How large multi-nationals manage their knowledge

By Marcus Birkenkrahe

Until recently Knowledge Manager at Royal Dutch Shell,
the author shares his experience in applying KM in industry ...

nowledge management (KM) is not just IT, it isn't just change management, or people management, and certainly it's not only infrastructure. It should affect business strategy and it is supposed to be the cornerstone of competitive advantage in the knowledge economy. It might make you rich or, if you do it badly, cost you dearly. Some promise that it will feed your cat and take your kids to school, too. Some call it a fad, a guru invention and a money-spinner for consultants.

However, this "fad" has been around for more than a decade. Drucker (1969) coined the term "knowledge worker" and, at the beginning of the 1990s, two seminal articles were published on the importance of intellectual assets by Stewart (1991) and Nonaka (1991). But it was not until a few years later that KM emerged as a strategic issue. The practices listed as aspects of KM are diverse: new ways of working, distributed teams, learning organisation, communities of practice, communities of interest, and so on. Common to all KM approaches is a systematic approach to the creation, sharing, consolidation and use of knowledge. As simple as that. Or as complex as that, because these activities are all essentially human activities. Information technology, while helpful as an infrastructure, cannot bear the burden of managing our knowledge for us, as much as we might like it.
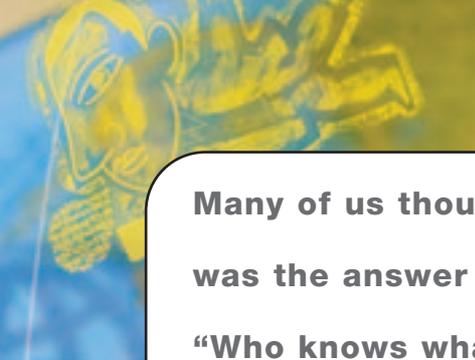
Many of us thought then that IT infrastructure was the answer to the two cardinal KM questions: "Who knows what?" and "What do we know already?"

IT'S JUST NOT JUST IT

Information technology is, however, frequently still the first point of contact with KM systems. Tim Berners-Lee led the team that created the worldwide web at CERN in 1989, with the deep involvement of scientists at various neighbouring institutions, including myself at a nearby German particle physics lab. The web was a project management blessing. It allowed us to share "virtual libraries" of information, hold online conferences and write joint publications without having to meet. Over time, the small-sized tool for a bunch of scientists grew into the web that we know today; essentially still the same platform for the sharing of information, though much faster to access, more colourful and with a lot more and diverse content. Many of us thought then that IT infrastructure – more and faster networks and IT applications – was the answer to the two cardinal KM questions: "Who knows what?" and "What do we know already?"

When I joined the Royal Dutch/Shell group of companies in 1997, I quickly realised that Shell's best-functioning KM system was not an IT system at all, but the community of expatriates; mostly senior managers who were rotated through overseas jobs in Shell's operations in more than 130 countries. The most-valued knowledge in Shell was created, shared, consolidated and used by people, not computers, and pushed around the globe through these expatriates. This was an important lesson for me. I witnessed the use of one important dimension of knowledge – deep, personal experience, the "extra bit" that distinguishes a seasoned practitioner from a novice, a job well done from a job adequately done. This knowledge is sometimes called "implicit" or "tacit" knowledge.

I had come to Shell from Accenture with a strong belief in process. Accenture was a successful global IT consulting firm. Its employees were aptly named "androids"; we were interchangeable and indistinguishable. The ability to implement at a consistently, recognisably high level was bestowed on us by the firm through a strong business integration methodology. We were trained in this methodology, gained access to it, used and fed into it by means of Accenture's global Lotus Notes system. Here was another lesson: the ability of a firm to obtain significant competitive advantage by exploiting another dimension of knowledge, now often called "explicit" or "codified" knowledge, included case studies, template processes, sample projects and methods.

The firm's partners sat on top of the consultants' hierarchy. They were the equivalent of Shell's senior expatriates. They carried the knowledge about their key business relationships, their competitors, about tricks and tips of the trade, in their own heads. Like Shell's expatriate knowledge base, this tacit knowledge was never codified or entered in a computerised network.

A lot of discussion is devoted in the KM literature to this distinction between tacit and codified knowledge. In my experience, this distinction is useful in order to understand that IT can never be more than an enabling infrastructure for the managing of knowledge. Beyond that, I have found the distinction to be of very little practical value. For one thing, it is not always easy to distinguish between the two categories and information moves back and forth between them constantly.

ADDRESSING CULTURE AND VALUE CREATION

The two companies mentioned so far, Shell and Accenture, are known for their excellence in the managing of knowledge. Shell was recognised as one of the winners of the

2001 European Most Admired Knowledge Enterprises (MAKE) Awards (see http://www.knowledgebusiness.com), behind direct competitors British Petroleum and Skandia, a Swedish insurance firm. Accenture was the winner of the 2002 North American MAKE awards, followed by Buckman Laboratories, a smallish chemical R&D company, and Clarica, the Canadian insurance group. What, we may ask, is it that is awarded in these companies? What makes them so special with regard to knowledge management?

The MAKE awards are given for a company's performance in eight categories of a value-based framework, all rooted in today's thinking on organisational performance. The categories are:

1 Success in establishing an enterprise knowledge culture.

2 Top management support for managing knowledge.

3 Ability to develop and deliver knowledge-based goods and services.

4 Success in maximising the value of the enterprise's intellectual capital.

5 Effectiveness in creating an environment of knowledge sharing.

6 Success in establishing a culture of continuous learning.

7 Effectiveness of managing customer knowledge to increase loyalty and value.

8 Ability to manage knowledge to generate shareholder value.

What stands out on this list is how these performance indicators are grouped around two major themes: culture and value. Neither technology nor process is explicitly addressed. The direct focus on culture and value makes it easier to implement KM in the end, because it allows us to address these two key issues that often make or break a project.

A DEFINITION OF KNOWLEDGE

At Shell, I learnt the value of concentrating on management's true problems, steering away from theory and focusing on execution. It doesn't matter how good it looks if it doesn't work. Instead of writing up a definition of knowledge, I created an image that I hoped would appeal to my peers (see **Figure 1**). Since they were in the oil and gas business, it had to relate to images that were already meaningful to them. I described KM as the process of drilling deep down through layers of data and information into a fertile layer of knowledge. Thus, intangible knowledge became identified with the most important tangible assets of the company – oil and gas. Supported by examples, this was adequate for taking the first steps toward "establishing an enterprise knowledge culture", in the words of the MAKE framework.

Of course, the real difference between knowledge on one hand and information and data on the other hand cannot be explained so quickly. This difference is fundamental when trying to understand the evolution of more established fields such as information and data management into KM and the difference between KM and disciplines such as competitive and business intelligence. These differences are essential for audiences who are professionally engaged in either of these areas.

In short, "knowledge is information possessed in the mind of individuals: it is
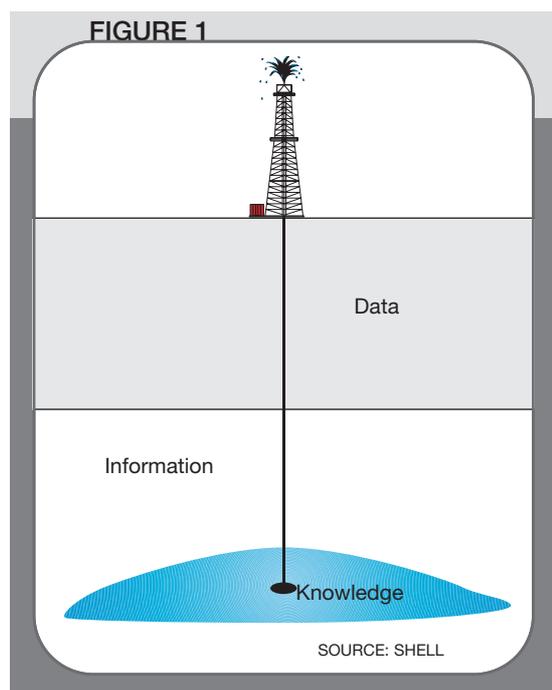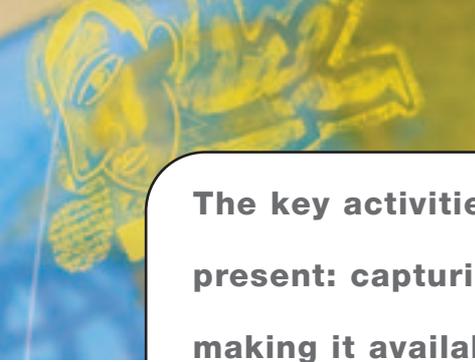
FIGURE 1

Data

Information

Knowledge

SOURCE: SHELL

personalised information (which may or may not be new, unique, useful or accurate) related to facts, procedures, concepts, interpretations, ideas, observations and judgements" (Alavi and Leidner, 2001).

Defining knowledge management so that managers understood what I was asking them to do was quite a different task. Regrettably, there was no one operational definition that any two experts agreed upon. Every guru and every company that invested in KM seemed to pride themselves on having crafted their own definition. I remember parading a potpourri of definitions in front of Shell managers. These included several very good ones, like "the right information for the right people at the right time" (originally from Dow Chemicals). But this turned out to be problematic because of its brevity and the use of the word "right". What exactly is the right information: is it what feels right to people? And so on.

Catchy definitions are useful in what Tom Davenport, acclaimed author and director of Accenture's Institute for Strategic Change, calls "phase one" of KM implementations (Davenport, 2002): "In phase one, we put the knowledge out there in repositories and encouraged people [...] to use it. The problem is that everybody today is too busy to consult and contribute to knowledge repositories on a frequent basis."

At the time of my involvement with them, both Accenture and Shell were still in phase one. Today they have entered phase two: "In phase two, we have to figure out how to embed knowledge and KM into jobs of knowledge workers, which is a much greater challenge," Davenport says. Doing this successfully is what is really awarded in the MAKE competition.

Davenport's admission of how difficult it is to motivate "knowledge workers" to engage with the systems provided for them, systems that are greedy to be fed regularly with highly "nutritious" knowledge, might surprise some. After all, Accenture is a consulting company, a business that almost defines KM. In consulting, there is nothing but knowledge to sell.

To appreciate how even a culture that prides itself on steeping its members in knowledge can have struggles with the more mundane activities, we may need to define knowledge management after all: "KM is the capability by which communities capture the knowledge that is critical to their success, constantly improve it, and make it available in the most effective manner to those who need it, so that they exploit it creatively and add value as a normal part of their work." I created this definition, which contains a list of core KM activities for Shell's Group KM Framework in 1997. It is also the definition, which the British Standards Institute (BSI) chose for its KM "Good Practice Guide" document (Kelleher and Levene, 2001). The definition identifies the main agent of KM as a "community" rather than "organisation" or "individual". The key activities that characterise a KM project are all present in this definition: capturing knowledge, constantly improving and making it available, exploiting it creatively and adding value. A few important points are hidden in the attributes: it must be worth capturing (critical to the business process); it must be available to those who need it most of all (knowledge is information in a context; the context determines who can make most use of it); and it must be or become a normal part of everybody's work. Hence the term "knowledge worker".

THE PAST: FOCUS ON KNOWLEDGE REPOSITORIES

It is obvious from this definition that taking knowledge management seriously is a multi-

faceted, time-consuming task. It should be comforting to the business manager that it ultimately must become a normal part of everybody's work. In the meantime, however, the human resources, usually already stretched, might break under the strain of the additional tasks – how can we justify the extra expense? The technology is small fish compared to the expense of people's time.

There is no better way to prove the benefits of KM than doing it and seeing positive results. In Accenture, even the phase one implementation of KM brought significant benefits in savings and improved client service. Many consulting jobs around the world show similar results. Because of a repository of global lessons learnt, it was now possible for a consultant on a project in, say, Alaska to access data on a project that was carried out in, say, Australia the day before. Repeated experience of working in this way, globally connected and drawing on shared knowledge, has laid the foundation for a knowledge community. In such a community, people share in a trusting way. They are willing to build on work done by others. If they have profited from available knowledge, they will generally rejoice in giving back to the community. The spirit of a community – the give and take, the free flow of value between members – is daily practice on the internet.

Another example from Shell is also firmly still placed in phase one. Around 1996, the company underwent a major restructuring of its operating companies. This involved downsizing in many areas. One of the places affected was the Instrumentation Customer Solutions Centre, a part of Shell's Oil Products.

Before the downsizing, a group of about 70 instrumentation experts had dealt with all instrumentation problems in Shell operating companies, serving more than 700 customers around the world. After the reorganisation, the centre had considerably fewer staff to deal with more problems, since its customers, the operating companies, had also downsized. Two simple KM insights, followed by action, helped them deal with the situation.
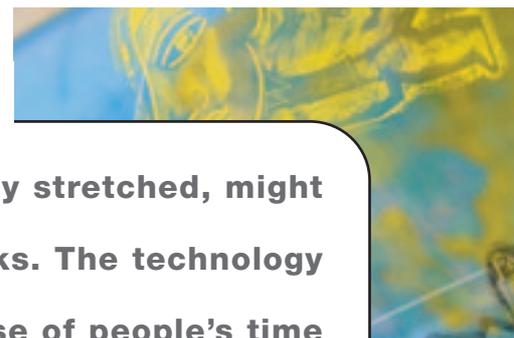
The first insight: customers can solve their own problems. Instead of a rigorously centralised query-answer process, the centre provided simple web-based tools that allowed the operating companies to communicate directly with each other about instrumentation issues. The centre stayed in the loop and, through a moderated discussion group, helped facilitate the relationship where needed.

Its second insight was linked to the first: focus on value, not volume. It created a database of best practices of instrumentation engineering, unique problems and solutions that were worth keeping in corporate memory. The job of selecting and nursing this knowledge was given to a retired instrumentation engineer, a highly experienced member of his guild.

At the heart of this example is once more an emerging knowledge community. Getting started by connecting, sharing and capturing is one thing. Making the various processes under the surface work smoothly and help them become a normal part of everybody's work is quite another. In the course of their KM project, the knowledge community in this example experimented with technology, people and scope. They did not so much execute a well-

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thought-out KM plan as grow it organically. Working iteratively, using frequent feedback and good common sense, they arrived at a practice of knowledge management that, more than five years after its first inception, is still successful for this group of engineers.

The model behind the story has, in fact, been applied elsewhere to more spectacular, commercial effect: both insights are behind CISCO's decision around the same time to place its customer relationship systems, including interaction and best practices, on the internet for its customers to see, interact with and contribute to. This improved the quality of CISCO products and helped it create a loyal following of customers who went on to contribute substantially to the company's phenomenal success.

The dual strategies of connecting customers and emphasising value over volume are not hard to understand. Once applied, one wonders why things were ever done differently. Creating knowledge communities seems such a straightforward thing to do. But it involves a critical look at one's own working practice and, often, substantial changes. In the case of the Shell instrumentation customer solutions centre, it was Shell's reorganisation that forced it to act. The creation and operation of the community was a bottom-up development, not instigated by top management, but largely planned and carried out by the knowledge workers themselves. Many successful KM outcomes are of this type, which is an example of self-organisation. The reason: managing knowledge might appear an abstract notion at the top; at the bottom of an organisation, it simply makes sense. It saves time. People enjoy their work more if their knowledge is acknowledged and welcomed and used. Finally, if knowledge is easily available, they can focus on more challenging and rewarding tasks.

THE PRESENT: EMBEDDING KNOWLEDGE IN THE BUSINESS

A more recent example of successful KM which is firmly in phase two, where knowledge is embedded in business processes (thus changing those processes along the way), comes from the largest of Shell's global business organisations, Shell Exploration & Production (EP), which is concerned with the finding, drilling and extraction of oil and gas. Over the past three years, EP has built a KM solution that supports both innovation and regular operations on a global basis for more than 30,000 employees, based on the creation of knowledge communities.
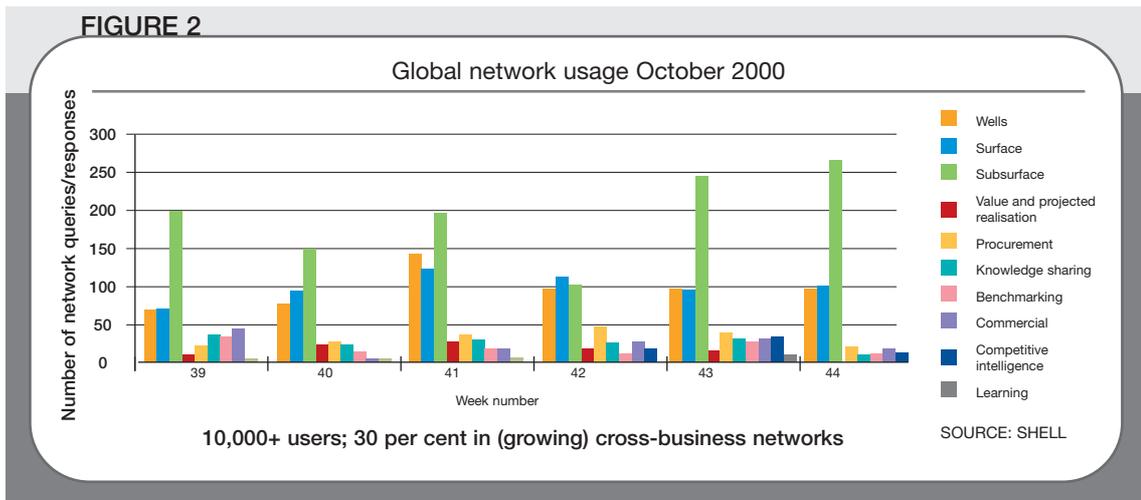
Since the 1930s, Shell engineers had managed technical know-how through standards. Standards are a form of codified knowledge – pure instruction, no story, clearly a phase one KM process. The standards are knowledge in aggregate form, extracted and refined by specialists. As in many other companies, the advent of the electronic age led to spending millions of dollars building databases of detailed technical documents. EP recognised a number of problems with these databases:

- Nobody searched them (and not because of unfriendly technology).
- They were quickly out of date.
- No structure for "which document do I take as the best?" was available (in fact, since the best depends often on the context and not on an objective judgement, no fixed structure of this sort can exist).
- They are massively expensive to implement and maintain.
- In a complex business, the taxonomy is too difficult to get right (though businesses keep trying to come up with comprehensive taxonomies which then fail the users).

EP felt it was high time to turn its back on using only standards to address the issue of

Global network usage October 2000

10,000+ users; 30 per cent in (growing) cross-business networks

SOURCE: SHELL

knowledge management. It dubbed its approach "New Ways of Working" and directed its attention to three areas: "eLearning packages to deliver base competencies, Global Networks to be the corporate memory, and Standards as being the massed high-level knowledge." Best practice is driven through focused delivery teams that operate globally and virtually; that is, without the need to be in the same physical location. The Global Networks – knowledge communities – are the heart of the system. There are three technical networks related to specialist professional disciplines of EP engineers and a growing number of cross-discipline ones, such as procurement, knowledge-sharing, benchmarking and competitive intelligence. The networks are driven by moderated web-based discussion groups on Shell's intranet, using AltaVista forums. The discussion group deals exclusively with the issue "What do others know?" The knowledge base deals with the corresponding issue "What information do we already have?" As in the case of the instrumentation customer centre mentioned earlier, experienced co-ordinators add information from the discussion group to the knowledge base.

EP has produced a booklet, titled *Our Ways of Working* (on the title page, the "*New*" in the title is struck out to indicate that the transition from an experimental situation to a normal state of managing knowledge is complete), filled to the brim with "war" stories taken straight from the global network. A quote at the beginning from one of the community members says it all: "The responses received from around the group were quick, informative and contained clear practical advice and experience gleaned by individuals who had faced similar issues around the world."

Administration of the networks is well funded: $US5.5 million annually, or 0.01% of EP's profits. The money is mostly spent on people, not on technology. The statistics speak for themselves: more than half of the 30,000-strong EP population are members in at least one global network. The number of cross-business networks is growing, which demonstrates the change from a specialist-focused silo mentality to a knowledge-focused community mindset (see **Figure 2**).

Both of the Shell KM projects I have discussed so far focused on the creation of a knowledge community among experts, using an initial taxonomy of industry-relevant categories as a starting point. Discussions rallied around the themes identified in these categories. The EP project was more aware of failed taxonomies in Shell's history and, therefore, assigned a smaller role to them. The communities were permitted to change the taxonomy and because the communities were grown from small groups, their taxonomies were easier to handle.

Another common feature of both projects was the focus on value rather than volume: good stories, the pearls of problem-solving, profound experiences and not merely a comprehensive data repository that requires sophisticated search engines to be of any use to the browsing knowledge worker.

THE NEED FOR RESEARCH

Companies that excel in knowledge management today have made the transition from phase one (focus on knowledge repositories that are really information and data repositories) to phase two (focus on embedding knowledge in business processes). They literally learn from their failures and successes by establishing organisational continuity (this works both ways; continuity is helped by the practice of learning, rather than blaming). The vehicle for KM improvement typically is a knowledge community, a community of common practice and interest. They typically employ a wide array of mechanisms to motivate community members, including storytelling (Shell, World Bank, IBM), performance rewards and/or punishment (sic! Several consulting firms), ethical ground rules (Buckman), executive leadership and peer-to-peer reviews (BP), articulation of the intellectual capital on the balance sheet (Skandia), scenario planning (Shell), balanced scorecard (most large companies) and many more.

In both the applied and the research literature, a lot of attention is paid to knowledge management tools. What we are only beginning to understand is how working in a knowledge community instead of in the traditional modes of hierarchies and informal groups – the infamous "old boys network" is an example – changes the way the individual works. Alongside is today's technology, supposedly to "boost productivity", including hand-held personal assistants, mobile phones, super-lightweight laptops, web portals and other knowledge repositories. Of course, these devices don't do the job by themselves. Technology never does. As Tom Davenport says (Davenport, 2002): "We need to do a lot of observing in order to understand how this activity can be improved." He is really asking for more research here.

Consulting companies are good starting points for research into knowledge-intensive organisations, because of their relentless, outspoken focus on knowledge creation, sharing and use. Companies including Shell and others in the camp of firms whose value is largely still determined not by the intellectual capital (the knowledge tied up in their workers rather than their patents and knowledge bases), generally have a harder time with that. But, as these examples and many others from contending heavyweights such as BP, Ford, Daimler-Chrysler, Siemens, IBM, the World Bank and others show, they are quickly catching up. It is common for consultants to pilgrim to the multi-nationals to learn a thing or two about knowledge management in the business, rather than the other way around.

THE FUTURE: PHASE THREE KNOWLEDGE MANAGEMENT

In phase three of knowledge management implementations, all business processes are knowledge management processes. The need to highlight knowledge management as a separate discipline no longer exists. The culture of the organisation has now changed as follows:

- "Knowledge is power", but individuals in the organisation understand that sharing knowledge is greater power.
- "Not invented here", referring to the reluctance to use shared knowledge, is no longer an obstacle to the percolation of knowledge. Improved controls, a history of sharing, and new reward mechanisms have established greater trust between employees.
- KM skills in the areas of communication, learning and relationships are recognised and relevant training courses are offered.
- Knowledge management is no longer an organisational change topic, but a practised habit. No separate business case needs to be

made, but the knowledge dimension is routinely addressed in all business cases.

Sounds too good to be true? Yet in consulting companies such as Accenture and in large multi-nationals including Shell or Toyota, the building blocks are already in place.

In Shell Finance Services, for example, a global provider to Shell companies, consultants at the beginning of client engagements already routinely look for any knowledge that could make their jobs easier. In addition to having a lot more information at their fingertips than before, this is the result of an altered quality of professional relationships. The finance professionals follow the example of their leaders who live what they preach and who are passionate managers of their own knowledge.

A phase three knowledge worker can choose from a variety of measures assembled as a KM toolkit. This toolkit contains all the methods of organisational interventions and change listed above, an array of methods to measure the impact of managing knowledge (preferably by assessing the quality of interpersonal relationships) and a number of technical infrastructure solutions to choose from. I am now working with a group of postgraduate students at The University of Auckland on creating such a toolkit for use in the New Zealand business environment.

PROVING THE VALUE OF KM

When Leo Platt, then CEO of Hewlett-Packard, was kicking off HP's knowledge management programme, he said: "If only HP knew what HP knows, we'd be three times as profitable."

But what if senior management is resistant to the idea that better knowledge management is in order? They will ask for hard, that is, financial, measures of success. KM is a "soft" area of management; measuring the business value of a knowledge community, for example, can be very difficult. It is easier to measure its activity level and when the leaders market those activities well, people will usually believe the community to be beneficial to the business. Putting a money value on it, however, is problematic. The value of a knowledge community in phase two of KM, when knowledge processes are increasingly embedded in the work culture, largely relies on the quality of relationships, which is notoriously hard to assess.

Every business success has more than one cause. It is obvious when a community produces innovations and breakthrough ideas, less obvious perhaps when the community simply produces a change of climate, better working relationships, subtler cross-fertilisations.

At Accenture, I participated in a business simulation where real client data of three years was fed into a simulator to ascertain which areas of KM investment had had the greatest effect on profitability. The answer highlighted areas of improvement that were obvious to anyone who cared to look, but now, a case had been made with which the partners could not argue. (The biggest impact on consultants' profitability came from the areas of "socialisation" and "contextualisation" related to the ability to create and sustain client relationships and introduce content into the relationship as a way of creating new meaning for the benefit of the client.) The study became ▶
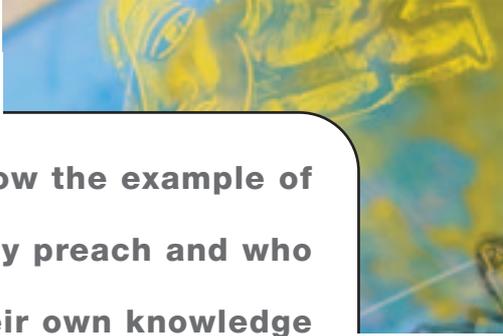
The finance professionals follow the example of their leaders who live what they preach and who are passionate managers of their own knowledge

a cornerstone of the global knowledge management strategy, which informed the creation of Accenture's intranet and profoundly changed its consulting practices around the world.

Another way of looking for solid data is to look at business failures and see where these can connect in an obvious way to knowledge failures: information required but not communicated at the right time to the right person; lack of operational transparency; disconnected actions between different departments; silo mentality and lack of trust between people who should have worked together or at least shared experiences, and so on. Such an investigation must be handled delicately, of course, but if it can be shown that such mistakes cost a large company, say, $50 million a year, then a case can certainly be made for a KM budget of $5 million a year.

WHAT ABOUT NEW ZEALAND?

How does all this apply to New Zealand, where small and medium-sized businesses dominate. Does size matter? It does and it doesn't. It can matter, if it provides you with

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deeper pockets, but that's not necessarily an advantage because it lures the company into repeating expensive mistakes simply because it can afford it. Diversity among a larger employee base can help, too. There is simply more knowledge and experience to draw upon. But this, too, has another side: the more cultures that live under one roof, the more work there is to bring about behavioural changes.

Accenture, for example, employed essentially one type of functional expert (albeit capable of working in many industries) and three large hierarchical groups (consultants, managers and partners) across the world. Shell on the other hand is a conglomerate of more than 1400 industries, grown over 100 years with many different types of functional experts and a deeper hierarchy.

Small and medium-sized companies will have an easier time getting started with knowledge management. Expensive information-processing technology is hardly necessary. Research from the London Business School (Earl and Scott, 2001) shows that experience in a variety of functions is a strong advantage for a knowledge manager (or a KM project manager). This spectrum of experience is easier to gain in smaller companies and subsidiaries, where resource constraints force employees to be more versatile and more flexible.

In a recent article in this journal, Martin Richardson asked whether the capability in "the transmission of tacit knowledge [...] gives an advantage to large countries and to large – perhaps multi-national – corporations." He then went on to speculate about the need to create policy that might improve the situation for smaller countries such as New Zealand.

In phase three as I have described it here, this advantage no longer exists. As the British scholar Ralph Stacey says: "Organisational

knowledge is between people in an organisation and has to do with the quality of relationships in that organisation." I already said that the distinction between tacit and codified knowledge is not very useful. In phase three, the focus must be on improving the quality of relationships between the different agents of the business process. In this race, small and medium-sized companies, and relatively small economies such as New Zealand's that are run by a well-educated workforce, could have an advantage over large, unwieldy, more complex economies and large multi-nationals with their tangled web of historically grown relationships that are often dominated by hierarchy more than anything else.

I have been in the country for a few months, but it appears to me that New Zealand is confidently setting sails for the knowledge economy. "The Knowledge Wave" initiative is a step in the right direction. Certainly New Zealand companies can take a shortcut and enter phase two.

One example that I have come across in the short time I have been here is the ICEHOUSE, a partnership between some of New Zealand's largest and best companies and The University of Auckland. Its goal is to boost innovation and entrepreneurship. There are no business processes that aren't knowledge processes in the ICEHOUSE. Says CEO Andy Hamilton: "The process of entrepreneurship is knowledge creation across products, processes and markets. As an incubator for high-growth, high-technology companies, the ICEHOUSE and its residents are in the business of knowledge. The speed and intensity of knowledge creation and transfer is the competitive advantage of business incubation."

It is easier for this small company, set up in the intellectual and physical vicinity of a university, to embrace the principles of the knowledge economy. But its example is not hard to follow. What it takes first of all is a change of mindset.

REFERENCES

Alavi, M., & Leidner, D.E. (2001). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues, *MIS Quarterly*, 25 (1), pp 107-136.

Davenport, T.H. (2002). Interview with Simon Selic, *Knowledge Management*, 5 (8), pp 30-31.

Drucker, P.F. (1969). *The Age of Discontinuity: Guidelines to our Changing Society*. London, Heinemann.

Earl, M.J., & Scott, I.A. (1999). What is a Chief Knowledge officer, *MIT Sloane Management Review*, 40 (2).

Kelleher S., & Levene, D. (2001). Knowledge Management: A Guide to Good Practice, *British Standards Institute*, PAS 2001, p 15.

Nonaka, I. (1991). The Knowledge-Creating Company, *Harvard Business Review*, 69 (6), pp 96-104.

Stacey, R.D. (2001) *Complex responsive processes in organizations*. London, Routledge 2001.

Stewart, T.A. (1991). Brainpower, *Fortune*, 123 (11) 42-60.