The effects of knowledge management on information sharing practices: a case study on Nortel networks

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In 1999 Nortel Networks deployed the Open Text Livelink knowledge management system (KMS). Livelink allowed for the centralization of key corporate applications and associated content at a global, regional, line-of-business and departmental level. Prior to the implementation of Livelink on an enterprise scale, the corporation’s 80,000 employees relied on fragmented departmental web pages which were scattered across 11 different Web servers making the task of finding information very difficult. This paper describes how the process of knowledge transfer at Nortel Networks changed with the deployment of Livelink and how it enabled the automation of workflows through the company’s Web-based Intranet. The paper also provides an insight into how KMS empowered employees, acted to increase productivity and encouraged innovation. The importance of this paper is in highlighting the significant role of people in the success of KMS and to provide examples of the dynamics at play in such a large-scale operation.

Keywords:
Knowledge Management, Knowledge Transfer, Nortel Networks

INTRODUCTION
Knowledge management is defined as “the systemic and organizationally specified process for acquiring, organizing, and communicating knowledge of employees so that other employees may make use of it to be more effective and productive in their work” (Hahn & Subramani 2000, p. 302). It then follows that a knowledge management system (KMS) are all those components (software, hardware, people and processes) that support knowledge management initiatives. These may include but are not limited to work flow maps, web sites, portals, document management systems, customer relationship management (CRM), data warehousing, data mining processes, virtual teams, contact lists, databases, collaboration tools, applications and news (Davenport & Prusak 1998; Jashapara 2004). Although a term that is often used interchangeably with document management and information management, knowledge management seeks the higher ideal of wisdom, the tying together of the tacit and explicit realms. As Agostini et al. (2003) add: “knowledge is not important per se, instead the process of knowing, learning, and creating knowledge is the relevant aspect” (Nonaka & Takeuchi 1995). In this paper, knowledge management is seen through the eyes of a multinational telecommunications corporation, Nortel Networks. The main objective of the paper is to tell the story of the impact that Open Text Livelink had on 80,000 employees and their information sharing practices in a corporation that spanned a presence in over 150 countries. The before, during, and after KMS snapshots are presented to bring to the fore those overriding challenges, struggles and subsequent successes that follow an implementation of a large-scale eBusiness solution. In addition knowledge transfer dynamics in the company are explored, as are the effects of downsizing on the value of knowledge management.

METHODOLOGY
Data collected for this research was done through focused and unstructured interviews, observation and participation from 1996 to 2001, typical of a combinative ethnographic and action learning approach. The researcher was a business and network planner who was also given the role of the departmental chief knowledge officer. The business unit the researcher worked in spanned four countries in the Asia-Pacific including Australia, Singapore, India, China. While the majority of the study was based on data collected in that region, the researcher was seconded to international offices (including the United States and Canada) for periods of up to four months at a time, which aided in a more global understanding of information sharing practices pre and post-KMS implementation throughout Nortel Networks. The main actors in the study were employees the researcher worked with on a daily basis, ranging from director, senior manager, architect, and graduate level positions. By studying the interaction between these employees, who depended on each other for the completion of over one hundred and fifty projects in five years, and studying the way the KMS was used post implementation it became apparent that people would play an integral part in the success of the KMS. Focused interviews involved top level management including directors and senior managers who had been mandated with making the KMS
successful; while individual unstructured interviews were conducted with over twenty employees to assess knowledge management practices and employee attitudes toward the KMS. Apart from interviews, the researcher conducted cyclic observations, of which the richest source of information was gathered during formal KMS focus group sessions and departmental post-mortem analysis sessions of account activities. These were mainly documented in the form of minutes of meetings and personal diary entries. Data was analyzed using a historical approach with a distinct narrative style of writing. The paper serves to fill a gap in the literature by addressing the need to present empirical evidence with respect to knowledge management in a social-technical context. While a great number of knowledge management case studies appear in popular business literature and Internet-based customer testimonials, very few studies have had access to the actual knowledge management system in place.

THE FRAGMENTED INTRANET

It was not that long ago that employees of global companies relied on fragmented web pages scattered across a multitude of servers throughout the world for their corporate information needs. Conducting searches for key pieces of data integral to the successful completion of a task was often a hopeless exercise. More often than not one had to pour through completely irrelevant hits on the company’s search engine only to walk away without locating anything of value. Nortel employees working in offices throughout Asia in 1996 for instance, had limited access to information generated by employees in other regions. Even within Asia the practice of uploading data onto servers as a means of making documents available to others was uncommon, save for small software development teams whose work by its very nature demanded accessibility. File transfer protocol (FTP) servers was the closest anyone got to sharing data and these were often analogous to garbage dumps that were cleared periodically to free up server space. File naming conventions were absent, as was version control, and any other form of metadata describing individual documents.

Beyond FTP servers, emailing attachments was heavily relied upon to the detriment of increasing operational costs. Employees on occasion were warned by superiors- even as high up as region presidents- to pick up the telephone instead of emailing, as the costs for transporting megabytes of data throughout Asia were becoming exorbitant. A good PowerPoint package for instance could make the rounds of your inbox even as often as five times from five different sources. It was also a topic of amusement and debate that original work completed by an employee in one office (e.g. a newly created Excel model) would make its way across the CORWAN and come back several months later by email from another employee unknown to the original author. Sometimes authorship was even overridden and credit given to another individual who had simply adapted a few bits and pieces. This could be considered a form of internal plagiarism, save for the fact that the company theoretically owned the intellectual property. In other cases, information was emailed without an audit trail of recipients; there was no concept of privileges (save for hardcopy documents that contained a front cover distribution list), and “confidentiality” became a word that had different meanings to different people. In fact, releasing a document to the account team, independent of the level of security clearance placed on it, meant that it would end up in the hands of customers within days, if not hours, even if the contents had not yet been fully discussed internally. Stating that something was “confidential” was like placing a magnet on it for unauthorized disclosure.

On other occasions employees would receive large email attachments that had little- if anything- to do with their daily work tasks. As ‘downloading-on-demand’ was still unfeasible given the lack of infrastructure availability and adequate web training, broadcasting messages would ensure blanket coverage of the employee base and thus not miss any of the key recipients it was meant for originally. It was not on a few instances, however, that commercial Nortel product pricing lists (including margins and discount rates for different countries) would make the rounds of everyone’s email inbox. This was not only a careless practice but competitively foolish. The telecoms sector is a small world, many employees working at Nortel at the time, had extended family working in opposition vendors. Even worse was that this type of practice was never identified as strategically perilous by upper management.

At the time the typical departmental setting was one where the majority of working information was stored on local hard-drives instead of a common server with employees responsible for making their own back-ups of data. At Nortel Networks Wollongong key project member’s computers often fell victim to viruses or worms. And to make matters worse, as if the loss of files was not detrimental enough, back-up storage procedures for laptops and notebooks were non-existent. Project team members were often left scrambling to locate older versions of files to meet customer deadlines, on occasion losing days and even weeks of coherent work and research. Employees also required numerous passwords for a variety of applications, most of which would expire or be forgotten. The absence of a central login to company applications was always a contentious issue as company employees lost valuable time waiting for IT personnel to reset passwords when they could have been working on important documents for customer engagements. Smart card secure ID badges were even deployed to staff in 1997 for remote access but due to synchronization problems they were abandoned some time later.
THE PROBLEM OF KNOWLEDGE TRANSFER

The absence of a central portal for employees also meant that individual web-based applications were unknown unless the universal resource locator (URL) was launched via email or some other general communications forum. Different departments within the company may have had their own web pages but again these were inadequate, poorly maintained and updated, and had a very small audience with little or no access security on the intranet. Up until 1998, subordinates relied on the ingenuity, good name, and goodwill of their supervisors and managers to gather and socialize important information. For this reason, a good supervisor could fast-track your career giving you access to more. Other supervisors would hoard information, keep it to themselves for the purposes of self-promotion, and then tell their subordinates that they did not wish to overload them with unnecessary information. Employees in teams were expected to share their findings with one another in order to complete tasks but this was not always the company culture. It was impossible to know who the key experts in the company were for collaborating on projects, unless an employee was introduced by word-of-mouth or chain-style emails. To be good at one’s work, more often than not, meant that an individual had to have a good network of colleagues- knowing the right people could save you a great deal of time, not to mention raising the accuracy of the actual results or solutions proposed.

Expatriates were often brought in to enhance the transference of knowledge between Canada, the US, France and other more isolated or newly established regions like Australasia. But no matter how good and strong these internal networks were there was always a question mark surrounding the vintage of the information sent by key contacts. Was it the latest product information for instance? Was the plan-of-records (PoR) the most recently defined? There was not always enough time to check these very important questions- especially given the time zone differences between Asia and other Nortel offices. One had to go on what they had as it was better than nothing and at least more accurate than a guesstimate. Sometimes consultants were seconded to projects for a short time, their access to company information was even more limited, and so they spent time reinventing the wheel, separated physically from the rest of the organization.

Collaboration was mainly insular, within project teams, and there was no manner to denote who did what in the corporation. Even up until 1998, the online corporate directory only noted the employee’s name, telephone number, location, and reporting manager. Thus, the problems were not only physical in nature with regard to the CORWAN infrastructure but were application-centric as well. Simple Word documents like company policies were even difficult to locate on local servers. These factors altogether contributed to a loss of productivity and propagated inefficiencies across departments. The problem however was not isolated to Nortel Networks- all the other telecommunication giants were suffering likewise. Companies were struggling with how to manage “knowledge” in large corporations with complex product and service mixes. The answer was to evolve to a better working environment that took advantage of internet protocol (IP).

Doing business at web-speed caused dramatic changes not only to the way information was exchanged but to the way people themselves worked. At about the same time that Nortel merged with Bay Networks and announced the “right-angle” turn from circuit-switched telephony to IP, the company CEO John Roth, decided to invest in knowledge management (KM) to help facilitate the merger process, promote knowledge sharing among employees, encourage refinement of business processes through workflow management leading toward ISO9000 certification, offer a central login for employees, and assist in employee communications from the top down and vice versa. Roth was a CEO who sought opinions on particular issues directly from his employees. He purposefully showed by example, crafting global memos that were pages long of heart-to-heart reflection. He made employees feel special, even if they were grass-roots installers. If he shared his knowledge, the mandate was that employees should also. He urged employees to think together, and create an environment of openness to help win more business. His decision to implement Open Text Livelink fundamentally came from a corporate need to remain competitive, even though the decision to specifically purchase the Livelink system was decided on a golf course.

THE PROCESS OF CHANGE

Livelink did more than just enforce a technical change in infrastructure layout. It changed the way people worked and it challenged individual beliefs about ownership of information. The process of implementing a knowledge management system (KMS) was more than just about allowing the centralization of information and enabling the collaboration between individuals in different regions. It was to strike at the very core of departmental and global business practices. In fact, the implementation of Livelink coincided with the company’s efforts to attain ISO9000 certification for as many different functional areas as possible. Some departments, like the Network and Systems Solution (NSS) department in Asia, found the challenge almost impossible. There was no defined workflow to how employees in designated roles conducted their studies, and studies varied in time, size, complexity and resource requirements. Some employees continually insisted to work with local files and share only a selection of documents with their project team. One of the key architects in the NSS team in Wollongong believed that their sophisticated models, if placed in the wrong hands,
could have major repercussions on Australian business. He argued that his tools contained a great deal of sensitive
customer and proprietary information, and if used inappropriately would mislead other customers or give competing
companies unfair advantage. During the dot.com bubble, it was reported widely by the internal security team, that
industrial espionage was a common happenstance. This is at a time that Human Resources (HR) were on a recruitment
drive, offering between two and five thousand dollars for the successful recommendation of local scare talent. The
competition for knowledge, especially that implicit knowledge residing in the brain of an employee, was fierce.

Chief knowledge officers were appointed in departments as well as ISO9000 team leaders to help the process overcome
initial teething problems. However the use of an ISO ‘policeman’ in each department put some individuals in some very
difficult situations. Some employees clashed with the ISO mandate which made them automatically rebel against the use
of Livelink when in actual fact the two were separate requirements. More generally, there was resistance to change
toward Livelink, and it seems that this was primary due to the lack of information provided to employees before it was
rolled out worldwide. For instance, some employees complained that it was too time consuming to upload and download
relevant data from the KMS and have to record the adequate metadata for every single document. While other employees
saw the advantages of downloading-on-demand and the right to access useful information that could help make them
more effective employees. Chief knowledge managers for some of the larger departments were also appointed to promote
the use and benefits of Livelink but these employees were often ostracized by others who did not respect their work. Most
employees viewed these individuals as an unnecessary company overhead however, claiming that they knew little about
how the business worked and were restricted in what they could bring to teams as they were not involved in the initial
creation of knowledge. Subsequently, the perception was that the need for chief knowledge managers to come up to speed
meant that employees would be disrupted by incessant questioning.

There were a number of shortcomings related to the KMS in 2000 many of which were linked to the capacity for Livelink
to handle multiple file types, especially object programming code and geographic information systems (GIS) extensions.
Other problems were practical in nature, such as: where did the given department fit in the global organization structure,
how would the department segment their server space to provide a repository of information that was meaningful in
nature into the future, how could all the features of Livelink be utilized effectively etc. Timely training of how to use
Livelink was also lacking and many of these courses came post-implementation. Colleagues first heard about Livelink
through the grapevine, in an almost organic fashion, but when some groups had access and others did not it became a
little confusing. The phased deployment plan was never communicated properly to employees, if at all, in some lines-of-
business (LOB). Livelink definitely required top-level management support but even with this backing it still took some
time for the skeptics to be converted. In essence nobody was saying that files could not be saved locally but that all
working files had to uploaded in a timely manner. When it came to deciding what kind of sensitive data/models to upload
and who could and should be able to view it, there were some interesting confrontations. In essence key personnel who
were experts in a given area and were generating their own models to support their work tasks, did not wish to give up
what made them special for others to easily mimic or learn from with time. There continued to be some resistance until
these same employees began to use access privileges for their uploaded files and essentially block everybody but
themselves from using particular files. This was not in the true spirit of the KMS but at least this promoted another level
of back-up storage. The facility for a personal (i.e. private) workspace on Livelink was available but few took advantage
of it, opting to place work documents on the enterprise workspace or store things locally.

**ENTER A KNOWLEDGE INFRA-“STRUCTURE”**

For some departments, the KMS was the answer to gaining timely access to internal and external intelligence information.
For other departments, the KMS would help them in their quest to raise their profile by providing an avenue to showcase
their work. But before launching any such site, groups had to work together to map out the layout and structure of their
virtual space on the KMS. This was not an easy task especially for those who had been working with ill-defined processes
in the past- they were not embarking on building a pretty web site but to some degree on aiming for best practice. The
initial brainstorming period raised questions about how work was being carried out, the type of work being completed in
some departments, and the level of quality and quantity of work being produced in other departments. In effect, this gave
birth to project management demands in the company, and encouraged visibility and transparency throughout the
organization.

The knowledge infrastructure did not appear overnight. Groups worked for weeks and in some instances, months, to
define what they believed would be a “future-proof” layout. After all, this space was to be the interface between them and
the rest of the Nortel world. For the NSS team, this required a lot of collaboration, consultation, and reviews (exhibit 1). It
also had to be decided which documents, past and present, would be ported onto Livelink, how this would be done, and
who would have the responsibility. In the end the manager and chief knowledge officers did the great majority of this
work, believing in the system, and made it voluntary for other employees in the team to follow suit. It took some months
before the whole group had bought-into the idea but the group finally was proficient at using the KMS. During projects only the crucial documentation would be uploaded to Livelink and the URL shared with other collaborators. At the conclusion of projects, all the inputs, processing, and outputs would be uploaded to Livelink. For the NSS team, it was hoped that one day they would be able to use the KMS to automate their Bill-of-Materials (BoM) sheet for customers’ Request for Quotation (RFQ). The proposal was to create Adobe PDF forms for “inputting” and use extensible markup language (XML) to facilitate the end-to-end calculations in Microsoft Excel or Access. In this way it was hoped that reusable content and repeatable processes could save employees time and allow them to take on more projects than in the past, as well as decreasing their time-to-market (TTM). The idea was to be able to source data that was usually all over the place (in essence distributed), and to put it into some structured context, where it had an invaluable role. Too often market researchers and financial analysts in the corporation would spend hours if not days searching for the right value-the KMS was about to change things.

Exhibit 1. The Nortel Networks Livelink Portal in 2001

Initially only a small number of features were being used on Livelink from those available. For example, although it was possible to “check-in” and “check-out” documents, hardly anyone ever did. This would have ideally suited employees who were using databases and financial systems. Employees could also take advantage of creating metadata for their documentation or define access privileges but very few ever did. Naming conventions were specified, usually at the department level, but some documents complied while others did not. In brief, those practices that were pre-Livelink were difficult to break after the implementation of Livelink, although bit-by-bit, change did occur. For example, in the NSS team, filenames were made up of country telephone area codes, the type of task, the initials of the author and a date and version number. Livelink also allowed for the creation of workflows for specific projects, allocating tasks and their duration, and other dependencies. It was not that the feature was not useful but that project management skills were lacking.

To some degree, the majority of the corporation was using Livelink as a Document Management System (DMS) in the beginning, but this changed as time went on and new applications were specifically created to help the employees of the corporation communicate and collaborate better. The notion of virtual teams became prevalent around 2000, and this is when the KMS became very important. Customers also, for example, were given access to an extranet space in Livelink where they could upload and share files with their supplier. Account teams also made use of this capability to gather as much intelligence from clients and provide commensurate returns to them with product knowledge that was not accessible to the public via www.nortelnetworks.com. Livelink helped consolidate and strengthen business relationships. Within six months of its introduction the benefits of the KMS were evident. Remote dial-up access users especially found it much easier to send around a URL embedded in an email than having to wait over one hour to attach a file to an email and then send it to a list of recipients. It saved time and made employees more productive. One manager even credited the KMS to
a growth in the number of patents generated by Nortel Networks. In the past the organization was very customer responsive at the expense of their knowledge creation—Livelink facilitated this business process (Perna 2001).

KNOWLEDGE MANAGEMENT APPLICATIONS

By the end of 2000, the knowledge management system was increasingly being touted as Nortel’s most important corporate tool. It not only brought teams closer together that were previously geographically disparate but it formed the basis for the launch of the company’s key communication and collaboration applications including: WorldOnline, StrategyNet, Market Research, Service Provider and Carrier Information (SP&C), Sales.com, Database Marketing Services (DMS), Corporate ID, Organization Structure, PeopleSearch, Building Locator, EmployeeConnect, CareerNet, Employee Training and Development, Information Services, Meeting Manager, Purchase Online, Travel Online and Stock Price, among others (exhibit 2). WorldOnline let the CEO directly broadcast multimedia messages to all the employees in the corporation. Employees could watch the broadcast live, or download a broadcast using Media Player. WorldOnline also reported the latest customer wins, highlighted key account and product strategies, and identified key employees and groups in the corporation. There were also a number of applications that supported sales-technical and marketing activities including Sales.com, SP&C, Market Research, and StrategyNet. Employees could use these portals to search for information about products, target markets, client backgrounds, and business case examples from across the globe. This knowledge empowered individuals and groups to produce higher quality output.

Although some would argue that it was information overload at times, this was better than days gone by, when no data whatsoever was available. The assumed information overload problem could also help employees by allowing them to compare facts from a variety of sources, and grant them the ability to make a decision on which data was the most useful for a given project. Employees could also quickly ascertain who their counterparts were in other regions and who would be a likely collaborator for advice on technical matters. While collaborative tools like MeetingManager and NetMeeting were not a consequence of Livelink, they were taken advantage of more, because employees were made aware of their services via the KMS. The applications were paramount to those employees who made use of them every single day and multiple times a day. Livelink had become so embedded in practice that when the Code Red worm infected servers it knocked out two days of productivity for most groups. Without access to the KMS, people could only use the telephone to communicate (if they had the name of the person they wished to contact), read printed matter and or use electronic resources on their local desktop.

Exhibit 2. A Collage of Nortel Networks Knowledge Management Applications

Although some would argue that it was information overload at times, this was better than days gone by, when no data whatsoever was available. The assumed information overload problem could also help employees by allowing them to compare facts from a variety of sources, and grant them the ability to make a decision on which data was the most useful for a given project. Employees could also quickly ascertain who their counterparts were in other regions and who would be a likely collaborator for advice on technical matters. While collaborative tools like MeetingManager and NetMeeting were not a consequence of Livelink, they were taken advantage of more, because employees were made aware of their services via the KMS. The applications were paramount to those employees who made use of them every single day and multiple times a day. Livelink had become so embedded in practice that when the Code Red worm infected servers it knocked out two days of productivity for most groups. Without access to the KMS, people could only use the telephone to communicate (if they had the name of the person they wished to contact), read printed matter and or use electronic resources on their local desktop.
THE EFFECTS OF DOWNSIZING

In 2001, after dozens upon dozens of acquisitions, the company began to downsize as a direct consequence of the dot.com crash. At the time the share price of the company had reached some seventy-five US dollars at its peak, and at its lowest fell to below one US dollar. The regime to downsize, in some cases meant that whole departments were made redundant, irrespective of the top talent within it, and this had a major repercussion on the value of the KMS in the organization. Members from one school of thought could argue that the introduction of Livelink was “just-in-time”, that it had taken root as an important tool before the downsizing was announced. Members from another school of thought could argue that the value of the KMS decreased after the rapid downsizing measures were enacted. Independent of the view taken the reality was that the KMS did help to retain corporate knowledge but it did not do so without end.

The challenge for those still employed by the company was first to know about the knowledge (in some instances it had been made private or read access only), and second if obtainable to know what to do with the information and how to use it. While some documentation was still used after the departure of the document creator, in most instances, employees still employed by the company felt they had to generate a lot of new material. In Nortel what became clear was that there was an intrinsic link between knowledge management and collaboration; take the collaborator away and the knowledge available to you lessens in worth significantly. The company continued to take drastic downsizing measures from 90,000 employees in 2001 to some 30,000 employees in 2004. Having cut about 60,000 jobs in three years the KMS could no longer expect to work miracles. The KMS once alive and used by so many, no longer had the same number of employees “feeding” it with information. Some employees, desperate to remain employed, even retreated to pre-Livelink practices, refusing to share their information with others, hoping that that would maintain their employability through the downsizing trend.

CONCLUSION

The value of knowledge management to large multinational corporations is undisputed. KMS is integral in organizations today that work at web-speed and require the creation of virtual teams who rely on reusable content and repeatable processes. However it needs to be emphasized that a KMS is not just a technology that can be implemented and can succeed on its own. It is people who will ultimately drive its success or failure. If used correctly the benefits are manifold including a dynamic working and learning environment that fosters information sharing and new value creation. Knowledge management helps employees build a collaborative culture, and create and extend their own personal business networks. Indeed there is a social side to this e-business solution. At no other time does this “socio-cultural” phenomenon become most obvious than when it is disrupted by necessary corrective actions to an organization’s size. In the case of Nortel Networks employees, it was wonderful to share and create together until the threat of redundancies loomed and subsequently affected social practice. In times of downsizing the “one big happy family” culture is quickly overtaken by the “everyone for himself” reality and this has the effect of stifling the value of a KMS in the short-term, especially as employee morale is generally low during these times of substantial change. It does not mean that the KMS loses its value completely, to some degree if becomes increasingly important because there are less heads working together to solve the same number of problems. As the organization again reaches equilibrium the KMS can be used as a catalyst to re-build, re-create, and re-store.

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