledge-based work, SME owners need to take on this challenge and find out how information and communication technologies as well as KM solutions can assist them. To assist the SME sector to keep pace with the emerging knowledge-based economy, government agencies, chambers of commerce, industrial and private sector organizations will need to commit more resources and provide more assistance in order to make the implementation of KM in SMEs more tangible and economically viable. Owners and managers of SMEs must be willing to break away from practices that had worked well for them in the old economy, and embrace the changes now associated with the new economy. Contrary to trends detected in our own study on the change propensity of (Chinese) SME owner-managers in Singapore (Menkhoff, Kay and Loh 2002), a recent survey (Chua 2001) of 158 Chinese enterprises in Singapore showed that a relatively large proportion of these firms paid insufficient attention to IT skills upgrading, innovation as a source of competitiveness, product customization, customer satisfaction and e-commerce operations. Based on these indicators, the author concluded that many SMEs in Singapore are not yet ready for the new economy. Predictors and key ingredients of entrepreneurial 'new economy compliance' remain, however, unclear.

Singapore's SME policy makers do hope that new economy related assistance schemes will motivate more local small entrepreneurs to embrace

related changes proactively. To increase online transaction capability of local SMEs and to encourage small entrepreneurs to adopt "ready-made" e-commerce solutions, both Singapore's SPRING and the Infocomm Development Authority (IDA) have implemented various new economy related SME upgrading schemes during the past few years. As illustrated above, Origin Exterminators represents a dynamic beneficiary of these policies. The characteristics of those small entrepreneurs who take up the challenge (and those who do not) have yet to be ascertained by empirical research (Menkhoff and Gerke eds. 2004). Many analysts are excited about the challenges and economic dynamism that KM will bring, and research is currently being conducted by the authors of this essay to examine KM practices in Singaporean and German organizations. We seek to examine how knowledge is created and utilized in business organizations, and to understand the process whereby individual and organizational learning is transformed into key competencies and practices. It is hoped that the study will help to identify some of the drivers of effective KM processes in small firms and to establish what it takes to improve firm performance through KM systems. More information on this and other projects can be found at: http://www.research.smu.edu.sg/faculty/km/index.htm.

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