# Knowledge Management & Transfer for the Electricity Industry in Canada

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## About the Electricity Sector Council

Approximately 100,000 Canadians are involved in the generation, transmission and distribution of one of our country's essential utilities: electricity. Their work powers homes and businesses across the country, fuelling everything from light bulbs, cell phones and refrigerators to water treatment plants and road vehicle assembly lines.

The Electricity Sector Council provides support to this dedicated workforce by collaborating with industry employers and other stakeholders to research and resolve human resource and workplace development issues.

This report is also available in French and can be obtained electronically at www.brightfutures.ca.

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# EXECUTIVE SUMMARY

> When organizations consume material assets, they often depreciate in value.  On the other hand, when organizations use knowledge resources, these assets tend to increase in value given that both the giver and receiver are enriched as a result of the transaction.
>
> *Working Knowledge, Davenport & Prusak, 2000*

## THE BUSINESS CASE FOR INVESTING IN KNOWLEDGE MANAGEMENT/KNOWLEDGE TRANSFER

In today's knowledge-based economy *knowledge* is viewed as an organization's best sustainable source for a competitive advantage.  In the electricity sector, knowledge has tended to accumulate within an organization primarily because the workforce has been stable with employees making their career in one organization, if not the sector.  A growing concern is the estimated 28.8% of the electricity sector's workforce that is projected to retire in the next half decade.  The Electricity Sector Council's (ESC) 2008 Labour Market Information (LMI) Study predicted there will be an insufficient supply of workers to fill the demand of the sector to meet the growing consumer demand for electricity. This gap exists at all levels of the industry, from engineers through technicians and trades people.  This means that the sector will have to double its hiring of recent post-secondary graduates at a time when the demand for such workers is increasing in many other sectors as well[1].

Today, the demographics and changing dynamics of the Canadian labour force poses a number of risks to the evolution of the electricity sector including:

⇒ **The Loss of Knowledge Unique to Organizations**: Legacy systems, innovations in transmission and distribution, trouble shooting, etc. – the loss of which could have significant implications for business competitiveness, productivity, and the overall health and safety in the harnessing and distribution of electricity.

⇒ **Ramping up New Employees:**  The demographics dictate that new employees will need to be ramped up much faster than in the past in order to replace retiring employees (most likely career employees) who have accumulated years of experience and knowledge.[2]

⇒ **New Skill Requirements:** The need to develop new skills in order to deal with emerging technologies such as those related to smart grids and new electricity sub-sectors such as wind and solar.

⇒ **Facing the Workforce of the Future:** A new generation of workers who no longer plan to have a career in one industry, let alone the same sector. They are more highly mobile and change jobs frequently, taking their technological savvy and any knowledge they have gained with them.

The productivity level of the workforce is the electricity sector's key competitive driver.  Losing many experienced, specialized, technical people and hiring new, knowledgeable but inexperienced, workers may have a detrimental impact on productivity, regulatory compliance and safety levels.

Companies within the sector will need to focus and invest in knowledge management (KM) and knowledge transfer (KT) in order to effectively harness their knowledge and business intelligence and transfer this knowledge to current and new employees.

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[1] Electricity Sector Council  *Powering Up the Future: 2008 Labour Market Information Study – Full Report.*
http://www.brightfutures.ca/lmi/etc/en/docs/LMI%20REPORT%20ENGLISH%20FINAL%20LONG%20Nov%2024.pdf
[2] Greenes, K. & Piktialis, D. (2008a) Bridging the Gaps: How to Transfer Knowledge in Today's Multigenerational Workplace

# THE VALUE PROPOSITION FROM INVESTING IN KM/KT

> Knowledge is the only critical asset in an organization that walks out your door every day. What are you doing to make sure it is retained and leveraged within your organization?
>
> *Jennifer Smith*
> *President, Intergage Consulting Group Inc.*

In the context of the new economy, future leaders are likely to face not simply a labour shortage, but a knowledge shortage, as organizations bleed technical, scientific, and managerial know-how at unprecedented rates.[3] One cannot underestimate the value of investing in KM/KT. Often KM/KT is focused on transferring knowledge from employees who are leaving and/or ensuring current employees are adequately prepared to assume new positions within an organization and/or know where to get the required information/direction they need to perform their job. KM/KT also supports organizations in tapping into and more effectively using existing information and data and creating new knowledge through standardized searchable databases, increased sharing, and collaboration. What is clear is that the benefits from investing in KM/KT are often cumulative including:

⇒ The greater the formal and informal networking, the greater information and knowledge acquisition.
⇒ The greater the knowledge acquisition, the greater the organizational innovation and efficiency.
⇒ The greater the amount of innovation, the greater the market and financial performance.

Without effective and well-proven KM/KT strategies and processes in place, corporate memory is at risk of being lost which has grave business and sector-wide implications.

## ELECTRICITY SECTOR-BASED KM/KT TOOLKIT

The ESC recognizes the need for organizations within the sector to more effectively harness and use its critical knowledge to improve operating efficiencies, identify future business opportunities and improve overall decision-making.

The ESC, supported by a sector-based Steering Committee, has developed the KM/KT Toolkit to provide support to organizations wishing to introduce and/or advance their approach to KM/KT. Approaches to KM/KT are as varied as each organization that employs them and the problems that they face. Therefore, it is important that organizations have access to a number of tools and approaches as well as the experience of others, which can be adapted to their unique organizational culture, workforce risks and business strategy.

## RECOMMENDATIONS TO EMPLOYERS, UNION ORGANIZATIONS AND INTERESTED STAKEHOLDERS

The KM/KT Toolkit highlights the research findings and best practices used within the electricity sector and provides organizations with tools and resources for implementing KM and KT practices and programs. Based on its review of KM/KT and the current practices and needs within the electricity industry, the KM Steering Committee recommends the following:

⇒ Make knowledge management a business priority - set goals, plans and targets.
  ▪ Use KM to drive a learning culture, encouraging knowledge sharing and support decision-making.

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[3] Delong, D (2004) Lost Knowledge: Confronting the Threat of an Aging Workforce

- Embed KM and KT in your corporate strategies and business processes (e.g., corporate risk assessments and asset management strategies).

⇒ Identify critical knowledge and create plans and structures to transfer this information - create a detailed road map.
- Engage senior leaders by creating an awareness and understanding of the organization's key knowledge risk and challenges.
- Identify a champion for the KM/KT project/initiative and link project/initiative to business objectives.

⇒ Undertake regular KM and workforce assessments.
- Integrate KM/KT into human resources management plans and processes (e.g. recruitment, training and development, performance programs and succession planning).
- Review all HR policies and programs to ensure they support effective KM/KT.

⇒ Generate KM/KT quick wins by piloting programs and working with program champions - review pilot programs and realign structures and systems.

⇒ Develop benchmarks and measurement tools to show the value of KM/KT practices and programs to the organization - measure program progress and communicate.

⇒ Empower, inform and enable management, employees and unions to work together to manage knowledge and collaborate for the benefit of the organization and industry.
- Encourage individuals to get involved in professional KM/KT networks both in Canada and internationally to leverage best practices.

⇒ Industry, labour and education should come together to identify the knowledge and skills needed within the industry and work together to create and support accelerated learning options for both current and new employees.

## NEXT STEPS

To ensure the success of the KM/KT Toolkit, it is important to obtain feedback from stakeholders within the industry to determine if the tools are both practical and appropriate. Further, the area of KM and KT is continuing to evolve and this valuable toolkit needs to be maintained and updated.

The KM/KT Toolkit is intended to be an interactive portal whereby companies can both access and contribute information, tools and resources. The goal is to create a KM/KT network with stakeholders throughout the sector and leverage best practices. In order to promote and sustain the use of the KM/KT Toolkit and portal, the following next steps are recommended:

⇒ **Engage the Sector**
- Develop a KM/KT community of interest and promote collaboration in the sector.
- Through the portal, encourage the development of Wikis, blogs, 'ask-an–expert', discussion groups, provide resources and best practices, etc.
- Coordinate face-to-face events, webinars, or workshops at sector-based conferences to build and sustain a community of interest.
- Promote ways to encourage collaboration in the sector between employers, government, academics (to inform educational programs), and other key stakeholders such as unions and think tanks.

⇒ **Maintain a Portal to Support the KM/KT Toolkit**
- The ESC will maintain the KM/KT portal, developed as part of this project, on its website. The portal is intended to be accessed by electricity sector firms and interested stakeholders for KM/KT information, tools and resources.

- Use the portal as a 'hub' where new resources and tools can be submitted, reviewed, and posted on the website.
- ESC and its sector stakeholders will be responsible for attaining appropriate funding and resources to maintain the KM/KT portal over time.

⇒ **Evaluate Results**
- Develop an annual evaluation plan to monitor the use and obtain feedback from stakeholders on the benefits and practicality of the toolkit, and the network that is developed.
- Evaluation plans could include: 1) web survey of users as they exit the portal, 2) web tracking of those who have visited the toolkit and downloaded tools and resources and 3) a survey or discussion board for users to provide feedback on the tools.

# 1. INTRODUCTION

## 1.1 BACKGROUND

The electricity sector is integral to the economic and social stability of Canada. While reliance on the more traditional hydroelectric power remains high (accounting for over 60% of Canada's electricity supply), experts predict the use of solar, geothermal and tidal power, as well as wind and other renewable sources of electricity, will increase dramatically over the next 10 years.[4]

The electricity sector has primarily relied on the same technology for the last 100 years, with the exception of more recently discovered ways of harnessing electricity such as nuclear, solar, etc. This has led to the requirement to have employees skilled in both legacy systems and technology as well as new innovations and technologies to support both traditional and growing renewable sub-sectors of power generation including wind and solar. At the same time, the focus in Canada is turning toward revitalizing the sector's aging infrastructure including power generation and transmission networks and systems.

Emerging new technologies and aging of current technology and infrastructure are not the sector's only concern. Recent studies conducted by the Electricity Sector Council (ESC), augmented by several other labour market studies[5], anticipate profound changes to the sector's workforce over the next decade. The sector is experiencing substantial structural change in human resources (HR) and technology advances. An estimated 28.8%[6] of the sector workforce is projected to retire in the next half decade. The majority of positions in the sector require some form of post-secondary education. The competencies and skills required in the sector are constantly being upgraded by new technology and management systems that are being introduced. Hiring for the future is not necessarily the same as hiring for today.

This has implications for both maintaining and sustaining a skilled workforce. For power producers, including both private and public, this means new skill sets and knowledge bases at all levels of the business to support research and innovation, changing operations (i.e. service delivery and distribution), and improvements to business processes, services, and products. Technology (automation and computerized systems) and the changing business environment are driving the need for new skill requirements. However, within the energy sector, the "new" doesn't necessarily drive out the old. There will continue to be the need for staff that are experienced and knowledgeable with operating legacy systems. Hence, existing staff need development so that they are ready to fill vacancies in senior and critical specialist/technical positions that require significant experience in the field but also an ability to adapt to new business realities and requirements. New workers require orientation and training to bring them to a competent level of performance. Sector representatives generally note that new graduates require four years on-the-job experience to reach full competency.

Given the changing labour market realities including innovation and changing demographics, if actions are not taken today, then the sector will not be able to maintain its current competitive position. Meeting these unique needs will be a challenge, and despite these changes impacting the sector, the ESC estimated that one-third of the industry does not have workforce planning and knowledge transfer tools and processes in place[7]. Without such tools, strategies and processes in place, corporate memory will be lost which has grave implications for competitive positioning, safety, productivity and business continuity, not to mention the need for understanding company-specific intellectual knowledge and know-how.

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[4] Electricity Sector Council http://www.brightfutures.ca/resource-centre/trends.html.
[5] Conference Board of Canada; Ontario Chamber of Commerce to name two.
[6] Electricity Sector Council *Powering Up the Future: 2008 Labour Market Information Study – Full Report*
[7] Electricity Sector Council *Powering Up the Future: 2008 Labour Market Information Study – Full Report*

The ESC recognizes the need for organizations within the sector to more effectively harness and use its critical knowledge to improve operating efficiencies, identify future business opportunities and improve overall decision-making. The ESC, supported by a Sector-based Steering Committee, has developed this KM/KT Toolkit to provide support to organizations wishing to introduce and/or advance their approach to KM/KT. It is important that organizations in the electricity sector have access to tools and approaches and the experience of others that can be adapted to their unique organizational culture, workforce risks and business strategy. What follows is an overview of what KM and KT is in relation to this study; the business case for investing in KM/KT and critical support factors to sustain KM/KT. Throughout the report, innovative approaches are presented to demonstrate how some organizations within the sector have been approaching KM/KT.

**KM/KT Sector Example:**
**Using IT to Codify a Traditionally Paper-Based Approach**
Mobile work crews at NB Power once had to complete their work orders by hand and input them into the system upon returning to the office. NB Power has invested in a workforce management system in Customer Service, Distribution and Transmission. The new online work order process is supported by 'tough books' that permit mobile work crews to access and input this information in the field. This wireless, online solution has reduced the paper burden, allowing for increased efficiency and productivity. This new system also allows for more effective tracking of the work orders and workload distribution.

# 2.   DEFINING KNOWLEDGE MANAGEMENT AND KNOWLEDGE TRANSFER

### Section Highlights

⇒ KM is the creation, capture, organization, sharing and leveraging of valuable explicit information/knowledge in an organization.

⇒ KT is the ability to formally transfer tacit and explicit specialized knowledge/best practices held by individuals and/or within units within an organization.

⇒ KM tends to be more focused on the storage and retrieval of formal/ explicit knowledge and information while KT tends to be more focused on the transfer of "tacit" knowledge.

⇒ KM and KT are inter-related.  KM is more about the collection and storage of information and KT is about moving towards "making connections" among those who retain the knowledge and those who need it.

⇒ KM and KT can then be viewed on a continuum in which knowledge is developed, captured, stored and transferred to the appropriate person in an organization - with the continuum ranging from explicit to tacit knowledge.

## 2.1 DEFINING KM

**Knowledge Management** is the creation, capture, organization, sharing and leveraging of valuable explicit information/knowledge in an organization (***Note***: it is recognized that KM can also capture tacit knowledge (turning it into explicit knowledge) but it is primarily used for explicit information; tacit knowledge will be addressed under Knowledge Transfer below).

*Explicit Knowledge* is articulated knowledge, expressed and recorded as words, numbers, codes, mathematical and scientific formulae, and musical notations.  Explicit knowledge is easy to communicate, store, and distribute and is the knowledge found in books, on the web, and other visual and oral means.

The gathering and capture of explicit information/knowledge involves the use of information systems to codify, capture and retrieve information (i.e. information that is recorded on paper or electronic media).

For the purpose of this study, the emphasis will be on helping employers understand the importance of KM to ensure that it is accessible to both existing and new employees.  This could be in the context of regulatory requirements, clients/ stakeholders, legacy systems, data repositories (e.g. corporate policies), etc.

> "Knowledge Management is really about recognizing that regardless of what business you are in, you are competing based on the knowledge of your employees."
>
> *Cindy Johnson*
> *Director, Collaboration and Knowledge Sharing*
> *Texas Instruments*

> "Knowledge that is accumulated from the outside is shared widely within the organization, stored as part of the company's knowledge base, and utilized by those engaged in developing new technologies and products. The process of shifting knowledge from the outside to the inside, or inside to the outside, is called knowledge conversion"
>
> *Nonaka & Takeuchi (1995)*

The key KM activities are capturing, organizing, providing access, maintaining KM repositories and resources, and the use and development of technology. Capturing explicit and tacit knowledge is a KM activity that enables the recording and representation of tacit knowledge in explicit form. A related KM activity is organizing the knowledge which requires classifying and categorizing knowledge for navigation, storage and retrieval purposes (Russel, 2001). A more detailed overview of KM activities can be found in *Appendix A*.

**Corporate Snapshot: From KM to KT**

"Creating a database to centralize information is not difficult and it is very important".

*Tom Goldie*
*Senior Vice President, Corporate Services*
*Hydro One*

In Hydro One's experience, the creation of the database for storing information is easy to implement as staff within the sector are highly technical and familiar with these procedures. What is required is that employees learn to document what's in their head through: formal *planning* (what they are trying to do); *implementation* (documenting what they did through effective planning) and *lessons learned* (monitoring and after-action reviews).
**Challenge:** Using the current systems better while leveraging the opportunities found within new social medias.

## 2.2 DEFINING KT

**Knowledge Transfer** is the ability to formally transfer tacit and explicit specialized knowledge/best practices held by individuals and/or business units within an organization. The sharing of the tacit knowledge by the users may generate the information to update the explicit knowledge of the organization, but it may also remain tacit. What is important is that it is known where the knowledge resides so it can be transferred when necessary. In order for this transferred information to have utility, it must be important to the success of the organization.[8]

*Tacit Knowledge* is unwritten, unspoken, and a hidden vast storehouse of knowledge held by practically every normal human being, based on his or her emotions, experiences, insights, intuition, observations and internalized information. Tacit knowledge is integral to the entirety of a person's consciousness, is acquired largely through association with other people, and requires joint or shared activities to be imparted from one to another. The list of KT activities is extensive and can range from formal education and development (including apprenticeship), mentoring, job shadowing, succession planning, communities of practice, knowledge networks, storytelling, the use of new social media including blogs, wikis, Facebook, etc.

There is a spectrum of knowledge transfer approaches and applications that can be introduced depending on the type of knowledge that needs to be transferred. Below is an overview of Hydro-Québec's approach to KM/KT which demonstrates the flow of knowledge within their organization and the model used for transferring both explicit and tacit knowledge.

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[8] Davenport, T. H. & Prusak, L. (2000). Working Knowledge: How organizations manage what they know. Boston: Harvard Business School Press.

**Overview of Process and Methods used to Transfer Knowledge at Hydro-Québec**



Knowledge Transfer, within the context of this study, is closely linked to strategic Human Resource Management (HRM) and involves tapping into the knowledge of employees - often before the decision is made to leave the organization. HRM has a critical role in contributing to sustained competitive advantages by facilitating the development, organizational learning and innovation, and helping to ensure the generation, capture and transfer of organizational knowledge.

## 2.3 THE RELATIONSHIP BETWEEN KM AND KT

KM and KT are inextricably linked and related, but knowledge transfer is often more complex because it attempts to codify and transfer knowledge and expertise that are held within peoples' heads as opposed to information that is documented. As a result, KT may require different approaches but often it is linked and builds on approaches designed to help manage knowledge within an organization. It is moving from "collection" of information to "making connections" among those who retain the knowledge and those who need it. It a conscious strategy to get "the right knowledge to the right people at the right time" and helping people share and put information into action in ways that strive to improve organizational performance.

# 3. THE KM/KT BUSINESS DRIVERS

### Section Highlights

⇒ Knowledge is an organization's best sustainable source of competitive advantage.
⇒ The threat to most employers is a knowledge shortage – not simply a labour shortage.
⇒ The Sector faces a number of recruitment challenges based on the complexity of the sector, new emerging technologies, the need for specialized knowledge, particularly in relation to legacy systems and an aging workforce.
⇒ The challenge is to know where knowledge, that is critical to supporting your business's competitive advantage, resides and how to harness it before that knowledge walks out the door.

In today's knowledge-based global economy, businesses and industries depend on progressively higher levels of education, and for many workers, the speed of change has necessitated continuous learning.[9]  Increasingly, Canada has recognized the importance of human capital formation and utilization as a critical part of its competitive advantage. The acquisition and application of skills and knowledge (including higher level educational attainment) have become a basis for increased productivity, economic growth, and are associated with better labour market outcomes, such as higher earnings, higher labour force participation rates and lower unemployment rates.  Numerous authors have pointed to knowledge as an organization's best sustainable source of competitive advantage and recent academic and popular media attention on organizational knowledge creation, capture, and transfer attest to a widespread acceptance of this idea.[10]

## 3.1 KEY KM/KT BUSINESS DRIVERS WITHIN THE ELECTRICITY SECTOR

Traditionally, employees in the electricity sector tended to be long term, joining the company upon graduation from university/college or completion of apprenticeship training.  Workers learned on-the-job as they were gradually promoted to more experienced and specialized posts.  Because of the technical and regulated nature of the majority of occupations in the sector, the industry maintains that even with the right training and qualifications, it takes four years after graduation for a new hire to be fully proficient in their position.  During the downsizing and consolidation years (late 80s and early 90's), few companies recruited new employees. This has led to a critical situation whereby remaining employees are leaving (retiring) and there are no employees ready to take their place. The situation is even more serious since the industry is growing, particularly in the newer electricity sub-sectors, and employers not only need to replace retiring workers, but require additional workers with new skills and competencies.

At the same time, experience within the sector is that colleges and other trade education programs are not readily available and will not provide enough graduates to fill the gap in the labour force market.  Because technology is evolving at a fast pace, especially in the electricity sector, there is also concern that educational programs are not adapting to the technological changes in the sector and responding to the industry's needs by producing graduates with the appropriate level of technical skills and knowledge[11].

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[9] Kevin Milligan, Assistant Professor of Economics at the University of British Columbia and a Research Fellow with the C.D. Howe Institute
[10] Davenport, T. H., DeLong, D. W., & Beers, M. C.  (1998). Successful knowledge management projects.  *Sloan Management Review, 39*(2):  43-57.; Costa, Dan.  (1999, July).  Knowledge is power.  Computer Shopper, 252-254.; and Marchand, D. & Davenport, T. H.  (2000).  Is KM just good information management.  In D. Marchand & T. H. Davenport (Eds.), Mastering Information Management.  New York:  Financial Times-Prentice Hall.
[11]  Electricity Sector Council Succession Planning Best Practices and Tools for the Canadian Electricity and Renewable Sector: Final Report. pg. 24, 2008.

## COMPLEXITY OF THE SECTOR

The electricity sector covers a wide range of sub-sectors, including hydroelectric, solar, wind and nuclear power; at a broader level the energy sector includes oil, natural gas and fossil fuels, in addition to other renewable sustainable energy resources. The sector is highly regulated, which means it is a complex working environment operating under strict training, certification, health and safety requirements.  High health and safety rates are integral to achieving high productivity, which in turn is required to maintain an advantage in a highly competitive global sector.  Losing a significant number of long serving employees, coupled with few recent hires, means that the regulatory environment is potentially being compromised, particularly health and safety.  It is becoming increasingly critical that organizations within the sector be able to hire graduates now and to somehow fast-track their long learning curve and transfer critical knowledge and expertise so they are ready to replace those who are expected to leave the sector in the coming years.[12]

## EMERGING TECHNOLOGIES

The electricity sector has primarily relied on the same technology for the last 100 years, with the exception of more recently discovered ways of harnessing electricity such as nuclear, solar, etc.  This has also changed with the introduction of smart grids and new electricity industries such as wind and solar.  These technology changes are driving new skill requirements.  However, the ongoing reliance on legacy systems, particularly for specialized programs and those that have been custom built in-house, has meant that organizations have to develop this knowledge internally as the legacy technologies are often quite unique and often not part of post-secondary education programs.  It is clear that the sector is evolving using a mix of old, new and updated infrastructure and equipment and traditional and non-traditional sources of electricity.  For power producers including both private and public, this means new skill sets and knowledge bases at all levels of the business to support changing operations and business requirements.

## THE NEED FOR SPECIALIZED KNOWLEDGE

It is widely known that the majority of positions in the sector require some form of post-secondary education and that these workers will need to become lifelong learners.  The competencies and skills required are constantly being upgraded by new technology, regulations and management systems that become available.  Results from the ESC 2008 Labour Market Information (LMI) Study indicate that employers are increasingly in need of employees who have a broader base of knowledge in computing/ technology and are able and willing to commit to lifelong learning.  Employers also want graduates with 'essential skills', such as communication and people skills, and math skills. More than ever tradespeople will be required to have the skills and training in new and advanced technologies. These changes are happening swiftly and Power Line and Cable Workers, Power System Operators, and other trades people are increasingly required to have a changed skill set which better reflects the demands of the electricity sector today.

## CHANGING DEMOGRAPHICS –   THE AGING WORKFORCE AND KNOWLEDGE TRANSFER

Recent studies conducted by the ESC, augmented by several other labour market studies[13], anticipate profound changes to the sector's workforce over the next few years.  The portion of the population aged 55 and older increased from just over 15% in 1971 to approximately 20% by the end of 1991 and it has risen to approximately 25% today, with a further projected increase to 30% by 2016.[14]

This change in demographics, coupled with slowing growth in the population due to declining fertility rates, have resulted in a declining growth rate in the working age population,[15] which, in turn, is predicted by some

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[12] Refer to the US coal industry study in Part B to this Toolkit - Best Practices for information about how one sub sector is currently dealing with the challenge of accelerated learning.
[13] Conference Board of Canada; Ontario Chamber of Commerce
[14] (1976 – 2005) Statistics Canada Annual Demographic  Statistics, (2006 – 2051) HRSDC - SPRD, Labour Market and Skills Forecasting and Analysis Unit, 2006 Reference Scenario
[15] Statistics Canada (2005) Population Projections for Canada, Provinces and Territories 2005-2031. Catalogue No. 91-520-XIE. (December) at p. 1

observers to adversely affect Canada's productivity growth[16]. As for the electricity sector, data based on reporting by employers estimates that approximately 30% of the current electricity workforce are expected to retire between 2007 and 2012. This has serious implications for both maintaining and sustaining the skilled workforce within the sector.

Under current trends, the 2008 ESC LMI Study predicts there will be an insufficient supply of workers to fill the demand of the sector to meet the growing consumer demand for electricity. This gap exists at all levels of the industry, from engineers, through technicians and trades people. This means that the sector will have to double its hiring of recent post-secondary graduates at a time when the demand for such workers is increasing in many other sectors as well.

> "Some technical jobs are difficult to recruit, primarily because of the specialized knowledge and new technical requirements that continue to expand. Utility companies are all competing for the same relatively small labour pool".
>
> *Northeastern Utilities*

Even if companies can hire the required employees, younger workers cannot be counted on to fill the void, as they lack the depth of experience that is required in the sector.[17] In addition, younger workers today tend to be more highly mobile and change jobs frequently, taking their technological savvy and any knowledge they have gained with them. Conventional expectations that knowledge will simply pass down through long tenured employees simply no longer holds true. The mobility and lack of loyalty of the modern workforce, and the fact that in many workplaces, as many as four generations work side-by-side, means knowledge is not always filtered well throughout the organization.[18]

Existing staff need development so that they are ready to fill vacancies in senior and critical specialist/ technical positions that require significant experience in the field. New workers require orientation and training to bring them to a competent level of performance, particularly in heavily regulated industries such as the electricity sector. Sector participants generally note that new engineering and technical graduates require four years of on-the-job experience to reach full competency. Managers, usually with engineering backgrounds, generally require 10 to 12 years of experience in the field, which is why management retirements are a particularly worrying issue for the industry. This is leading to an emerging critical situation whereby remaining employees are leaving (retiring) and there is an insufficient pool of well-trained and experienced employees ready to take their place. The situation is even more serious since the sector is growing, particularly in the newer electricity sub-sectors, and employers not only need to replace retiring workers, but require additional workers with new skills and competencies to sustain business growth.

## DEVELOPING THE NEXT GENERATION OF ELECTRICITY WORKERS & POST-SECONDARY EDUCATION

The sector needs to invest substantially in human capital development. In some areas of the industry, workers (such as engineers, specialized technicians and management) typically have a life-long career in the electricity sector, and these workers possess a tremendous amount of corporate memory and experience. Sector workers have, on average, a higher level of education than workers in other industries. Specifically, 76% of electricity workers have a certificate, degree or post-secondary degree, compared to 57% for all industries. This is positive since globally all labour experts predict that employees in the future, whatever the sector, will be required to have some form of post-secondary education. Having a skilled and trained workforce means that industry organizations within the sector will be competing aggressively with each other to recruit and retain many of these graduates.

Within this backdrop, the sector has faced an "image" problem a result of cyclical downturns in the sector that led to slow downs and a lack of demand for labour and subsequent declines in enrolment in electrical

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[16] OECD (Organization for Economic Co-operation and Development) (2005a), Aging and Employment Policies: Canada, Paris: OECD.
[17] Greenes, K. & Piktialis, D. (2008a) Bridging the Gaps: How to Transfer Knowledge in Today's Multigenerational Workplace
[18] Retrieved from: http://www.management-issues.com/2008/8/27/research/organisations-ignoring-the-transfer-of-knowledge.asp

engineering programs, except in British Columbia.  This may be changing with the predicted rise in demand for electricity and a greater interest in greener/renewable sources of electricity including: solar, geothermal, wind and tidal power.  However, even with a changed image, there is an issue with the number and calibre of graduates ready to work in the sector.  In recent years, universities have not invested in electricity-related programming and faculty are reaching retirement ages. In some cases positions are not being replaced with academic experts in the electricity sector.  Many national and international sector councils within broader energy industries have noted that the number of engineering graduates has been declining, particularly in the nuclear and electrical fields, which in turn has been compounded by the fact that the engineering faculty in these disciplines are also of a retirement age and are not being replaced.  This means that there are not enough universities offering electricity-related specialized programs since the numbers of professors in these fields are also declining and not being replaced.  In turn the programs are not being sufficiently updated and fuelled by new academic research.  The US, the UK as well as the Nuclear, Solar and Wind sectors are actively working through their respective international sector councils with governments, educational institutions and other stakeholders to remedy this issue.

The approach to developing workers in the sector is also changing.  According to the International Atomic Energy Agency (IAEA), traditional worker training programs have addressed explicit knowledge that is contained in written documents, policies, and procedures.  However, tacit knowledge that is held in a person's mind has not typically been either captured or transferred in any formal manner.  Rather, new workers have acquired such knowledge over time (if at all) through working with those who already possess it.  As those workers, who are in possession of this tacit knowledge, leave the workplace for retirement, the effective capture and transfer of that information becomes even more critical.[19]

Although this need has always existed as individuals transferred to other jobs or leave the organization, there have usually been others in the organization that also had the tacit knowledge to provide continuity of operation. It is the increased rate of current and expected worker departures, along with the decreasing numbers of qualified replacements that has made KT a more significant problem.

The potential risks associated with impending demographic shifts, emerging and legacy technologies, potential economic downturns, increasing competition and, in some cases, a mismatch within the sector between the supply and demand of employees with the right skills and expertise include an increasing lack of knowledge to maintain legacy systems and/or have and apply sophisticated technology skills at all levels of the workforce (from power line workers to electrical engineers). There is also the potential for a decrease in innovation and productivity due to critical gaps in the workforce, a lower level of skills, knowledge and expertise, which could lead to an increase in health and safety incidents, both on the job, for the sector and for the Canadian public.

Clearly the sector is diverse with different life cycles and approaches to harnessing and distributing electricity using a variety of technologies and systems - some legacy and others leading edge.  The business drivers and needs of organizations within each sub-sector will vary as will the solutions to KM/KT issues.

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[19] International Atomic Energy Agency (IAEA). "The Nuclear Power Industry's Aging Workforce, Transfer of Knowledge to the Next Generation", in the June 2004 Journal of Knowledge Management Practice.

# 4. VALUE PROPOSITION FOR INVESTING IN KM AND KT

### Section Highlights

⇒ Employees today waste approximately 25% of their time looking for information.
⇒ When organization individuals can use knowledge at the same time, and shared knowledge stimulates the creation of new knowledge.
⇒ Knowledge transfer can represent a low-cost alternative to the creation, codification, and capture of new knowledge and significantly contribute to overall organizational success by preventing individuals from repeating the mistakes of other individuals.
⇒ The benefits to the Sector from investing in KM/KT are many but include: greater innovation, improved productivity and safety and greater market and financial performance.

Often KM/KT is focused on ensuring current employees are adequately prepared to assume new positions within an organization and/or know where to get the required information/direction they need to perform their job. As demographics continue to shift and workforces around the world age, capturing key knowledge from 'subject matter experts' before they leave has become increasingly critical. Capturing this knowledge and sharing it within the organization is also key to productivity and efficiency which in turn impacts business competitiveness. KM/KT is an issue not just because of high retirement rates, but also to leverage organizational knowledge as a company asset.

> "With everything else dropping out of the competitive equation, knowledge has become the only source of long-run sustainable competitive advantage, but knowledge can only be employed through the skills of individuals. The value of an individual's knowledge depends upon the smartness with which it is used in the entire system."
>
> *Thurow, L (1996) How Today's Economic Forces Shape Tomorrow's World*

The challenge facing many organizations is not only the loss of their most experienced employees, but also many of these professionals and managers are taking with them new types of critical expertise and experiential knowledge that did not exist a generation ago. In the context of the new economy, future leaders are likely to face not simply a labour shortage, but a knowledge shortage, as organizations bleed technical, scientific, and managerial know-how at unprecedented rates.[20]

To mitigate these risks and lay a foundation for an effective future workforce, senior managers must understand the dynamics of their current employee base, the drivers of turnover, the knowledge and skills that must be shared before they are lost, and the best ways to tap into the future talent pool. Organizations are encouraged to develop approaches that are tailored to their own business requirements and operating environment and include a mix of tactics to address KM/KT requirements. Despite the changes impacting the sector, and the increased recognition of the importance of managing knowledge and thus the reinforced concepts of KM/KT, the ESC estimated that a third of the industry does not have workforce planning and KT tools and processes in place. The consultations for this study also reveal that many in the sector are just beginning to move from KM/KT pilots and targeted projects, towards a more strategic approach to KM/KT. In the absence of supporting information and tools, however, many in the sector may struggle to implement KM/KT successfully within their organization.

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[20] Delong, D (2004) Lost Knowledge: Confronting the Threat of an Aging Workforce

Without effective and well-proven KM/KT strategies and processes in place, corporate memory is at risk of being lost. This has grave implications for competitive positioning, safety, productivity and business continuity, not to mention the need for understanding legacy systems and company-specific intellectual knowledge and know-how.

The industry already recognizes that organizations within the sector cannot afford to ignore the need for a more integrated, systemic and targeted/risk-based approach to KM/KT. They need to have a much better understanding of the implications of the structural changes ahead, and tools and strategies that they can use and adapt, from identified best practices, to address these future challenges.

> **Illustrative Example of the Benefits of KM**
> Corporate employees spend up to 25% of their day looking for information – which can be 25% of a company's staff costs. According to a 2008 IBM study of 4000 human resources executives, only 13% of people can find someone with a particular area of expertise in their own company. This means the bulk of work does not leverage the specialized knowledge that exists right there in the firm, because there is no good way to find the information. Collaborative solutions such as web technologies are solving some of these issues.
>
> *Source: "Five Best Practices for Enterprise Collaboration Success".*

## 4.1   INVESTING IN KM/KT: SUPPORTING BUSINESS STRATEGY

KM/KT is important to all companies, particularly in sectors that generate, collect and use a lot of information and data to inform business strategies and to gain a competitive advantage. KM products and services are split between fulfilling organizational needs and identifying those needs and opportunities.

> **KM/KT Corporate Snapshot: Knowledge Mapping**
> Mapping knowledge becomes a critical tool for identifying critical processes and knowledge required for the organization to succeed, and identifying individuals with specialty experience within the organization. Hydro One has invested in Knowledge Mapping to help identify who holds the information that is critical to the company's achievement of business objectives and success. Once these positions are identified, the next step is to identify if more than one person holds this information. If the information resides with only one person, then this person and position becomes the target for future succession planning efforts.

⇒ **Fulfilling needs:**  Addressing an organization's KM needs entails surveying the organization to identify key 'pain points' or areas of continued aggravation (such as lost documents, writing communiqués from scratch on the same subject numerous times, loss of corporate memory due to high retirement rates, documenting the process and lessons learned after major organizational projects are completed).  It is important in any KM exercise to identify the real problem areas and to find solutions to these problems.   Tangible success in one KM project increases the organization's understanding of the value of KM, despite the time and effort required 'to get it right'.

⇒ **Identifying needs and opportunities:**  Organizations need to be able to use and analyze data and information from a number of sources to elicit emerging issues that need to be resolved; emerging opportunities that can benefit the organization and/or its stakeholders; elicit areas requiring new or amended policy or program development; contribute to reducing or eliminating risk to the organization (operational, technology, health and safety).

Interestingly, as organizations consume material assets, they often depreciate in value.  On the other hand, when organizations use knowledge resources, these assets tend to increase value given that both the giver and receiver are enriched as a result of the transaction.  For example, more than one individual can use knowledge at the same time, and shared knowledge stimulates the creation of new knowledge.

More importantly, KT can represent a low-cost alternative to the creation, codification, and capture of new knowledge and significantly contribute to overall organizational success by preventing individuals from repeating the mistakes of other individuals.[21] One practitioner put it this way: *"We used to say knowledge is power. Now we say sharing is power"*.[22] Thus, it can be argued that KT could represent not only a competitive advantage within an organization but also a less expensive alternative to knowledge creation and acquisition. This may not always be the case; however, an assessment is required at the initial strategy stage if it is easier to re-create than to transfer.

> "A learning organization is an organization that is skilled at creating, acquiring, interpreting, transferring, and retaining knowledge, and at purposefully modifying its behaviour to reflect new knowledge and insights."
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> *David, G. (2000) Learning in Action: A Guide to Putting the Learning Organization to Work, Harvard Business School Press*

Effective KM/KT includes the following benefits:

⇒ Structured and systematic access to documents and knowledge across the organization and between professionals in the same and related fields.
⇒ Access to the person who has the required information or can help find the answer.
⇒ Reduced search time for information and data.
⇒ Effective use of relevant information to support strategy and decision making.
⇒ Integration of paper and electronic information and other media.
⇒ Freeing up time to focus on the benefits of information instead of the problems with information management.
⇒ Retention of corporate memory and intellectual assets, which is extremely important for organizations and sectors undergoing significant workforce adjustment.
⇒ KM solutions that facilitate collaboration, information sharing and organizational learning through products and services such as standardized taxonomy / classification systems, searchable repositories and databases.
⇒ KT solutions including accelerated learning options, which is very important to sectors experiencing high retirement rates and replacing with new, less experienced people.
⇒ Increased understanding of the customers' needs and preferences in order to provide better products and services allowing for improved business enablement.
⇒ Product/service excellence by bringing new ideas into the design process and capitalizing on lessons learned.
⇒ Operational excellence through the use of best practices to improve the internal performance of the enterprise; contributes to continuous learning and avoidance of repeated mistakes:
   o Increased productivity, speed, agility, profits, growth, and process improvement.
⇒ Improved performance, effectiveness and capabilities (cost savings).
⇒ Risk reduction.
⇒ Improved personal connectivity (allowing employees to acquire and employ new and improved competencies and networks):
   o KT across projects moves knowledge from project sources of knowledge to project recipients with the goal of improving performance and capabilities.
⇒ Increased ROI on management's investment in technology and knowledge resources.

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[21] Baum, J. A. C. & Ingram, P. (1998). Survival-enhancing learning in the Manhattan hotel industry, 1898-1980," *Management Science, 44*(7): 996-1016.; Gruenfeld, D., Martorana, P., & Fan, E. (2000). What do groups learn from their worldliest members? Direct and indirect influence in dynamic teams. *Organizational Behavior and Human Decision Processes, 82*(1), 45-59
[22] Pederson, C. R. (1998). Management of knowledge new IT 'craze.' *Computing Canada, 24*(27), 19-21.

Knowledge ultimately assumes value when it affects decision making and is translated into action.[23]  Firms unable to manage knowledge assets will become increasingly uncompetitive in the future business environment.  For those who can harness their knowledge assets, the culture must adapt to the new environment and put in place new processes in order to achieve the expected return on investment.[24]

## 4.2   CHALLENGES TO KM/KT IMPLEMENTATION

Key research tends to point to a number of specific factors that inhibit firms from successful implementation of KM / KT initiatives (Cortada, 2001).  The top three key factors are: 1) corporate culture that does not value knowledge or facilitate its use in daily activities; 2) the failure of top management to proactively support KM initiatives; and 3) a lack of shared understanding of a KM business strategy.  Below is a list of other common KM errors[25]:

⇒ Not developing a working definition of knowledge. Substantial amount of research indicates that it does not matter what definition is chosen, what matters is that everyone is working under the same definition with the same understanding of KM within their organization;

⇒ Emphasizing knowledge 'stock' to the detriment of knowledge flow;

⇒ Viewing knowledge as existing predominantly outside the heads of individuals. This point reflects the views of many practitioners and researchers who argue for sharing knowledge with employees at multiple levels of the enterprise.  The research indicates that knowledge is always localized (in the heads of individuals or small groups who work in close proximity);

⇒ Not understanding that the most fundamental purpose of managing knowledge is to create a shared context;

⇒ Paying little heed to the role and importance of tacit knowledge;

⇒ Disentangling knowledge from its current uses;

⇒ Downplaying thinking and reasoning. Knowledge development and breakthrough in insights requires some form of reasoning – it is through reasoning that improvements can be made;

⇒ Focusing on the past and present and not the future;

⇒ Failing to recognize the importance of experimentation;

⇒ Substituting technological contact for human interface (this view is increasingly gaining importance among KM/KT experts and practitioners).  Despite all the plethora of communication gadgets and tools,

**Potential Barriers to Implementation**

*Hidden knowledge*: people don't know what it is they know, or that someone else needs it. They're sitting on a potential gold mine but don't realize it. They can't transfer something they don't know they have.

*Blindness*: knowledge and best practices may exist (even down the hall), but the potential recipients don't know about it. They may suspect it exists but don't know how to find it. They don't search or don't know how to search. In effect, they are blind.

*Locked-up tacit knowledge*: Tacit knowledge – the know-how and judgment that come from experience, intuition, tricks, and rules of thumb is often 80% of the valuable knowledge in a process. However, because tacit knowledge is typically very hard to express and difficult to codify, the really valuable stuff remains "between the ears and eyes" of the source. The recipient gets only the explicit (20%) portion of valuable knowledge, and then wonders why the transfer failed.

*"We're different" blinders*: potentially valuable knowledge and practices often don't transfer across functions, companies, industries – even entire sectors like education – because potential recipients focus on differences, not similarities of processes. They reject valuable knowledge due to parochialism, tunnel vision, ego, ignorance, protectionism, arrogance.

*"Sorry – I'm too busy"*: even if the transfer would save time, they don't have time to save time. The transfer never gets a hearing.

*Implementation is hard:* Even if all of the previous barriers are overcome, the transfer of knowledge occurs, but action doesn't follow.  It remains under construction or simply dies, for a variety of reasons – no money, fear of change, lack of leadership, no buy-in, turnover, no support, lack of training, change management, etc.

[23] De Long, D.W. "Diagnosing cultural barriers to knowledge management," The Academy of Management Excellence, 14 (4), 2000,pp. 113-127
[24] Nash, I. (2002) "Management not measurement is key" Australian CPA ( 72:4) May, 2002, pp. 14-27
[25] Fahey, L., and Prusak, L., "The Eleven Deadliest Sins of Knowledge Management", Knowledge Management MIS 580, Texas A&M University, 2008

many experts argue that people conversing (in person or virtually) is the optimal method for knowledge transfer; and

⇒ Seeking to develop direct measures of knowledge. The ability to measure the impact of KM/KT supports the business case for KM/KT activities and allows a company to assess its intellectual and intangible assets as a resource like any other organizational resource.  When knowledge is viewed in this light, then firms will give more value to the KM/KT concept, particularly when return of investment (ROI) can be demonstrated.

## 4.3   ENABLERS TO KM/KT IMPLEMENTATION

If knowledge is indeed as important as some argue it is, perhaps an organization should investigate ways to increase its use of the knowledge it already possesses.[26]   One critical step towards realizing this goal is to identify factors that encourage or discourage KT in organizations.   Once KT is understood within an organizational context, managers might be able to implement strategies to boost organizational efficacy through better KM. A review of the literature has identified the following four major enablers of KT:

- Leadership,
- Culture,
- Infrastructure/technology, and
- Measurement.

For this study, based on new research, two more elements have been identified as an enabler of KM/KT, specifically leadership and recognizing that KM/KT requires change management processes be implemented.

### LEADERSHIP

One research study that analyzed employee values and satisfaction at 26 large organizations found that leadership was the single most important factor in successful KM practices.[27]   The reason being is that employee behaviours are a reflection of management behaviours.  This is not surprising as most organizational change research will speak to the importance of leadership and culture to successfully changing organizational direction, practices and behaviours.  Studies have found that at least two of the following success factors need to be present for KM/KT initiatives to be successful:

⇒ Communication in the organization
⇒ Senior management commitment
⇒ Collaboration and teamwork
⇒ Employee commitment to the concept and practice of KM
⇒ Innovative corporate culture
⇒ Application of appropriate technology

Other "enduring principles" have been identified:

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**Hydro-Québec**

KT is seen at a higher KM strategy level that needs to be well linked with the management of expertise and content.  The Succession Plan is based at a unit level to ensure effective integration of the successor and the person that is leaving.  KT is also built into the competency management plan.

Hydro-Québec is increasingly using sponsors (started with managers in 2002) and has developed a proof of concept for Communities of Practice.  These have evolved to two different collaborative approaches of both technical networks and communities of practice. Networks are more functionally based/functional responsibility – appointed to network.

Communities of practice first began with engineers, managers, and specialists.  While some were more prone to collaboration, on the whole Hydro-Québec found a great deal of resistance to communities of practice and collaboration. As a result, Hydro-Québec focused on engaging and developing support of these professional groups.

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[26] Ladd, A., & Ward, M.A., (2002) An Investigation Of Environmental Factors Influencing Knowledge Transfer.
[27] Sharp, D. *KM Today: Challenges & Opportunities",* Information Systems Management, spring 2003.

⇒ Business values drive transfer benefits
⇒ Transfer of best practices is the most common and most effective KM strategy
⇒ KM must be woven into the corporate infrastructure
⇒ KM earmarked funding is rare
⇒ Having the 'right' culture is critical
⇒ Successful KM efforts employ a 'push-me-pull-you' approach
⇒ If it works, it really works
⇒ Top level support is critical
⇒ Technology is a catalyst not a panacea
⇒ Mature KM efforts lead to transition from nurturing to measuring

> **KM/KT Corporate Snapshot: Defining Responsibility for KM/KT**
>
> *"*At Hydro One, shifting the company's approach to knowledge transfer is a significant undertaking to get the policies, processes, templates and systems in place. This involves a lot of coordination at the business unit level to be able to successfully implement. Senior management's job is to set KM/KT directions, expectations, and identifying appropriate champions. It is then up to the business units to implement as required. HR plays an advisory role and is responsible for providing support and ensuring that the KM/KT initiatives stay on track."

Many experts have found that the most useful applications of knowledge occur when employees are given many opportunities to discuss and debate the definition and use of knowledge. Employees need help to identify what their roles as creators and users of knowledge should be. Managers need to focus on not just the information or facts, but also on what people think they know as they make decisions on behalf of the firm.

## ORGANIZATIONAL CULTURE

Organizational culture is the biggest barrier to KM/KT as it is the most difficult to identify and ultimately to alter. It yields less quickly or easily to innovation, because it is a function of the past. If an organization's natural tendency is to share and collaborate, all that has to be done is eliminate structural barriers and provide enablers (like technology and facilitators) to allow practices and ideas to flow seamlessly across time and space. However, if a company's nature is not to share, what results is hoarding, either because there are barriers to sharing or due to existing organizational culture that does not promote it. If the culture works against KM/KT then the best and greatest KM/KT approaches and applications may not be enough to alter the behaviour of employees. People and culture are seen as the key to KM/KT for the following reasons[28]:

1. Learning and sharing knowledge are social activities – they take place among people;
2. Practices embedded in people, culture and context are complex and rich – dialogue and demonstration can enrich the learning; and
3. To ensure practices and knowledge not only transfer, but transfer effectively and make a difference you have to connect people who can and are willing to share the deep, rich, tacit knowledge they have.

Preparing an organization for KM/KT initiatives means changing or adapting the organizational culture to support and facilitate the sharing, utilization and creation of knowledge. Instead of the traditional hierarchical structure of organizations and divisions, a knowledge organization is structured based on teams of knowledge workers composed of people from across disciplines and across the organization.

Some authors note that a mismatch between the goals of KM/KT and organizational culture might cause a major conflict, reducing the effectiveness of knowledge projects. Indeed, some even label this friction as the "biggest obstacle".[29] The ability to identify how conducive an organization's culture is to the transfer of knowledge could provide management with the tools to determine whether it is worth the investment to

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[28] O'Dell, C.S, Essaides, N. & C. Jackson Grayson, Jr. (1998) *If Only We Knew What We Know : The Transfer of Internal Knowledge and Best Practice*
[29] Costa, Dan. (1999, July). Knowledge is power. *Computer Shopper,* 252-254.

implement KT strategies.  For many companies however the shift to a culture of sharing and collaboration is not easy.  To enable successful KT specific transfer mechanisms must be put into place to ensure the flow of best practices.

The culture of the company should give everyone access to the knowledge base of the company. Since the greatest knowledge base in the organization is in the heads of the individual associates of the company, everyone should be provided with access to everyone else in the organization across the organizational barriers to communication and the "structural silos" of the organization. Knowledge initiatives involve everybody in the organization - whether it is called Knowledge Sharing, Knowledge Transfer or Knowledge Management, these initiatives will cut clear across the organization; everybody's knowledge is important to the functioning of the organization, but as previously noted, changing culture is difficult and often slow.  Therefore, it is important to understand the reasons for the corporate culture in order to change it.[30]

**Intergenerational Differences**
In the past, the expectation of passing along knowledge and leaving a legacy fit well within the cultural values of long-tenured employees who spent their careers with the same company. In today's workplace, where four generations work side-by-side, knowledge is not always filtered well throughout an organization.[31] According to the American Productivity and Quality Center (APQC), encouraging contribution is a challenge for any KM initiative, but it has a slightly different twist in a retention context because the individuals who need to contribute may be leaving the organization or the project.

In a typical Command and Control Structure, where the trainer is all knowing and dispenses knowledge on a 'need to know basis', boomers expect information to be neatly catalogued and organized in a logical manner, and to have manuals available with extra information and ideas to cover future scenarios and problems. [32] Corporate training programs and environments largely mirror boomers' learning preferences. Knowledge moves up and down the organization in a sequential manner from one person to another, but this sequential movement creates its own problems. Knowledge deteriorates as it moves through different individuals in a sequential manner.  Information is gathered on the front line, passed to some manager so that he can put his perception on the situation and so forth up the line, going from in-box to in-box until it gets to a senior manager or expert somewhere in the organization, who then puts his infinite wisdom on the situation and sends it back to the front line.  Not surprisingly this leads to confusion. While it is difficult to eliminate command and control management structure in most organizations, silos can be reduced and a more networked model of communication can be introduced which facilitates and encourages faster communication and information sharing.  Those companies that manage to excel not only redesign processes but also place an emphasis on the institutionalized and active sharing of knowledge across functional silos.[33]

This new model mirrors what is described as the learning style of 'gamers'.[34]  Since gamers' developmental years were spent "saturated" in electronic interactivity, they have a learning style distinctly different from the 'boomers', a style that:

- Is not focused on books and reading;
- Ignores any hint of formal instruction;
- Includes trial and error and approaching a problem from different angles;
- Relies heavily on learning from peers, with a distrust of information from authorities;

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[30] Buckman, R. (2004) Building a Knowledge Driven Organization
[31] Argote, L., Ingram, Levine & Moreland (2000). "Knowledge Transfer in Organizations: Learning from the Experience of Others." Organizational Behavior and Human Decision Processes 82(1) (May): 1-8.
[32] Karl M. Kapp (2007); Tools and Techniques for Transferring Know-How from Boomers to Gamers
[33] Fahey, L., and Prusak, L., "The Eleven Deadliest Sins of Knowledge Management", Knowledge Management MIS 580, Texas A&M University, 2008
[34] Buckman, R. (2004) Building a Knowledge Driven Organization (Gamers – the 90's generation, often turn to internal blogs, use instant messaging, they have embraced fast and instant means of communication such as Wiki's; Boomers – post World War II generation, tend to use emails, make phone calls and have face-to-face communication as their primary means of engagement, boomers need to consider the possibility that trust can be built in ways other than face-to-face interactions).

- Centers around small, focused bits of information;
- Demands just-in-time information—with no interest in learning about what they might need some time in the future; and
- In sharp contrast to boomers, gamers desire instant (or almost instant) knowledge delivered in an informal manner as soon as they need it.

The value added to the organization from this communication model is described in Metcalf's Law: the more that different disciplines of the organization can be involved in the collaboration process, the greater the ability of the organization to bring together critical knowledge to any situation that the organization faces, and ultimately the greater the value delivered at the point of need. By changing the organizational culture and critical supports, the organization begins to build the neural network of the organization.

The culture should allow each individual to enter knowledge into the system. Since each individual associate is part of the knowledge base of an organization, everyone within the system should have equal rights to enter knowledge into the system without prior filtration by management or experts. An organization will excel in KT if they are able to make employees feel that their knowledge is valued and encourage them to share their knowledge across time and space. In open organizations, the 'expert' is not always known and can be anybody at any point in time depending on the subject and their ability to share their knowledge about a subject. The key is knowledge sharing, which requires behaviour change at every level of the organization. Ninety percent of efforts for KT should focus on culture change.

## PUTTING IN PLACE CRITICAL ORGANIZATIONAL & IT INFRASTRUCTURE

Even if you announce full senior management support for a best practices and KT initiative; even if you put in the most sophisticated "anywhere-anytime-anybody" technology for sharing; and even if you provide incentives for sharing (recognition, promotion, money) you may get poor results.[28] The reason for this is that people need help in understanding and transferring best practices. An explicit and institutionalized organizational infrastructure is needed and important.

Infrastructure includes the transfer-specific mechanisms put in place to ensure best practices flow throughout the enterprise. These include technology, work processes, and networks of people. Infrastructure also includes: corporate policies; the organizational structure surrounding the processes: the essential line and staff roles that must be played to support the new initiative of KT. An infrastructure of organizations and people must also be mobilized to make KT happen; leadership, a healthy culture, and basic information technology are necessary but not sufficient. To work, KM/KT must be institutionalized into the organization through the creation of new support systems, in addition to IT systems, with new job responsibilities, new teams and new formalized networking. Organizations must create a set of roles and skills to do the work of capturing, distributing and using knowledge. There are many strategic and tactical tasks to perform, and it is unrealistic to assume a company can simply throw KM activities on top of existing positions. Humans add value that turns data and information into knowledge; as such, employees in dedicated roles with specific responsibilities must therefore perform some aspects of this process. If no one is "charged" with watching out for the transfer, it will fizzle and fade.

Conversely, KM/KT will not succeed in an organization if it is solely the responsibility of a small or even large staff working group. Ultimately, managers and workers who do other things for a living have to do the bulk of the day to day activities of KM/KT. The most successful organizations are those in which KM/KT is part of everyone's job.

Critical infrastructure choices should be influenced by geography, culture, money technology, leadership and market structure, philosophy – but most of all, answers to the following three questions:

1. How important is transfer of knowledge and best practices in the strategy of the organization?

2. How much assistance and intervention does the organization think is required to make transfer happen and get results in their organization in a timely manner?
3. How does the infrastructure address the barriers to the flow of knowledge and its implementation?

## MEASUREMENT

It is important to measure the projects and business processes that are being improved through KM/KT approaches and tools and let the users evaluate the contribution. Anecdotal evidence, usage statistics, and documented cost savings are important for justifying efforts and expanding them within an enterprise. Measurements are essential to ensuring the sustainability and success of transfer efforts over time.

While there are evolving and highly sophisticated ways to measure knowledge that go beyond traditional accounting, the best way to measure the impact of knowledge and best practice transfer is not by gauging the size of your knowledge capital base, but rather the effect it has on company's performance. Knowledge initiatives have to be connected to measurable improvements in performance.[35] Otherwise, why would companies invest in them? Look at the outcomes desired, not the activity itself. It is more important to measure the success of projects and business processes that are being improved through KT. Hence, practitioners/ leaders in KM attempt to link the outcomes of these efforts to their original value proposition.

Understanding how each enabler affects the KT process is the first challenge. Next, it must be ensured that all four are managed in harmony. If the technology allows sharing, but the culture says "keep what you know to yourself" transfer won't happen. If there are no designated knowledge champions and facilitators, even a company with a pro-sharing culture may not succeed. If there is no process for designing and managing change, good intentions will flounder. Infrastructure, culture, technology and measurement are all necessary enablers; none alone is sufficient. Rather they must all work in concert to achieve sustainable success.

### KM/KT as a Change Process

Best practices would indicate that companies need to approach planning, design and implementation of a KM/KT strategy/initiative with the same structured approach required by any organizational change effort that may require a proof of concept (e.g., pilot) or a corporate-wide, potential "quantum-leap". The extent to which the change will be a quantum leap will depend on the size of the initiatives, as well as the organizational culture, leadership and how behaviours are rewarded.

Change initiatives, including those that change how knowledge is managed and transferred, requires a map to guide the company's transition from the current state where knowledge is managed haphazardly, if at all. There may be some attempts at the grass-roots level or none at all. The desired state is an organization that has embraced the internal transfer of knowledge as a core process designed to deliver dramatic and sustainable improvement in performance. Key stages in the KM/KT change process include: planning, designing, implementing and scaling up.

KM/KT enablers need to be supported by a structured process. What follows is an example of critical success factors for strengthening KM/KT initiatives identified by the International Institute for Sustainable Development (IISD):

⇒ **Stated rationale for knowledge initiatives**. There are a number of rationales including competitive advantage; knowledge retention, etc. Successful KM/KT strategies need to ensure a shared understanding throughout the organization as to why the KM/KT project/initiative is needed.
⇒ **KM efforts need to be connected to an organization's mission and operations.** This component answers the question "knowledge for what ends?" Other organizations (such as CIDA and the World Bank) have both noted that unsuccessful projects are often characterized by a disconnect between the knowledge sharing activities and the day-to-day operations of the organization.

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[35] O'Dell, C.S, Essaides, N. & C. Jackson Grayson, Jr. (1998) *If Only We Knew What We Know : The Transfer of Internal Knowledge and Best Practice*

⇒ **Setting objectives at the right level.** A fundamental mistake is one of scale. Knowledge sharing works best when it is closest to the level of implementation and impact. One begins at the operational level to collect the data before aggregating to corporate levels, "*knowledge flows are situation specific, and while infrastructure, protocols and systems are important, they must be designed and supported with specific purposes in mind*". …"*the shorter, more focused the project, the better the knowledge flows*". [36]

⇒ **Understanding the components of KM.** A set of strategies and tools to facilitate the following:

  ▪ **Internal KM** – how the organization manages internal communications among the different divisions in order to strengthen its knowledge base; how to manage the archiving and sharing of knowledge products developed by its staff and partners. In some organizations, the focus is on formation of structured communities of practice or thematic knowledge networks supported by list servers and websites for exchanging information. Membership organizations often focus on creating the space for dialogue among members and capturing the dialogue so that it can be used. The specific modality for internal communications is up to the organization, but these factors are important: internal communication needs to be across the whole organization; there needs to be tools to support communications, storage and retrieval.

  > **Example of a Successful Project:**
  >
  > The Energy and Resources Institute was looking for operational efficiencies for their managers and staff who wanted better access to project and planning information. They started by capturing explicit knowledge in systematic ways for internal use. Since the organization is project driven, they set up systems as they needed them. Their primary knowledge focus is on how to capture knowledge used by others and therefore their orientation was to focus on external knowledge communications.

  ▪ **External KM** – how the organization flows its knowledge into the hands of the people it most wants to use it; how it strengthens its knowledge through its interaction with external experts and decision makers; how it knows whether its insights make a difference. There needs to be consideration of the different modalities for collaboration and communication and a selection of the most appropriate modes for the task; management of the relationship building and communications processes and regular monitoring and adjusting of these efforts.

⇒ **Piloting is a common KM practice.** Their research showed that creating a safe place for experimentation with the new technologies is important. Rapid piloting and scaling up can be more effective than planning a large scale KM strategy from the beginning.

⇒ **Defining roles and responsibilities for KM.** Champions are needed at both top management and middle management levels. Middle managers are the people who connect knowledge needs and flows with operations; often specific roles for young professionals are articulated since they often serve as both connectors across an organization and are the beneficiaries of strengthened knowledge flows.

⇒ **Planning the sustainability of KM processes.** Often systems are set up but are not sustained due to the lack of long term strategies for maintenance, improvement and further development. An emerging best practice in KM is long term planning for sustainability of any new KM project.

IISD research found that an overarching KM strategy was not always effective, their research indicated that deploying three to four KM initiatives that are related, but not dependent, was the most successful route, particularly in the initial stages of introducing and consolidating KM into the organization. A successful combination of strategies includes:

⇒ Internal communications strategies – strengthening the tools for internal communications.

⇒ Influencing strategies – identifying and maintaining relationships the organization needs to have with external experts and with those in positions to make required change (i.e. bridging the gap between research and action).

⇒ Communication strategies – flowing the knowledge out of the organization to broader audiences.

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[36] IISD, page 4.

⇒ Administrative strategies – supporting the infrastructure for KM such as IT and human resources.

# 5.   GETTING STARTED – DEVELOPING AND IMPLEMENTING KM/KT IN YOUR ORGANIZATION

The worlds of KM and KT are quite complex and varied as are most organizations within the electricity sector. There is no one right response or approach to KM/KT but rather each organization needs to approach KM/KT by understanding where its pain points are; where the organization is at greatest risk of losing information either within the organization or when employees leave the organization and building an organizational culture that is dedicated to acquiring and sharing knowledge.

The ESC has developed a KM/KT Toolkit to help support organizations in the Canadian electricity sector in developing tailored approaches to KM/KT that meets each organizations unique need.  The Toolkit can be accessed through: www.brightfutures.ca/kmat.

The ESC KM/KT Toolkit is supported by the KM/KT Theoretical Framework.  This part of the research is intended to provide those practitioners that are new to the area of KM/KT with the foundations and basics in KM/KT theory.

**Potential Approaches/Applications for the KM/KT Toolkit**
The KM/KT Toolkit is designed to help a range of organizations – both those who are new to the area of KM/KT and those who are already working in the area, but who are interested in introducing a more strategic approach to KM/KT.  It is divided into three main components as illustrated in Figure 1:

1.  Framing your KM/KT Strategy (Building the Value Proposition)
2.  Developing and Implementing your KM/KT Strategy (Storing and Transferring Knowledge)
3.  Monitoring and Evaluating your Results from KM/KT Investment

**Fig. 1 - Overview of the ESC KM/KT Toolkit Three-Phased Approach (Surrounded by critical environmental supports)**
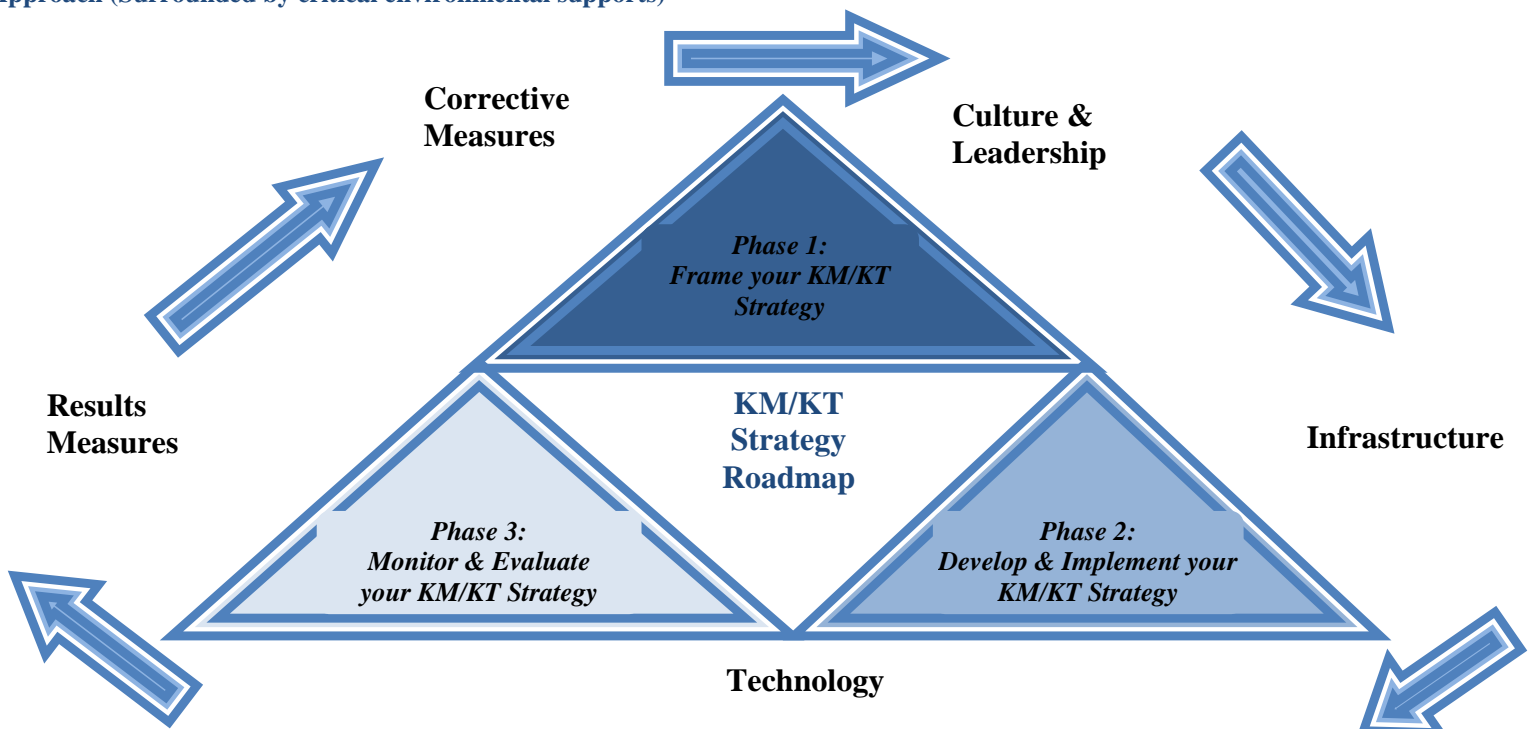
At the same time, users of the ESC KM/KT Toolkit are able to go directly to the toolkit tools and supports by reviewing a few targeted scenarios that can help direct users to the most appropriate point of entry; access leading best practices found within the sector and beyond, as well as links to KM/KT theory.

The ESC KM/KT Toolkit is designed to provide relevant and applicable information pertaining to knowledge management and transfer for the Canadian electricity and renewable industry. Whether your organization is just beginning to examine KM/KT, or if your organization has undertaken a number of KM/KT initiatives the Toolkit has been designed to help managers and practitioners develop a plan to address corporate KM/KT activities. It is designed to help leaders/managers and professionals in meeting a range of corporate KM/KT objectives. In going to the ESC KM/KT Toolkit, you will have access to a wealth of tools and resources to help you:

⇒ Assess your KM/KT risks;
⇒ Undertake a workforce assessment;
⇒ Map where critical knowledge resides in the organization;
⇒ Identify KM/KT priorities based on corporate priorities and risks;
⇒ Develop a KM/KT plan focused on a corporate strategy which can either be focused at a corporate level or testing through a proof of concept/pilot; and
⇒ Develop an evaluation plan to measure the results from your company's investment in KM/KT.

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Building a bright future cannot be accomplished effectively without understanding, appreciating and nurturing one's knowledge assets as they are the key to any organization's success.  Together, ESC and its partners within the industry aim at helping organizations in harnessing their competitive advantage through their knowledge assets by developing a tailored and sustainable KM/KT strategy to efficiently and effectively transfer key information to future generations.

Please visit the ESC at:   www.brightfutures.ca and for further information on knowledge management and transfer, access the ESC KM/KT Toolkit www.brightfutures.ca/kmat.

# APPENDIX A: OVERVIEW OF KM/KT ACTIVITIES

Below is an overview of the range of possible activities/practices that are commonly associated with KM/KT.[37] It is intended to give you a high level overview of KM/KT activities. This report is supported by a more detailed KM/KT Toolkit which is intended to support companies in the Canadian electricity sector in the development and implementation of their own organizational KM/KT plan. Additional tools, approaches, best practices and case studies used and examined on KM/KT within the Electricity sector are available within the KM/KT Toolkit.

## OVERVIEW OF KM ACTIVITIES

The key KM activities are capturing, organizing, providing access, maintaining KM repositories and resources, and the use and development of technology. Capturing explicit and implicit knowledge is a KM activity that enables the recording and representation of tacit knowledge in explicit form. A related KM activity is organizing the knowledge which requires classifying and categorizing knowledge for navigation, storage and retrieval purposes (Russel, 2001). There are many ways to organize knowledge once it is explicit, namely:

⇒ Chronological
⇒ Alphabetical
⇒ Numerical
⇒ Category (sub category) type
⇒ Coding system

Organizing knowledge is a vital component to effective KM. The functions of translating and structuring information into usable knowledge require filtering, editing and organizing pieces of information into common and relatable themes. Knowledge must remain easy to use, otherwise employees will not use it and knowledge will not be shared. Approaches for access information/knowledge (the flow of knowledge from one place to another and from one form to another) primarily centre on sharing mechanisms, which include, but are not limited to: common access to explicit, recorded knowledge; directory of experts; mentoring and coaching; apprenticeships; and joint projects (in-person and virtual meetings).

Knowledge maintenance is required in order to ensure the knowledge stored is useful, relevant and accurate. Knowledge does not just 'die', but lies there. In order to ensure the knowledge stored is useful then certain criteria need to be applied to see whether and how captured knowledge can remain applicable. These criteria include the following:

⇒ When was it created
⇒ The source
⇒ Who interpreted / recorded
⇒ Context / relevance
⇒ Category
⇒ Expected lifespan / obsolescence / retention criteria.

## OVERVIEW OF KEY KT ACTIVITIES

KT is focused on the transfer of tacit knowledge – knowledge that is often contained in an employee's head – into a form that can be used elsewhere and retained within an organization. A number of methods to support KT are outlined below.

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[37] More information on approaches to KM/KT can be found in the ESC KM/KT Toolkit – Supporting Inventory or Approaches, Tools and Best Practices.

**HR Related Methods (As related to Recruitment, Development and Succession Planning)**
⇒ Apprenticeships
⇒ Collegial Coaching (Peer Coaching)
⇒ Exit Interviews
⇒ Experience Capitalization
⇒ Internships
⇒ Job Rotation
⇒ Job Shadowing
⇒ Knowledge Distillation
⇒ Knowledge Elicitation Interviews
⇒ Knowledge Self-Capture
⇒ Leadership Transition Workshop
⇒ Mentoring
⇒ Retirees on Retainer
⇒ Risk Assessment
⇒ Skills Inventory
⇒ Structured On-the-Job Training
⇒ Succession Planning
⇒ Training

**Team-Based Methods**
⇒ After Action Review
⇒ Peer Assist/Peer Review
⇒ Retrospect

**Project/Process Oriented Methods**
⇒ Job Aids
⇒ Process Documentation

**Best Practices/Lessons-Learned**
⇒ Best Practice Studies or Meetings
⇒ Critical Incident Interviews or Questionnaires
⇒ Lessons Learnt

**Mapping**
⇒ Information and Knowledge Audit Together
⇒ Information Audit
⇒ Knowledge Audits
⇒ Knowledge Maps
⇒ Mind Maps
⇒ SWOT analysis

**Knowledge Sharing and Learning among Professionals, Peers, Employees**
⇒ Action Learning Sets
⇒ Activity networking
⇒ Brain storming
⇒ Communities of Practice
⇒ Expert Interviews
⇒ Information Exchanges
⇒ Knowledge café
⇒ Knowledge Fairs

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**KM/KT Corporate Snapshot: On Boarding New Staff**

While the Alberta Electrical Systems Operator (AESO) is small (in relative terms) e.g., under 350 employees, its workforce has more than doubled in one year. As such, the AESO is focused on getting positions staffed quickly and ensuring they are quickly competent to perform the job. There has been a focus on orientation and on-boarding in order to ensure employees are up and running early and that they understand the history of the company and its regulatory requirements. New employees are also eligible to participate in a mentoring program.

The AESO has also set up communities of practice (CoP) supported by technology such as Wikis, and e-chat rooms. Their priority has been a CoP for transmission as they were most affected by a recent reorganization and there is a need to break down silos within the organization.

The AESO has received positive feedback from younger staff on the orientation, on-boarding program and training sessions. The mentoring program is reviewed very positively. Investments in consistent procedures and organizational renewal of the Transmission Division are helping to ensure continuity of staff. The AESO is also getting much more positive feedback from customers.

⇒ Knowledge Network
⇒ Learning Histories
⇒ Staff Profile Page
⇒ Storyboards
⇒ Storytelling
⇒ Yellow Pages

**Existing and Emerging Technologies/Software and Social Technology**
⇒ Blog
⇒ CMAP
⇒ Digital workspaces
⇒ E-learning
⇒ Electronic Performance Support Systems
⇒ Expert Systems
⇒ Instant Messaging
⇒ Knowledge Filter's Knowledge Center Software
⇒ Learning Games
⇒ Open Space
⇒ Pod Casting
⇒ Really Simple Syndication (RSS)
⇒ Serious Games
⇒ Social Media/On-line Dialogue
⇒ Social network services
⇒ Wikis

# APPENDIX B: STUDY AND METHODOLOGICAL OVERVIEW

## OVERVIEW OF THE STUDY

The ESC recognizes that there is a need within the electricity sector for better knowledge management and transfer in order to manage and mitigate the risks that demographic shifts will impose upon the sector and in support of corporate best practices. Organizations need to use knowledge management (KM) and knowledge transfer (KT) throughout their business in order to improve operating efficiencies, identify future business opportunities and improve overall decision-making. It is clear that not all organizations within the sector can afford to develop an integrated and systemic approach to KM/KT, nor do all organizations need to follow the same KM/KT approach. The approaches to KM/KT are as diverse as each organization that employs them, and the problems that they face. As such, it is important that organizations in the sector have access to tools and approaches and the experience of others that can be adapted to their unique organizational culture, workforce risks and business strategy.

To support this requirement, the ESC undertook a review of KM/KT literature in order to develop a best practice inventory and toolkit to help support the Canadian electricity sector in: remaining competitive; ensuring effective adherence to regulatory and health and safety requirements; and better managing their workforce risks and challenges.

This report is designed to provide organizations in the electricity sector – be they large or small, advanced in the implementation of KM/KT practices or just getting started, with:
- ⇒ An understanding of KM and KT.
- ⇒ The rationale/business case for investing in KM/KT.
- ⇒ An overview of some of the advantages and challenges of implementing KM/KT.
- ⇒ Provide access to a toolkit which would include an overview of:
    - o Methods and approaches to KM/KT;
    - o Tools to support the development and implementation of approaches to KM/KT; and
    - o Selected best practices in the fields of KM/KT.
- ⇒ A more detailed overview of different KM and KT models to help those who are interested in a more detailed overview of the theoretical underpinnings of KM/KT which may help in selecting which KM/KT model best suits their organization.

The expected outcome of this project is to enhance the assessment, implementation and effective use of KM/ KT practices within the sector. Specifically:

- ⇒ To support the process of building sector awareness and know-how on the importance of KM/KT to business operations, business strategy, competitive advantage and HR management. This will be achieved through the production of this report and the accompanying KM/KT Toolkit.
- ⇒ To produce tangible and practical KM/KT tools, tips and suggestions to assist organizations within the electricity sector in implementing KM/KT within their own business context, strategy and culture. This will be achieved through the production and dissemination of the KM/KT Toolkit and Best Practices.

The primary source of research for this Report was an extensive literature review and key stakeholder consultations. Initial consultations were also undertaken with the five recognized knowledge experts in the area of KM/KT who lent their expertise and insight to ensure the research team was on the right track and in identifying emerging thinking and best practices in the area of KM/KT, particularly within the sector itself.

In terms of the literature review, the first focus of the research team was to narrow the scope of analysis. There are innumerable KM/KT research, literature and websites available – with some research/reports being

better than others. In order to limit the focus of the review to something that was practical, the Steering Committee approved an extremely comprehensive search of KM/KT articles, research, reports, presentation decks, and videos related to KM/KT based on a combination of linked criteria including the industry sector, primary business drivers, and the regulatory environment.

It was expected that this approach would drive the research team towards more current, relevant and compelling stories, best practices, experts, and evidence related to best practices in the areas of KM/KT, particularly as it relates to heavily regulated resource/energy based industries.  In the end, the research was culled down from over 300 books, research, articles, presentations, journals, etc. to a list of over 100 items which were reviewed to support the drafting of this report.

Following this detailed review and the drafting of the report and the KM/KT Toolkit, further consultations were undertaken with representatives from the sector as follows:

⇒ Sector survey to determine extensiveness of KM/KT implementation within the sector;
  o Follow up with organizations who completed the survey to discuss in more detail their organization's approach to KM/KT;
⇒ Four best practice reviews of organizations recognized to be leading in various areas of KM/KT; and
⇒ Further stakeholder consultations including a Webinar with leading industry practitioners to review the draft KM/KT Toolkit and provide feedback on ways to make it more user-friendly and practical to a variety of users.

The literature review and these consultations helped to inform the development of this report, as well as the ESC KM/KT Toolkit and a KM/KT background documents which is expected to provide both background and foundational information to those who are just learning about KM/KT.  The tools and resources provided in this Toolkit were not developed as part of this project, but rather have been culled from best practices and tools found and/or provided through the literature review and consultations.  These tools and resources are appropriately cited and referenced.

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