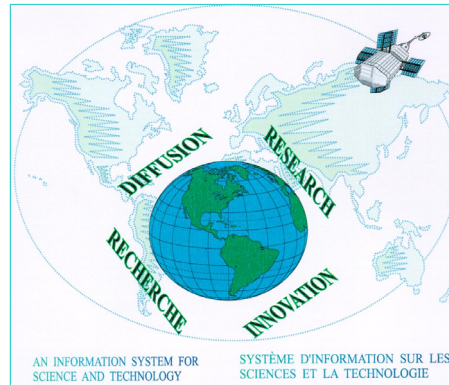


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Knowledge management in practice in Canada, 2001



Knowledge management in practice in Canada, 2001

Survey of Knowledge Management Practices, 2001

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Working Papers

The Working Papers publish research related to science and technology issues. All papers are subject to internal review. The views expressed in the articles are those of the authors and do not necessarily reflect the views of Statistics Canada.

The science and innovation information program

The purpose of this program is to develop **useful indicators of science and technology activity** in Canada based on a framework that ties them together into a coherent picture. To achieve the purpose, statistical indicators are being developed in five key entities:

- **Actors:** are persons and institutions engaged in S&T activities. Measures include distinguishing R&D performers, identifying universities that license their technologies, and determining the field of study of graduates.
- **Activities:** include the creation, transmission or use of S&T knowledge including research and development, innovation, and use of technologies.
- **Linkages:** are the means by which S&T knowledge is transferred among actors. Measures include the flow of graduates to industries, the licensing of a university's technology to a company, co-authorship of scientific papers, the source of ideas for innovation in industry.
- **Outcomes:** are the medium-term consequences of activities. An outcome of an innovation in a firm may be more highly skilled jobs. An outcome of a firm adopting a new technology may be a greater market share for that firm.
- **Impacts:** are the longer-term consequences of activities, linkages and outcomes. Wireless telephony is the result of many activities, linkages and outcomes. It has wide-ranging economic and social impacts such as increased connectedness.

The development of these indicators and their further elaboration is being done at Statistics Canada, in collaboration with other government departments and agencies, and a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and we are continuing with our efforts to understand the characteristics of innovative and non-innovative firms, especially in the service sector that dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say only *how much* the federal government spends and *where* it spends it. Our report **Federal Scientific Activities, 1998 (Cat. No. 88-204)** first published socio-economic objectives indicators to show *what* the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information has been used to provide a context for performance reports of individual departments and agencies.

As of April 1999, the Program has been established as a part of Statistics Canada's Science, Innovation and Electronic Information Division.

The final version of the framework that guides the future elaboration of indicators was published in December, 1998 (**Science and Technology Activities and Impacts: A Framework for a Statistical Information System**, Cat. No. 88-522). The framework has given rise to **A Five-Year Strategic Plan for the Development of an Information System for Science and Technology** (Cat. No. 88-523).

It is now possible to report on the Canadian system on science and technology and show the role of the federal government in that system.

Our working papers and research papers are available at no cost on the Statistics Canada Internet site at <http://www.statcan.ca/cgi-bin/downpub/research.cgi?subject=193>.

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Preface

Innovation and the adoption and dissemination of technologies and management practices are vital to economic growth and development. It is through innovation that new products are introduced to the market, new production processes are developed and introduced, and organisational changes are made. Through the adoption of newer, more advanced, technologies and management practices, industries can increase their production capabilities, improve their productivity, and expand their lines of new products and services.

This study is one in a series of studies that the Science, Innovation and Electronic Information Division (SIEID) has undertaken that have examined technological and organisational change in the Canadian economy. In 1993, a first survey of innovation and the adoption of advanced technologies in the manufacturing sector was carried out. It was followed in 1996 by a survey of innovation in the communications, financial services and technical business services industries. The Survey of Innovation 1999 surveyed manufacturing and was the first innovation survey of selected natural resource industries.

Biotechnology surveys carried out in 1996, 19997 and 1999 have examined both the development of new biotechnology products and processes and the use and planned use of biotechnologies. The 1999 Survey of Innovation, Advanced Technologies and Practices in the Construction and Related Industries is the first survey of innovation and advanced technologies and practices in the construction sector. A number of surveys have focused on the use and planned use of advanced technologies and practices: surveys of advanced manufacturing technologies were carried out in 1987, 1989, 1993, and 1998; and survey of the use and planned use of information communication technologies were carried out in 1999, 2000, and 2001. And finally, the Survey of Electronic Commerce and Technology, 2000 contained two questions on organisational and technological improvements and provided the first cross-economy data on the issue, covering both firms in the private sector and organisations in the public sector.

The pilot Knowledge Management Practices Survey is the latest addition to this series of surveys on the adoption of new organisational practices. This working paper provides the reasons for, and the results of using knowledge management practices by firm size and by type of adopter. This working paper is the second of several that are planned using data from the Knowledge Management Practices Survey, 2001.

Acknowledgements

This report provides data from the pilot Knowledge Management Practices Survey, 2001. Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

The publication of this report was made possible through the contribution of many people, first and foremost amongst whom are our respondents. This report would not have been possible without the assistance of Guy Sabourin, Adele St.Pierre, and Claire Racine-Lebel. Finally, the constant assistance and encouragement of Dominique Foray and Fred Gault made working on this project a pleasure.

Abstract

Findings are presented from a 2001 Canadian pilot survey on the use of knowledge management practices by firms. Nine out of ten firms surveyed reported using at least one of 23 knowledge management practices that were studied. This survey, a world first by a statistical agency, measured the extent to which knowledge management practices were used by Canadian businesses in forestry and logging; chemical manufacturing; transportation equipment manufacturing; machinery, equipment and supplies wholesaler-distributors; and management, scientific and technical consulting services. The reasons for, and the results of, using knowledge management practices as well as the practices themselves are examined by firm size and by type of adopter.

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In the fall of 2001, Statistics Canada conducted a pilot Knowledge Management Practices Survey (KMPS) of firms in five sub-sectors¹ of the Canadian economy. The survey was conducted as part of an international initiative co-ordinated by the Organisation for Economic Co-operation and Development. The survey showed that nine out of ten Canadian firms managed some aspect of their knowledge and that larger firms used more knowledge management practices than their smaller counterparts.

This paper summarises the findings of the 2001 KMPS and focuses on knowledge management practitioners and their characteristics including firm size and whether they recently adopted new knowledge management practices. Practitioners are defined for the purposes of this paper as firms that indicated they used at least one of 23 business practices related to knowledge management, which, "involves any systematic activity related to the capture and sharing of knowledge by the organisation". (See Annex 1 - Tables for listing of knowledge management practices.)

Putting knowledge management into practice

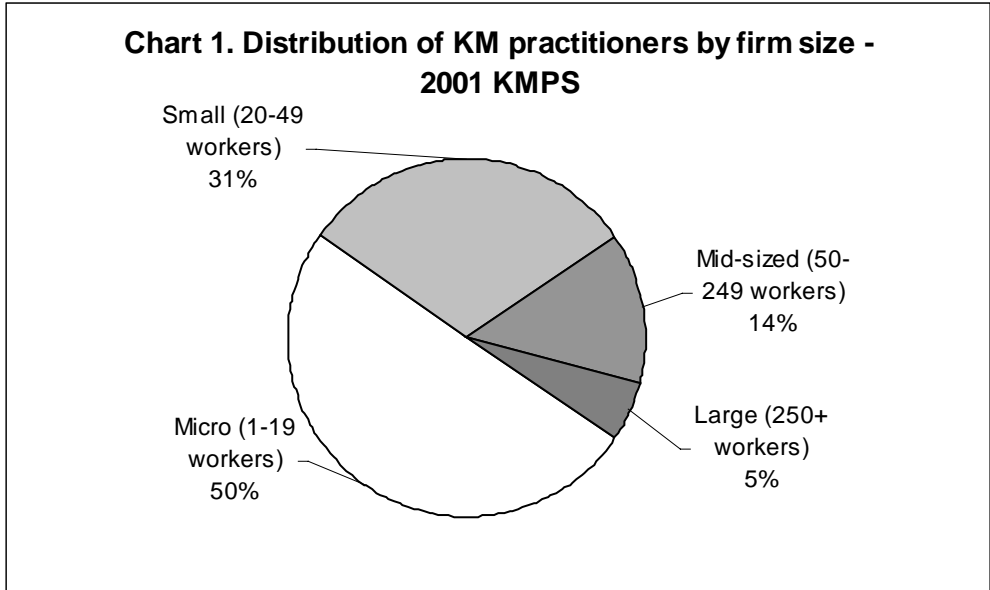
On average, firms in all five sub-sectors used 11 knowledge management practices - just under half of the practices listed. The average number of practices used increased with firm size ranged from 10 for micro firms (1-19 workers) to 15 for large firms with at least 250 workers. Small firms of 20-49 workers used 12 and mid-sized firms (50-249 workers) practised 14.

Recent adopters², defined as users who had put into place at least one of 18 knowledge management practices since 1999, on average used 14 practices, showing a similarity to large firms. On the other hand early adopters, firms that had not included any new knowledge management practices since 1999, shared their average of 10 with micro firms - the majority of firms within this group.

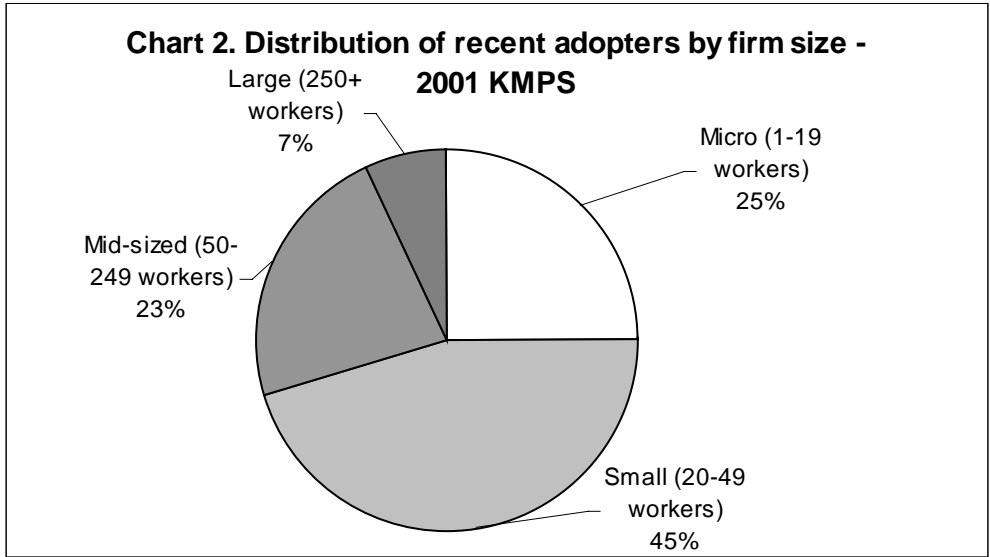
The distribution pattern of recent adopters by firm size varied noticeably from that for all practitioners (see Charts below). Micro firms comprised half of all practitioners and just one quarter of recent adopters. This low representation of micro firms as recent adopters may reflect how these firms are managed. Micro firms may not require formal management practices or routines or have the need or capacity to introduce some of the knowledge practices identified in the survey.

¹ The five sub-sectors are: Forestry and Logging (113); Chemical Manufacturing (325); Transportation Equipment Manufacturing (336); Machinery, Equipment and Supplies Wholesaler-Distributors (417); and Management, Scientific and Technical Consulting Services (5416) for more information on methodology see Annex 3 and L. Earl, (2002) "Are We Managing Our Knowledge? Results from the Pilot Knowledge Management Practices Survey".

² See Annex 2 Definitions for descriptions of recent and early adopters.



Source: Statistics Canada, Knowledge Management Practices Survey, 2001



Source: Statistics Canada, Knowledge Management Practices Survey, 2001

Average number of practices in use

While recent adopters on average used 14 practices, recent adopters in the two larger firm size categories both tended to have an average of 16 practices in place. In all firm sizes except small firms where they tied, the recent adopters used on average more practices than did early adopters. This suggests two divergent observations. First that the business practices listed may have better suited larger firms and therefore these firms used more of them. Second, if recent adopters can be considered to be more innovative in management than are early adopters then recent adopters are imitating the management behaviours of large firms (Fagerberg, 2001). Recent adopters also could be firms undergoing firm growth that required organisation and structure (de la Mothe and Foray, 2001). They may have imposed management structures to make themselves more attractive for partnering opportunities. The changes could have been imposed by customer, supplier or distributor needs³. Finally the firms may have needed to reposition themselves within the market due to some type of shock or to prevent a perceived shock.

The most frequently used knowledge management practices

To help respondents, the activity of knowledge management was presented as 23 practices grouped under six headings: Policies and Strategies; Leadership; Incentives; Knowledge Capture and Acquisition; Training and Mentoring; and Communications.

Almost every practitioner ascribed the responsibility for their knowledge management practices to managers or executives and this most frequently used practice shows the importance of leadership to knowledge management (Table 1). Capturing and using knowledge obtained from other industry sources such as industrial associations, competitors, clients and suppliers ranked second. This popular practice could include business environment scanning and market research. Cohen and Levinthal (2000 reprint, p.39) argued that "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities". They labelled this ability absorptive capacity and it would appear that knowledge management practitioners are inclined towards developing their absorptive capacity.

The third and fourth most popular practices, both fell under training and mentoring. This section of practices indicates how firms develop, transfer and retain the knowledge of their workers and all are important components of knowledge management (Dixon, 2000; Cross and Israelit, 2000; and Baird, Deacon and Holland, 2000). Brelade and Harman (2001) made a strong case for the role of human resource departments in knowledge management. They stated "it's only through the acquisition of knowledge by individuals and their willingness to apply it for the benefit of the organization that competitive advantage and service excellence can be achieved" (Brelade and Harman, 2001, p. 30). Four-fifths of knowledge management practitioners encouraged experienced workers to transfer their knowledge to new or less experienced workers and provided informal training related to knowledge management. The practice of encouraging workers to transfer their knowledge is in keeping with Denning's (2001) work that suggested that not all

³ During questionnaire testing one firm commented that they had to complete overhaul their supply, distribution and warehousing systems and organisation to match that of one of their major clients or lose market share.

workplace skills can be put down in writing (codified) and distributed through documentation. Some skills and knowledge are shared and transferred through practical application or "doing".

Firm size view of knowledge management practices

Small and mid-sized practitioners followed the trend of ranking executive leadership, knowledge acquisition and capture and knowledge transfer between workers as the top three practices (Table 4). Micro practitioners inserted informal knowledge management training as their third most popular practice in the place of knowledge transfer between workers.⁴

Large firm practitioners diverged from the other firm sizes. Davenport and Prusak (2000, p.17) suggested that a critical mass of between 200-300 employees is required before firms begin to need to manage their knowledge strategically.⁵ Large firms focussed on human resource development, emphasising training while still encouraging knowledge sharing. The three top practices for large firms, were in order: encouraging workers to continue their education by reimbursing tuition fees for successfully completed work-related courses; knowledge transfer from experienced workers and offering off-site training to workers in order to keep skills current. Large firms next rated capturing and using knowledge obtained from other industry sources followed closely by executive leadership and having a values system or culture intended to promote knowledge sharing.

Recent adopters and early adopters shared top practices

Executive leadership also led the practices for both recent and early adopters (Table 1). Each type of adopter also ranked knowledge capture and acquisition from other industry sources as well as knowledge transfer and development in their top three practices. A striking difference between recent and early adopters emerges in how they viewed the use of knowledge sharing incentives. While two-thirds of recent adopters embraced both monetary and non-monetary incentives intended to encourage knowledge sharing, early adopters seemed to ignore these practices. Recent adopters may have been creating more supporting structures for knowledge management by showing their inclination towards having in place knowledge sharing values or culture.

Reasons that practitioners used their suites of knowledge management practices

Nine out of ten practitioners asserted that improving their competitive advantage was the most critical or important reason to use knowledge management practices (Table 2). Training workers to meet strategic objectives of the firm followed closely. The third most highly rated critical or important reason was improving worker retention. The least cited reason to adopt knowledge management was to ease collaborative work of project or teams that are physically separated. However, the small number of practitioners' that actually had to facilitate work by project teams that were physically separated tempers this observation.

⁴ For more information on knowledge management by small firms see Schuetze (2001).

⁵ " The Knowledge Management Practices Survey's results suggest that for Canada, firms begin to employ more knowledge management practices when they attain at least 100 workers." (Earl, 2002, p. 12).

Micro practitioners look to knowledge management to improve their competitive advantage

For micro practitioners improving their competitive advantage and improving worker retention represented the most important reasons for using their suites of knowledge management practices (Table 5). Since, two-thirds of micro firms indicated that they had policies or programs intended to improve worker retention in place, their concern over worker retention is consistent with the practices they used.⁶ Absorbing the effects of worker turnover could be more difficult for micro firms where the loss of as little as two workers could represent over one-tenth of their workers.

Small firms were also highly motivated to use knowledge management practices to improve their competitive advantage. However, other reasons ranked equally highly with these practitioners. Increasing efficiency by using knowledge to improve production processes, training workers to meet strategic objectives of the firm, identifying and /or protecting strategic knowledge present in the firm and protecting the firm from knowledge loss were all very important reasons to have adopted knowledge management practices for small firms. This suggests that small firms start to look to knowledge management practices as a means to improve the application of knowledge in the firms' operations.

Mid-sized practitioners also looked to their knowledge management practices to improve their competitive advantage and to increase efficiency with the next most critical or important reasons being training workers to meet strategic objectives and integrating knowledge within the firm.

For large practitioners, increasing efficiency by using knowledge to improve production processes led the list of reasons, but, more of the listed reasons were also highly rated. Large practitioners showed strong concern about preserving knowledge within the firm by rating highly integrating knowledge within the firm, protecting the firm from knowledge loss due to workers' departures, improving worker retention and identifying and/or protecting strategic knowledge present in the firm.

Recent adopters shared large firms' interest in increasing efficiency and to a lesser extent their concern over knowledge loss (Table 2). Improving competitive advantage and training workers to meet strategic objectives of the firms also ranked high with recent adopters. Recent adopters may be showing evidence of increased emphasis on the value of their knowledge assets to production processes. Early adopters failed to share the recent adopters' enthusiasm for increasing efficiency by using knowledge to improve production processes as a highly rated reason to use knowledge management.

⁶ The Knowledge Management Review Vol 4. Issue 6 addresses the question of knowledge retention from many angles, in particular see Seeley (2002) for a discussion of knowledge retention techniques in use by firms.

Results of using knowledge management practices

Knowledge management practitioners overall found their suites of practices were most effective for two human resources-oriented results (Table 3). The most effective result of using knowledge management was improving worker skills and knowledge. The second place result was increased worker efficiency and / or productivity, which balances nicely with the high rating for increasing efficiency as an important reason to introduce knowledge management practices. These results suggest that knowledge sharing, creation, generation and maintenance are perceived as important to workers' efficiency and / or productivity.

While micro firms found that knowledge management very effectively or effectively improved skills and knowledge of workers as well as improved worker efficiency, they also highly rated improved client or customer relations and increased adaptation of products or services to client requirements (Table 6). This suggests that micro firms and practitioners in general found knowledge management practices assisted them in creating client-oriented firms.

Small practitioners highly rated improved worker skills, but they were somewhat less enthusiastic about the other results. Of interest, for small firms improved vertical knowledge sharing (flows up the organisational hierarchy) tied with improved client or customer relations as the second most effective results of using knowledge management.

The most important results continued to be improved efficiency, worker skills and client relations for mid-sized practitioners followed closely by improved horizontal and vertical knowledge sharing as well as increased adaptation of products and services.

Most large practitioners rated horizontal sharing of knowledge as their most effective result of using knowledge management. Communications issues across departments, functions or business units are often cited as problem areas in large administrations. Improving communications therefore is a much sought after result for these firms and this is also shown in the high rating of vertical sharing of knowledge within firms. Improved worker efficiency and skills as well as adaptation of products or services to client requirements were also highly rated results for large practitioners.

While still viewed as a very effective or effective result by two-thirds of recent adopters, improved worker efficiency rated on par with increased horizontal and vertical knowledge sharing and increased adaptation of products or services to client requirements behind improved worker skills and knowledge (Table 3). Once again recent adopters showed a similarity in their results to large firms. Early adopters shared the enthusiasm for the effectiveness of knowledge management at improving worker efficiency as well as skills. Where recent and early adopters differed related to improved vertical knowledge sharing with early adopters not enjoying as fully this result.

Triggers to implementing more knowledge management practices

Losing key personnel ranked as the primary trigger to implement more knowledge management practices for practitioners of all firm sizes and period of adoption. This is not surprising given the fact that three-quarters of firms indicated that an important reason they had implemented knowledge management was to improve worker retention. For all practitioners losing market share placed second followed by difficulties in capturing workers' undocumented knowledge (know-how) as triggers for implementing more knowledge management practices. The importance given to these triggers may indicate that practitioners were prepared to put into place mechanisms to control knowledge loss and therefore to protect themselves. It also corresponds with the practitioners' concern about competitive advantage.

Micro practitioners' preoccupation with loss of key workers and market share showed through in their two main triggers to implement knowledge management. Small practitioners showed concern about potential knowledge loss through loss of personnel, difficulty in capturing know-how and information overload problems as their main enticements to use more knowledge management. For mid-sized practitioners use of knowledge management tools or practices by competitors crept into their top three rankings of incentives suggesting mid-size firms closely monitor and imitate other firms in their industry.

For the majority of large practitioners the hot incentive to use more knowledge management remained controlling loss of knowledge shown by their tying loss of key personnel and capturing know-how as the primary triggers⁷. These two triggers go hand in hand. If a firm has problems documenting its corporate memory then losing key personnel can be even more catastrophic as knowledge walks out the door. Large firms were positive about their efforts through knowledge management to improve their corporate memories.

Recent adopters strayed from aligning themselves with large practitioners by ranking information overload as their second most important incentive. Early adopters continuing their traditional market oriented concerns for management, placed loss of market share second. These findings suggest that keeping knowledge within the firm is an overwhelming incentive to use knowledge management practices for all practitioners.

⁷ Cross and Baird (2000) and Brown and Duguid (2000) argue that firms and organisations are concerned about knowledge loss whereas Bartlett and Ghoshal (2002), Zack (1999) and Quinn discuss the need of firms to leverage their knowledge resources.

Conclusions

The KMPS has allowed us to explore the reasons behind the use of various business practices that are intended to systematically capture and share knowledge by organisations. Firm size plays an important role in the practices adopted as micro firms had lower usage rates of certain formal or structured practices such as reimbursing tuition fees, documenting good work practices, updating databases, and providing training for employees off-site. These practices may not be seen as cost-effective or beneficial for smaller firms, and in the case of some practices such as facilitating virtual teams for project members in different work-sites, less relevant than they may have been to large firms. Large firms traditionally have more sophisticated operating structures and the knowledge management practices that they chose to employ reflect some of the challenges that confronted them, including developing their human resources and corporate memories and hence competence building.

Recent adopters although comprised predominantly of small and mid-sized firms, showed organisational behaviours that imitated those of large firms. These firms as well as large firms looked to their suites of knowledge management practices to improve the state and use of knowledge by the firm. For these reasons they also practised good stewardship of their knowledge by putting into place organisational structures - policies and strategies backed by an appropriate set of knowledge sharing values or culture.⁸ Recent adopters may be evincing the imitative behaviour noted in the adoption or diffusion of new technology (Fagerberg 2001, p. 316). Recent adopters may also be reacting to a shock or perceived shock within the market and therefore augmenting their management practices to withstand the change. They also may be firms undergoing expansion or in need to respond to clients' requirements.

It is evident from this survey that in firms of all sizes there is a sense of concern over knowledge loss, especially the loss of tacit knowledge that can so easily walk out of the door.

⁸ Foray and de la Mothe emphasised that "transfer and sharing of knowledge are not actions that happen on their own. There must first be rules, standards and incentives of different kinds - in short, culture and organisation." (p. 218)

Annex 1 – Tables

Table 1. Knowledge Management Practices in Use – Practitioners, Recent Adopters and Early Adopters - Canada	Practitioners %	Recent Adopters %	Early Adopters %
Policies and Strategies			
Written knowledge management policy or strategy	36 C	52 C	27 C
Values system or culture intended to promote knowledge sharing	59 C	79 B	48 C
Policies and programs intended to improve worker retention	66 B	69 C	64 C
Used partnerships or strategic alliances to acquire knowledge	68 B	68 B	69 C
Leadership			
Knowledge management practices were a responsibility of managers and executives	94 A	94 A	94 A
Knowledge management practices were a responsibility of non-management workers	34 B	41 C	30 C
Knowledge management practices were a responsibility of the knowledge officer or knowledge management unit	22 B	27 C	19 C
Knowledge management practices were explicit criteria for assessing worker performance	35 B	41 C	33 C
Incentives			
Knowledge sharing was rewarded with monetary incentives	32 B	65 B	15 B
Knowledge sharing was rewarded with non-monetary incentives	36 B	66 C	21 B
Knowledge Capture and Acquisition			
Firm captured and used knowledge obtained from other industry sources such as industrial associations, competitors, clients and suppliers	92 A	88 B	94 A
Firm captured and used knowledge obtained from public research institutions including universities and government laboratories	43 C	41 C	45 C
Firm dedicated resources to detecting and obtaining external knowledge and communicating it within the firm	43 C	45 C	42 C
Firm encouraged workers to participate in project teams with external experts	41 B	51 C	36 C
Training and Mentoring			
Firm provided formal training related to knowledge management practices	32 B	44 C	25 C
Firm provided informal training related to knowledge management	81 B	82 B	81 B
Firm used formal mentoring practices, including apprenticeships	28 B	49 C	17 B
Firm encouraged experienced workers to transfer their knowledge to new or less experienced workers	82 C	92 B	77 C
Firm encouraged workers to continue their education by reimbursing tuition fees for successfully completed work-related courses	63 C	53 C	68 C
Firm offered off-site training to workers in order to keep skills current	51 C	73 C	40 C
Communications			
Workers shared knowledge by regularly updating databases of good work practices, lessons learned or listings of experts	41 B	61 C	30 C
Workers shared knowledge by preparing written documentation such as lessons learned, training manuals, good work practices, articles for publications, etc. (organisational memory)	44 B	51 C	40 C
Workers shared knowledge in collaborative work by project teams that are physically separated (“virtual teams”)	17 B	20 B	15 B

Source: Statistics Canada, Survey of Knowledge Management Practices 2001. Note: See Annex 3 "Methodological Notes" for an explanation of the alphabetic quality indicators.

Table 2. Reasons for Using Knowledge Management Practices –Practitioners, Recent Adopters and Early Adopters –Canada Critical/Important	Practitioners %	Recent Adopters %	Early Adopters %
To improve competitive advantage of the firm or organisation	93 A	89 B	94 A
To help integrate knowledge within the firm or organisation	72 C	72 C	73 C
To improve the capture and use of knowledge from sources outside the firm or organisation	51 B	64 C	45 C
To improve sharing or transferring of knowledge with partners in strategic alliances, joint ventures or consortia	57 C	63 C	55 C
To increase efficiency by using knowledge to improve production processes	69 C	90 B	58 C
To protect the firm or organisation from loss of knowledge due to workers' departures	53 C	68 C	45 C
To train workers to meet strategic objectives of the firm or organisation	81 C	89 B	76 C
To increase worker acceptance of innovations	71 C	79 C	66 C
To improve worker retention	74 B	78 C	72 C
To identify and/or to protect strategic knowledge present in the firm or organisation	65 C	66 C	64 C
To ease collaborative work of projects or teams that are physically separated (different work sites)	27 B	32 C	25 C
To promote sharing or transferring knowledge with clients or customers	61 C	47 C	68 C

Source: Statistics Canada, Survey of Knowledge Management Practices 2001

Table 3. Results of Using Knowledge Management Practices – Practitioners, Recent Adopters and Early Adopters - Canada Very Effective/Effective	Practitioners %	Recent Adopters %	Early Adopters %
Increased knowledge sharing horizontally (across departments, functions or business units)	65 C	68 C	63 C
Increased knowledge sharing vertically (up the organisational hierarchy)	52 C	70 C	42 C
Improved worker efficiency and/or productivity	80 B	66 C	87 B
Improved skills and knowledge of workers	88 A	88 B	89 A
Increased the number of markets (more geographic locations)	33 C	19 B	39 C
Improved client or customer relations	76 B	71 C	79 B
Helped add new products or services	64 B	47 C	72 B
Increased adaptation of products or services to client requirements	78 B	67 C	84 B
Increased flexibility in production and innovation	44 B	52 C	40 C
Prevented duplicate research and development	34 C	27 B	37 C
Improved corporate or organisational memory	51 C	47 C	52 C
Increased ability to capture knowledge from public research institutions including universities and government laboratories	22 B	26 C	20 B
Increased ability to capture knowledge from other business enterprises, industrial associations, technical literature, etc.	49 C	51 C	48 C
Improved involvement of workers in the workplace activities	63 C	65 C	61 C

Source: Statistics Canada, Survey of Knowledge Management Practices 2001

Table 4 . Knowledge Management Practices in Use by Firm Size	Micro 1-19 workers	Small 20-49 workers	Mid 50-249 workers	Large 250+ workers
Policies and Strategies				
Written knowledge management policy or strategy	29 C	42 C	38 C	50 A
Values system or culture intended to promote knowledge sharing	44 C	73 B	70 B	85 A
Policies or programs intended to improve worker retention	66 C	61 C	70 B	78 A
Used partnerships or strategic alliances to acquire knowledge	79 C	56 C	62 B	58 A
Leadership				
Knowledge management practices were a responsibility of managers and executives	95 A	94 A	94 A	85 A
Knowledge management practices were a responsibility of non-management workers	29 C	27 C	58 B	51 A
Knowledge management practices were a responsibility of the knowledge officer or knowledge management unit	15 B	29 C	25 B	31 A
Knowledge management practices were explicit criteria for assessing worker performance	18 C	52 C	54 C	57 A
Incentives				
Knowledge sharing was rewarded with monetary incentives	17 C	48 C	45 C	48 A
Knowledge sharing was rewarded with non-monetary incentives	21 C	56 C	47 C	41 A
Capture and Acquisition				
Firm captured and used knowledge obtained from other industry sources such as industrial associations, competitors, clients and suppliers	95 A	91 B	87 A	86 A
Firm captured and used knowledge obtained from public research institutions including universities and government laboratories	D	30 C	55 C	49 A
Firm dedicated resources to detecting and obtaining external knowledge and communicating it within the firm	30 C	54 C	56 C	67 A
Firm encouraged workers to participate in project teams with external experts	39 C	35 C	55 C	69 A
Training and Mentoring				
Firm provided formal training related to knowledge management practices	24 C	30 C	54 C	53 A
Firm provided informal training related to knowledge management	88 B	71 C	79 B	76 A
Firm used formal mentoring practices, including apprenticeships	19 C	27 C	52 C	58 A
Firm encouraged experienced workers to transfer their knowledge to new or less experienced workers	D	93 B	92 A	93 A
Firm encouraged workers to continue their education by reimbursing tuition fees for successfully completed work-related courses	D	67 C	81 B	96 A
Firm offered off-site training to workers in order to keep skills current	35 C	57 C	81 B	93 A
Communications				
Workers shared knowledge by regularly updating databases of good work practices, lessons learned or listings of experts	24 C	57 C	60 B	60 A
Workers shared knowledge by preparing written documentation such as lessons learned, training manuals, good work practices, articles for publication, etc. (organisational memory)	22 C	61 C	70 B	77 A
Workers shared knowledge in collaborative work by project teams that are physically separated (“virtual teams”)	12 B	8 B	43 C	53 A

Source: Statistics Canada, Survey of Knowledge Management Practices 2001

Table 5 . Reasons for using Knowledge Management Practices by Firm Size Critical/Important	Micro 1-19 workers	Small 20-49 workers	Mid 50-249 workers	Large 250+ workers
To improve competitive advantage of the firm or organisation	92 B	95 A	90 B	89 A
To help integrate knowledge within the firm or organisation	D	74 C	81 B	89 A
To improve the capture and use of knowledge from sources outside the firm or organisation	36 C	66 C	70 B	68 A
To improve sharing or transferring of knowledge with partners in strategic alliances, joint ventures or consortia	D	70 C	41 B	52 A
To increase efficiency by using knowledge to improve production processes	44 C	96 A	91 A	98 A
To protect the firm or organisation from loss of knowledge due to workers' departures	26 C	85 B	67 C	86 A
To train workers to meet strategic objectives of the firm or organisation	D	93 A	82 B	89 A
To increase worker acceptance of innovations	D	84 B	74 B	73 A
To improve worker retention	70 C	79 C	76 B	83 A
To identify and/or to protect strategic knowledge present in the firm or organisation	D	88 B	58 C	83 A
To ease collaborative work of projects or teams that are physically separated (different work sites)	16 B	30 C	52 C	54 A
To promote sharing or transferring knowledge with clients or customers	D	57 C	53 C	57 A

Source: Statistics Canada, Survey of Knowledge Management Practices 2001

Table 6. Results of using Knowledge Management Practices by Firm Size Very Effective/Effective	Micro 1-19 workers	Small 20-49 workers	Mid 50-249 workers	Large 250+ workers
Increased knowledge sharing horizontally (across departments, functions or business units)	D	67 C	66 B	80 A
Increased knowledge sharing vertically (up the organisational hierarchy)	35 C	72 C	62 B	74 A
Improved worker efficiency and/or productivity	88 B	70 C	71 B	74 A
Improved skills and knowledge of workers	92 B	90 A	73 B	78 A
Increased the number of markets (more geographic locations)	D	18 B	22 B	35 A
Improved client or customer relations	83 C	72 C	65 B	68 A
Helped add new products or services	77 C	47 C	52 C	64 A
Increased adaptation of products or services to client requirements	88 B	68 C	64 B	74 A
Increased flexibility in production and innovation	34 C	49 C	59 B	67 A
Prevented duplicate research and development	D	27 C	40 C	61 A
Improved corporate or organisational memory	D	63 C	46 C	67 A
Increased ability to capture knowledge from public research institutions including universities and government laboratories	21 C	24 C	20 B	32 A
Increased ability to capture knowledge from other business enterprises, industrial associations, technical literature, etc.	D	55 C	52 C	39 A
Improved involvement of workers in the workplace activities	D	68 C	59 B	63 A

Source: Statistics Canada, Survey of Knowledge Management Practices 2001

Annex 2 - Definitions

Early Adopters: Knowledge management users or practitioners that did not begin using any of the eighteen practices used to define recent adopters.

Knowledge management: Knowledge management involves any systematic activity related to the capture and sharing of knowledge by the organisation.

Knowledge Management Practitioners: Firms that indicated they are using at least one of the knowledge management practices listed in Table 1.

Recently Adopted: Indicates the proportion of the practice in use that was adopted since 1999.

Recent Adopters: Knowledge management practitioners that began to use at least one of eighteen knowledge management practices after 1999. The five practices excluded were: 1. Knowledge management practices are a responsibility of managers and executives; 2. Knowledge management practices are a responsibility of non-management workers; 3. Firm specifically rewards knowledge sharing with monetary incentives; 4. Firm specifically rewards knowledge sharing with non-monetary incentives and 5. Firm provides informal training related to knowledge management. In total, not including these five practices as candidates for recent adopter firms negatively affected an estimated 85 firms.

Workers: The term “workers” includes regular workers (employees) as well as managers, executives, partners, directors, and persons employed under contract.

Annex 3 - Methodological notes

Questionnaire development

Statistics Canada conducted the pilot survey on Knowledge Management Practices between September and December 2001 as part of an international initiative headed by the Organisation for Economic Co-operation and Development.

Survey content

The survey is based on in-use / planned-use identification of a series of knowledge management practices. Respondents that indicated that any practice listed in the first question was “In Use” (In Use Before 1999 or Used Since 1999) continued to the next section. Respondents not using any of the practices skipped to question 10 – “Incentives to Use”.

Questions 3-9 captured the reasons, results, effectiveness and responsibility for using knowledge management practices.

All respondents answered questions 10-14. Question 10 related to incentives to use knowledge management practices. Question 11 provided employment structure information for the firm. Questions 12-14 were administrative questions.

Data reliability

Code	Rating	Standard Error
A	Very good	$\leq 2.5\%$
B	Good	$> 2.5\%$ and $\leq 7.5\%$
C	Good to poor – use with caution	$> 7.5\%$ and $\leq 15.0\%$
D	Very poor – may not be acceptable	$> 15.0\%$

Collection methodology and survey frame

In order to reduce response burden, the KMPS used samples from the Annual Survey of Manufacturers (ASM) and the Unified Enterprise Survey (UES).

Enterprise coverage is limited to these sub-sectors:

Forestry and Logging (113) (ASM - 1999)

Chemical Manufacturing (325) (ASM - 1999)

Transportation Equipment Manufacturing (336) (ASM - 1999)

Machinery, Equipment and Supplies Wholesaler-Distributors (417) (UES - 1999)

Management, Scientific and Technical Consulting Services (5416) (UES - 1999)

Sampling

A two-stage survey was developed. For the first stage, refer to the documentation in the ASM and UES to understand the sample stratification, allocation and selection process. The statistical unit of these surveys is the establishment.

At the second stage, the statistical units were responding enterprises from the ASM and UES with at least 10 employees and revenue of \$250,000 or more. The establishments in these two surveys were grouped at the enterprise level. The activity sectors (5) and the size of the enterprises (10-49, 50-199, 200 and more employees) were used for stratification purposes. 510 enterprises were distributed in such a way that the Coefficients of Variation (CVs) are similar for all strata. Simple random sampling was carried out for each stratum.

Verification and imputation

All questionnaires confirmed as completed passed through a verification and imputation system. As one of the objectives was to evaluate the questionnaire, minimal imputation took place. Verification was limited to ensuring that the responding values were valid and that the question skips were respected. In cases identified as incorrect, the following occurred:

- imputation of a value from a donor for questions identified as mandatory,
- imputation of a non-response code for questions identified as non-mandatory.

Donors were selected randomly according to certain characteristics (hot deck) and independently for each of the questions. Groups of donors were assembled based on their characteristics:

- Group I: same province, same activity sector and same category - number of workers (question 11),
- Group II: same activity sector and same category - number of workers (question 11),
- Group III: same activity sector and category grouping - number of workers (question 11).

For each imputed value, the first attempt was made to find a donor in the Group I's, then Group II's and finally Group III.

Response rate

The distribution of the response for the 510 enterprises was:

- 407 enterprises suitable to receive a questionnaire,
- 48 non-respondent enterprises (refusal, no contact, ...),
- 51 out-of-scope enterprises
- 4 inactive enterprises.

Of the 407 questionnaires mailed, the distribution of the response is:

- 348 enterprises with complete questionnaires,
- 58 enterprises with incomplete questionnaires or non-respondents,
- 1 out-of-scope enterprise.

The response rate for the survey is 76.5% (348/455).

Estimation

The statistical units of the first stage are enterprises whereas the second stage they are establishments. To produce estimates at the enterprise level, the weight share method was used. All the estimates were produced using Statistics Canada's Generalized Estimation System (GES). For the formulas used in variance calculations, please refer to the GES documentation.

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