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Managing Knowledge in Electronic Commerce Era: A Case Study of an On-Line Learning Centre

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Abstract:

Recent academic and managerial interest in electronic commerce activities has created enormous interest in the world of information technology and in many other industries. Hence managers are facing new challenges. One such daunting task is the ability to manage knowledge as knowledge can be exchanged or transferred on Internet or Intranet without physical contacts or time-bound. In order to understand some of the key human resource issues related to organizing global knowledge in the electronic commerce context, an exploratory case study was conducted. One of the key findings from this case study is the recognition that HRM will play a new dual role in organizing global knowledge sharing in the e-commerce era, One is to continue dealing with traditional administrative transactions; and the other is to nurture knowledge-related activities. This contradicts the simplistic prescriptions about managing knowledge which suggest that the implementation and utilization of a particular IS system are all that is necessary to facilitate effective knowledge sharing. Instead, this exploratory case study shows that successful knowledge sharing is dependent not only on the use of particular information technologies but also on the successful creation of a knowledge-sharing environment with a KM-focused HRM as the coordinator of related activities.

Keywords: E-commerce and Knowledge Management

1. Introduction

Electronic commerce ('e-commerce', hereafter) is associated with technology as an enabler, facilitator, and even inhibitor of business activities both within and among all types of organizations (Applegate et al., 1996). It is thus creating enormous interest in the world of information technology as well as in many other industries. There is little doubt that the growth in this area will continue as more organizations are joining the festivities, establishing and cultivating business relationships, performing business transactions, distributing business knowledge, and implementing competitive strategy (Applegate et al., 1996). Developing new business strategies has now become one of the most important challenges facing organizations in the era of e-commerce (Bloch et al., 1996). One such daunting task is the

ability to manage knowledge as the knowledge can be exchanged or transferred on Internet or Intranet without physical contacts or time-bound (Berthon et al., 1998).

Knowledge has been identified as one of the most important resources that contribute to the competitive advantage of an organization (Grant, 1996). This has led to a number of studies that have attempted to understand how organization explores and exploits knowledge (Leonard-Barton, 1992; Nonaka and Takeuchi, 1995; Grant, 1996). Despite the popularity of the notion of organizational knowledge and knowledge-intensive organizations, relatively few studies have provided empirical insights into how companies manage their employees through the interplay between organizational context and information technology (Starbuck, 1992), especially in the e-commerce context. Instead, some of the existing knowledge management (KM) literature has engaged in ontological debate about the nature of knowledge and therefore tends to promote particular approaches as universal panaceas. More specifically, with the development of KM study, there has been a massive outpouring of articles and books dealing with these issues from a prescriptive standpoint. Their relatively weak empirical base notwithstanding, many of these contributions confidently define organizational knowledge as a kind of economic asset or commodity, or as a purely cognitive phenomenon (Pan and Scarbrough, 1999).

Thus this study has selected ChemCo¹ for an in-depth study by addressing the gap between conceptual research and organizational practice. It aims at highlighting the HRM dimension through demonstrating the temporal interplay of three key factors proved critical in ChemCo' global KM (an On-line Learning Center) initiative (1996-1998), namely, training and performance measurement, rewards and incentives, and a new role for HRM. The paper is arranged as follows: the first section will review related literature. In the second section, the research methodology will be presented. Followed by an introduction of the case company, and findings from the data analysis by examining the development of an on-line learning center. This section will highlight the carefully managed interplay between KM-focused HRM and knowledge management tools developed at ChemCo. Finally, three lessons that were learned from the case findings are shown.

2. A Review of Related Literature

KM has enjoyed a rapid growth in the 1990's (Brown and Duguid, 1991; Nonaka and Takeuchi, 1995; Bouwman and Nouwens, 1999; Pan and Scarbrough, 1999). In the existing literature, there is certainly no shortage of opinions and theories about KM. The field of KM brings together a range of different issues, including the economies of knowledge (Drucker, 1992; Handy, 1989, 1994; Peters, 1993), the emergence of knowledge as an important resource (Grant, 1996; Drucker, 1992), learning (Senge, 1991), cognition (Spender, 1996; Walsh and Ungson, 1991), the taxonomy of knowledge (Polanyi, 1966; Nonaka and Takeuchi, 1995). While the field continues to show progress in understanding the nature of KM, most of the existing studies suffer from un-integrated efforts that are the result of "methodological manoeuvres institutionalized into the contemporary analysis of organizational knowledge" (Spender, 1996: 66).

In the context of e-commerce era, the existing literature has shown that the focus of KM studies has moved from knowledge to the process of knowing activities taking place in virtual

¹ Note: ChemCo is a pseudonym; all names have been changed to ensure anonymity.

communities (Brown and Duguid, 1991; Nonaka and Takeuchi, 1995; Bouwman and Nouwens, 1999). Particularly in these days when information technology has facilitated the formation of many virtual communities (Bloch, et al, 1998), it is worthwhile examining KM in the context of e-commerce, involving the use of information technologies.

In addition, as we can see, very few studies to date have examined the so-called 'knowledge-intensive organizations' (KIO). Even in some of the rare cases, they are often described as organizations staffed by a high portion of highly qualified staff who trade in knowledge itself (Starbuck, 1992; Alvesson, 1993). We know comparatively little about the actual organizational processes through which knowledge is valorized in competitive outcomes (Huber, 1991) using advanced technologies in a global manner. At the same time, the absence of an understanding for managing knowledge workers on a broad, global and relevant basis becomes an increasingly critical problem for managers. In particular, the details of a KM-focused HRM are rarely discussed in existing studies. This is perhaps due to the general lack of empirical studies of knowledge management (Leidner, 1999).

Against such backdrop, this exploratory study departs on a perspective that has been previously suggested by Scarbrough (1999a: 7) in describing the nature of knowledge work. According to him, "knowledge work is less a matter of the application of predefined expertise and more a joint product of human interactions with informational and intellectual assets delivered through information and communication technologies (ICTs)". Therefore, in this research, processes of KM are integrated into the fabric of the organization, thus requiring a conceptual shift away from the traditional view of the firm. As such, traditional managerial activities which focus on the improvement of human relations, communications, group and team processes, performance evaluation and improvement now take on new interpretations and meanings due to the employment of electronic commerce, thereby re-conceptualizing the role of human resource management (HRM).

Thus, the case study aims at demonstrating the development of an on-line learning center being part of a much wider debate about the shifting demands of the importance of knowledge and sources of competitiveness in the era of electronic commerce. Such belief is reflected in the current interest in KM which has raised a number of questions about the ways that ICT and knowledge workers are managed. From a case study of a distinctive practice whose purpose is to facilitate knowledge sharing and learning for competitive advantage,

3. Research Design

The paper is based on a detailed case study of ChemCo. The research adopted a retrospective approach. The main fieldwork was conducted on-site at ChemCo' corporate headquarters, with semi-structured interviews carried out with the most knowledgeable managers (Huber and Power, 1985) and informants. Informants were encouraged to express in their own terminology and experiences. To provide a managerial perspective as well as an holistic organizational perspective, the researcher formally interviewed 12 top managers (including the Chairman and Chief Executive Officer of the company) and 38 other employees. The range of interviewees covered the different actors and management levels involved in the development and implementation processes.

Observations of meetings, training classes and individuals at work were also made throughout the study. The field notes from these observations were used to verify or elaborate the

interview data. In addition, access to the case company's intranet was gained. The company supplied a laptop, allowing observation of knowledge transfer in real time during the site visit. More than 50 on-line discussions over global knowledge management issues were also carried out with employees from Europe, Asia and Latin America to provide insights into the complex cross-cultural social and technical issues around managing global knowledge. In addition, eight KM related meetings were attended and observed. Five telephone interviews and over 200 electronic mails interviews were conducted to collect and verify data. The technical details of the knowledge sharing systems were provided mainly through archival data. Documentary evidence permitted cross-checking of much of the interview materials. It was possible to control reliability of the managers' recollections on technical and other details by comparing them with internal documents. Interpretation of empirical events was furthered through discussions with the other members of the research group and several knowledge management researchers and practitioners outside the case company. The use of externally oriented articles provided yet another possibility to triangulate the validity of the interview data. In addition to interviews, observations, archival material and supplemental data collection and member checks were applied. Specifically, archival data was collected in the form of newsletters, handbooks, vignettes, and instructional videos produced by ChemCo or from information held on ChemCo intranet.

From a case study of a distinctive organization whose purpose is to facilitate knowledge sharing for competitive advantage, this study has selected ChemCo for an in-depth study by addressing the gap between conceptual research and organizational practice. To provide a managerial perspective as well as an holistic organizational perspective, the researcher formally interviewed 12 top managers (including the Chairman and Chief Executive Officer of the company) and 38 other employees. The range of interviewees covered the different actors and management levels involved in the development and implementation processes.

4. Case background and analysis

ChemCo is a \$300 million chemical company serving industries in 102 different countries selling 1,000 different specialist chemicals. It was established in 1945 as a manufacturer of specialist chemicals for aqueous industrial systems. Triggered by increasing external competition in 1989, the management decided that knowledge would become the foundation of the company's competitive edge. Three years later, the implementation of the K'Netix® knowledge network marked the realization of the organization's vision.

By 1993, for a total of US\$75,000 per month in access charges and an IBM ThinkPad 720 with a modem, all ChemCo employees could make a single phone call that to establish a point-to-point with headquarters and provide necessary access to global information services. Based on the concept, K'Netix was introduced with seven forums (three customer-focused forums and four regional-focused forums) established to co-ordinate ChemCo's on-line conversations.

In 1996, apart from continuously providing infrastructure for systematic knowledge sharing, the ChemCo management decided to create a multi-lingual, on-line Learning Centre for human resource development (HRD) as part of the KM-focused HRM strategy. Building on its maturing ICT platform and knowledge-sharing environment, the company began experimenting in 1996 with Lotus' novel educational product LearningSpace™. This

allowed employees to increase their knowledge through Intranet-based learning and training. It also helped to keep track of customer service calls and needs.

Prior to this experiment, ChemCo had produced computer-based training (CBT) programmes to provide self-paced, anytime, anywhere course materials to their employees in 1992. These programmes were produced on a course-by-course basis. In 1995, the Distance Learning Team was formed to expand and centralise distance learning efforts. This group laid the foundation for the ChemCo Learning Centre, which was set up to co-ordinate the delivery and administration of electronically distributed educational and training programmes for the personal and professional development of employees. It encompasses learning opportunities ranging from short training courses to advanced academic degrees.

The original purposes behind ChemCo Lab's distance learning efforts included the need to reduce the duplication of training efforts among technical experts and the need to make training consistent across associate companies. The use of CBT to train employees has provided the company with a sales-force that is better prepared to solve customers' problems. It has also:

- enhanced learning/training opportunities;
- reduced training time for new recruits;
- empowered employees to engage in personal and career development;
- created a knowledge advantage over competitors;
- produced a value added benefit to sell to customers;
- ensured globally standardised training;
- reduced time away from customers.

(Source: Internal Document -1997: 3)

In order to deliver these benefits to employees, the development of the ChemCo Learning Centre was linked to three primary goals. The first was to provide a co-ordinated training and development function within ChemCo. The second was to leverage the available technologies to deliver training and development efforts in a cost-effective way. Thirdly, the Learning Centre was to play a critical role in keeping employees up-to-date with their profession (Ellis, 1998). To make the objectives of the centre clear, a mission statement was created which focused on the success and development of employees:

“The ChemCo Learning Centre will support the corporate mission by delivering, developing, and facilitating world class training and educational opportunities, when and where they are needed. We will empower employees to manage their personal and career development, create competitive market advantage and engage customers with our products and services.” (Ellis, 1998: 190)

One of the key elements in establishing the Learning Centre was the use of ICT for global information and knowledge dissemination. The use of computers in employee training and learning is considered by some researchers as both cost-effective and a powerful learning method (Whalen and Wright, 1998). The choice of ICT for the Centre has implications for the cost and convenience of the existing Intranet system. According to one computer engineer at the Centre:

“Because the responsibility of the learning Centre is to provide and deliver learning opportunities, the infrastructure should be built

alongside the existing system -- that way it could ensure minimum systems training and time spent on design and technical issues.”

As a result, tools such as Lotus’ Domino™ and Microsoft’s FrontPage™ were used to facilitate design and content modification. The decision to use these particular forms of software was also driven by the central belief that in using information technology, content and learning objectives should drive the technology employed, and not vice-versa.

Once the choice of software was made the Learning Centre project team had to decide on the issue of delivery options. The team had to choose between asynchronous, synchronous and instructor interaction. The key factor in making this decision was the type of content that was to be delivered. As the Learning Centre put it: “Given the dispersed nature of our employees, our bias has been the choice of asynchronous delivery tools over our corporate Intranet”. Asynchronous Internet-based training was selected and facilitated through the use of tools such as Lotus Notes and LearningSpace Learning within the environment of virtual collaboration. The cost and speed of distribution are always important issues in relation to virtual training delivery. According to one computer engineer, the main advantage of using asynchronous Internet-based training, since many of the courses offered are text-downloaded asynchronously, is that it tends to use less access bandwidth than the real time instruction approach. On the other hand, real-time communication requires more capacity. The bandwidth availability required by offering real-time courses may also limit the type of courses to be offered. Another reason for not choosing the real-time option is that it would restrict the availability of employees for training.

In 1998, although the scheme was still in its very early stages, more and more ChemCo employees were signing up for the virtual Learning Centre courses. The Centre has begun to provide continuous training and learning for the CoPs which form around issues and then disband when those issues are resolved. It is widely believed at ChemCo that all future training of virtual workers working in a knowledge-intensive environment is likely to be conducted via Internet-based or other computer-based alternatives.

5. On-line Training

As already mentioned, one major task of the Learning Centre was to provide job-related training via the company’s Intranet. Some employees regarded this as a natural development:

“An evolutionary step from traditional training departments is the growing realisation and acceptance that learning need not happen in a centralised location in front of an instructor.” (Director of the Learning Centre)

Not only did the sales employees welcome the initiatives; non-technical staff members were also excited, as they had not previously been offered any opportunities for further learning. As one non-technical associate commented:

“For non-sales employees learning is left to ourselves. I have not in five years been on a further training or education course specific to my job funded by ChemCo. This may be available if I asked, but I have never been informed of a further education programme being available to employees. To support the front-line I do ensure I read

and learn, as much as time allow, information on new products new applications etc, and regularly read forums to gain knowledge by osmosis. This on-line learning is a great news for me.” (Internal survey, 1995)

Despite the groundbreaking efforts in establishing on-line learning and training programmes, not all ChemCo employees were convinced by the function of the ChemCo Learning Centre:

“We need to do a better job of hands-on learning and ‘mentoring’ in field applications. All the access in the world won’t help if the representative does not know what question to ask.” (Internal survey, 1995)

To address some of the concerns relating to the establishment of the new learning centre, it was made clear to ChemCo employees that the philosophy of the Centre went beyond the traditional notions of classroom and teacher. It was developed as the organization’s response to changing external circumstances as well as being part of the continuous global knowledge-sharing initiative. As the Director of the Learning Centre explained:

“The ChemCo Learning Centre is founded on two basic strategic assumptions. First, that ChemCo’s competitive advantage resides in the collective knowledge of its employees, and second, to sustain that advantage the company must invest in the skills and competencies of our employees.” (Director of the Learning Centre, 1998)

Still in its very early stages, the ChemCo Learning Centre’s efforts have been focused upon increasing the knowledge content resides within each associate. In particular, the focus of the Centre was on researching and acquiring the necessary training materials. To that end, since 1997, ChemCo Learning Labs has been working with content providers such as universities from specific geographical areas to enhance the flexibility of its training courses. As one manager at the Learning Centre noted:

“We’re also offering the ability for our translation group to partner with certain content providers to actually translate their existing content and the determine how we could, how we could barter that service back into advantages for the content provider as well, because then, we could effectively provide them a translated copy of their material and expect something in return.” (Manager of the Learning Centre 1998)

The content provided was drawn from some of the best universities in the world as well as from custom-designed tools to help with employees’ day-to-day duties. Content and direction were driven by the needs of ChemCo employees:

“The current goals include fully automated on-line administration of all training within the world-wide company, full language translation (into English, Spanish, Portuguese, French, and German), personalisation of curricula, skill set gap analysis, etc. As this is a new venture, we are still in the process of formulating many of our long-term goals.” (Informant from the Learning Centre, 1998)

The continuous strategic use of collective knowledge and the Learning Centre has certainly been a remarkable educational achievement. According to the Director of the Centre, as a percentage of total personnel, the number of employees with a college degree increased from 39 per cent in 1980 to 73 per cent in 1997.

6. Slowness in Deploying a Systematic KM-focused HRM

Despite ChemCo's concerted efforts to provide HRD activities on-line, the need for innovation in systematic/organization-wide KM-focused HRM – involving the design of new training programmes, performance evaluation and reward systems, and the introduction of knowledge leadership – soon become apparent. This was clearly evident in a comment made by one sales person in an internal survey:

“The training has in the past been given by KTD, who do a good job at the ‘this is how it works’ approach. But we need to focus much more on what benefits can be obtained from sharing knowledge. One option might be to train a few sales people, let them be involved in documenting the benefits, using case history data in the training materials etc and selling the KM concept to the rest of the sales team, using KM department as training facilitators.”

Part of the call for a systematic KM-focused HRM was the need for a reward and incentive system. Since 1992, ChemCo has occasionally introduced incentive programmes to build enthusiasm and momentum around the principles of KM. When KM was first introduced in 1992, as indicated earlier, there was some resistance towards the initiative. One of the possible reasons for this was the lack of employee motivation. The main source of the problem, as explained by one R&D scientist, was the fear of job insecurity in relation to the sharing of personal knowledge:

“Compensate the experts to give their knowledge to others. Where is the incentive for the experts to give their knowledge to others and then be replaced by computer data in the future! They are not going to participate and cut their own career.”

To overcome this, a series of innovative approaches was used to encourage participation. An example was provided and explained by a former forum specialist: “there was a sense of resistance in the beginning, what we did was to mix a reward-and-punishment approach”. Accordingly, a number of incentives were offered at the level of the individual, for instance:

“Once in a while, we gave out monetary rewards (\$50) for our Latin employees for their contributions in knowledge sharing. With the culture there, US dollars are always an incentive. Together with certificates, the monetary rewards were considered as successes, and it was later observed that participation in knowledge sharing there has gone up.”

Although ChemCo does not offer regular financial rewards for posting knowledge, selective rewards have been utilised from time to time. For example, a one-time event at a fashionable resort was arranged for the 150 employees who had contributed the most widely used knowledge. At this event, employees helped to shape the future of the KM initiatives. Those

chosen received new laptop computers and participated in a number of KM-related discussions. However, this less than scientific approach to taking decisions met with some criticism:

“There was a lot of resentment in the company about how people were chosen and what was going on. That lasted and is still present and so I think there’s still a lot of resentment toward KTD just for that reason. You know, because everyone who was there got a brand new computer was rewarded and recognized. I think in some ways the resentment kept people from participating later.” (Marketing manager)

Although some of those not included in the event felt disappointed and unhappy, the overall level of participation in the knowledge-sharing forums rose immediately. At the same time, the ‘punishment’ component became more subtle but even more persuasive. For example, during the early implementation period of K’Netix®, top management wrote to employees who did not participate in the sharing activities. The management asked why they did not wish to contribute, stressing that previous ways of working were becoming defunct and that change was necessary to secure the organization’s future success. Some of the reasons cited were related to being uncomfortable with technological changes and job insecurity issues. These concerns were taken aboard by the top management and played a big role in their subsequent development and implementation of KM-focused HRM.

While recognizing the importance of having a systemic evaluation and rewards system and performance measurement system for knowledge sharing, ChemCo did not begin to consider such needs seriously until 1997. The issue of knowledge worker performance measurement remains one of the most important yet least developed aspects of ChemCo’ efforts to organize knowledge sharing. As one informant explained:

“We are just now (after seven years of implementing knowledge sharing) in a process of developing standardized job profiles for all of our employees which all contain a list of performance skills in addition to whatever other ones they need in their particular positions.”

The slowness in developing a systematic KM-focused HRM was due to the fact that ChemCo management initially felt that focusing too much on knowledge itself might actually hinder the normal process of knowledge dissemination, according to a VP-HR. In order to avoid that, “a valuable alternative implemented is the measurement and monitoring of both the process improvement and related outcomes”. However, this proved to be insufficient as more and more employees were expecting clearer performance measurement details.

When ChemCo embraced the concept of KM in the early 1990s, top management knew it would take more than sophisticated technology and leading-edge software to promote coherence and ensure success. To be precise, managers at ChemCo believed that it would take the following three key factors to implement KM successfully: advanced KM systems and tools, continuous cultural change, and KM-focused HRM. These knowledge sharing initiatives were both planned and allowed to emerge over time, thus allowing sufficient flexibility to respond to unforeseeable changes in the internal and external environments.

Based on the case findings, the following section aims to draw out some lessons that could have future implications and worthy of future research.

7. Lessons Learned: Towards a New Role for HRM

In view of the trends toward virtual community-based organization and human-centred implementation of KM, HRM at ChemCo has moved increasingly towards playing a co-ordinating role in aligning knowledge activities behind common purposes, norms and values. Co-ordination, in this study, was found to have been achieved through mutual adaptation among members with common knowledge and shared implicit 'coding schemes' accumulated through interactions (Lam, 1997).

Our interpretation of ChemCo's experience in organizing its learning center raises several interesting future research implications for other organizations. In the following section, the study aims to present descriptive findings on the lessons learned and provide a number of possible questions for further research in this area. The lessons learned from the case study are: the provision of training and performance evaluation, rewards and incentives, and the new role for HRM.

8. Training and Performance Measurement

One of the major requirements for an effective development of a KM-focused HRM is related to the training and performance evaluation of knowledge workers. Traditional organizations have considered training as an expense to be minimised. This is also the fundamental reason why organizations generally prefer to hire ready-trained workers rather than provide training themselves (Lynch, 1994; Stern and Ritzen, 1991). However, as the nature of work-related knowledge becomes more fluid, organizations have no choice but to take training needs more seriously. In order to become more efficient in providing training for employees, more and more organizations are beginning to adopt the strategy of just-in-time learning via the Internet or Intranet (Stern, 1998).

With the trend towards providing flexible training using ICT, HR managers are likely to take on two additional training responsibilities in managing knowledge workers: to provide training in an on-line knowledge-intensive environment and provide KM-focused HRM activities. Brown (1984), for example, emphasises the key role of HR specialists in new interpretative communities through the provision of training experiences that can develop the ability to contribute to constructive knowledge sharing. This implies that training is to be provided on-line in and across CoPs. In other words, it suggests that knowledge should be acquired when and where it is needed. In this regard, in addition to the traditional distance learning concept, a number of emerging practices in promoting just-in-time learning are now being adopted by organizations, including: cross-training by co-workers, job rotation, suggestions systems, skill-based pay, and formal or informal groups (Stern, 1998). The last two practices are particularly important in the case of ChemCo's own experience in developing its on-line learning centre.

Another immediate implication for HRM is the adoption of KM-focused training and personnel development. In terms of knowledge-sharing training at ChemCo, HR personnel were left out of the decision-making and implementation process almost entirely, at least in the initial stage. Most KM-related training was left to the KTD Department. Only recently

(1998) did HR personnel begin to work with KTD personnel in developing training materials for knowledge sharing as well as for other job-related training. This involves allowing greater flexibility in employees' use of time so that they can adjust to the new technologies of KM tools. For example, employees are encouraged to learn how to use the ICT-based knowledge transfer system, to understand the system's short-term and long-term benefits, and to review its effectiveness, e.g. in terms of facilitating knowledge sharing.

In fact, the lack of systematic evaluation and expectation of employees' participation in knowledge sharing is one important reason why ChemCo did not become a truly knowledge-intensive firm earlier. Among the obstacles to such an innovation, one key factor was the nature of a knowledge worker's job, which is extremely varied, complex and often highly individualistic. However, in due course, the company appreciated that, given its reliance on the contributions made by knowledge workers, meaningful performance measurement through qualitative practices was essential as a mechanism for motivating their work and facilitating knowledge sharing in the CoPs. The qualitative practices include a number of contributions to internal base practice databases, internal coaching and mentoring, effective team-working and team development, and product innovation. In this way, skill- and knowledge-based performance evaluation systems, which are a major departure from traditional HRM practices, have become the core of the performance evaluation system at ChemCo.

9. Rewards and Incentives

Any discussion of the issue of performance measurement inevitably requires an examination of the use of rewards and incentives. In general, the rise in the number and importance of knowledge workers is changing the balance of power within organizations and creating new tensions and responsibilities between management and knowledge workers. In this case, ChemCo employees no longer work only for financial incentives and packages. Instead, the notion of incentive-based knowledge sharing has been implemented as part of the company's knowledge-sharing culture.

Since the beginning of the implementation, ChemCo managers have been using "creative incentives" to encourage knowledge workers to participate in knowledge sharing (Matusik and Hill, 1998: 694). Usually these have been in the form of compensation and rewards and have been linked to the factors that help to improve the level of participation within the organization. Use has also been made of one-time rewards. For example, in 1994, 150 ChemCo employees were selected to participate in a meeting held at a holiday resort in USA, and they were all given new laptop computers to encourage their active participation in sharing knowledge. The use of creative rewards and incentives was arguably more a symbolic recognition – a 'culture-guiding device' – than a reward aimed at directly influencing behaviour (Scarbrough, 1999).

While the use of rewards was recognized as an effective management tool for the encouragement of key knowledge-sharing behaviours at ChemCo, it was also seen to be double-edged. This is because it generated resistance among some employees, particularly since it was linked to explicit sanctions for those who were less willing to co-operate. Despite the difficulties, however, the reward practice at ChemCo has succeeded in establishing the principle that employees should be rewarded according to their knowledge contribution instead of their formal job titles. This has undoubtedly provided concrete incentives for

ChemCo employees to share knowledge within the organization. However, the use of rewards and incentives has been sporadic and ad hoc rather than systematic.

What the study suggests is that the use of incentives and rewards in organizing knowledge sharing needs to be part of a comprehensive knowledge culture-building effort. It is extremely important to create a context in which knowledge sharing is encouraged or even demanded. There is therefore a need to foster a climate in which there is a powerful social obligation to share. Ultimately, it is HR's task to provide appropriate training, both technical and non-technical, for knowledge workers. It is clear from the case study that knowledge-based compensation and reward designs focused on challenges inherent in the nature of knowledge work while ensuring that monetary rewards and their administration never became an issue for knowledge workers. Thus, the new focus of compensation in organizations needs to shift from old organizing models to new ones that are tailored to the exigencies of knowledge work (Despres and Hiltrop, 1996).

10. The Development of a KM-focused HRM

Finally, as far as developing a KM-focused HRM is concerned, there can be no doubt that the management of human resources and competencies is a crucial issue in organizing knowledge sharing. Keegan (1998) used a detailed study of people management in a knowledge-intensive firm to demonstrate that traditional HRM practice prescription does not fit the needs of knowledge-intensive firms. The case study findings support Keegan's findings while adding that a KM-focused HRM is probably best developed after the initial stages of the knowledge-sharing system have been implemented.

In the case study, one of ChemCo's vital ingredients for the success of knowledge sharing was identified as its inter-relationship with HRM. Traditionally, the HR Department was responsible for training and education, career development and making available and developing appropriate human resources. With the growing emphasis on the importance of knowledge, the role of the department inevitably changed. For example, since 1996 the Learning Centre has been developed with an emphasis on allowing its employees to manage their personal and career development; and bringing new knowledge and skills to its employees in a cost-effective manner. Such change implies a new role for HRM with major organizational implications for human resource managers (Despres and Hiltrop, 1996). In this case, the challenge facing HR managers is to facilitate a balance between the macro considerations, such as structural groups and cultural norms, and micro considerations, including a whole range of people practices and standards (Bahrami and Evans, 1997).

The present study provides important empirical evidence and lessons on how a KM-focused HRM was co-ordinated in an effort to organise knowledge sharing. First, the findings highlight the contribution of a specific human resource development interventions which help provide training and development initiatives for knowledge workers. As evidenced in the case study, HRD is being delivered in novel ways, for example through the development of the on-line ChemCo Learning Centre. HRD support of this kind is important not only in providing specific kinds of training and information, but also in promoting a common language and understanding amongst participants in CoPs (Scarborough, 1999b).

Secondly, the co-ordinating role of HR in facilitating knowledge sharing has also provided exciting opportunities for ChemCo employees to nurture, shape and transform the CoPs with the assistance of the ICT-based knowledge transfer system. With the new responsibilities of HR managers, a KM-focused HRM may be seen to have two major roles: one in dealing with traditional administrative transactions, and the other in nurturing knowledge-related activities. ChemCo's KM-focused HR teams have undertaken these roles by inserting influences without authority, building bridges, co-ordinating activities between information technologists and members of CoPs, and viewing themselves as catalysts.

Thirdly, the case findings also imply that HRM should move beyond a narrow focus on training to take a more central role in co-ordinating the context (social and technical) which facilitates knowledge sharing. Such a shift in perspective requires the ability to provide meaningful systematic measurement indicators and to contribute to constructive dialogue. In this regard, ChemCo's experience suggests that the measurement of the benefits and results of knowledge sharing alone was not the highest priority in organizing knowledge sharing. It was more productive in the early stages to observe, monitor, nurture and celebrate early success than to work out elaborate knowledge-related measures.

Finally, as emerged from the case study, the following questions deserve further attention in future research.

- What kinds of information systems are best for conducting on-line training activities?
- How would on-line training differ from other forms of training, in terms of the ability to manage knowledge in the e-commerce era?
- How should an organization evaluate on-line knowledge sharing performance?
- How should knowledge workers be compensated? How are they different from existing rewards and incentives?
- Should incentive-based knowledge sharing be part of an organization culture? What are the enabling and inhibiting factors involved?
- How should incentive-based global knowledge sharing system be implemented?
- What role should HR play in organizing global knowledge sharing in the e-commerce era?
- Should HR take on the challenges of facilitating global knowledge sharing? Or is it something that top management or IT department should take on?
- What new IT skills are needed for HR in order to play a proactive role in the 21st century?

11. Conclusion

The need for a KM-focused HRM is recognized not just as a simple implementation issue, but as an indication that a fuller understanding of the KM-focused HRM policies and system design is necessary. HRM is probably the least developed aspect of the KM practices at ChemCo. Although management believed that the early introduction of knowledge-sharing performance measurement would hinder development, since 1998 it has moved towards developing systematic measurement systems. Thus, as suggested in the case study, the compensation package for knowledge workers is shifting from objective and rational, towards subjective, performance measures.

Managing knowledge has become the most challenging tasks facing managers in today's electronic commerce era. As mentioned earlier, with the new information technology, such as Internet, Intranet, knowledge sharing and learning can be rearranged, human resource management be redirected, and customer service be reshaped. In particular, the ability to deal with the socio-technical interactions of information technology and social elements involved in managing knowledge has been highlighted in the case study.

One of the most important findings from this exploratory case study was how HRM will play a new role in organizing global knowledge sharing in the e-commerce era. This contradicts the simplistic prescriptions about KM which suggest that the implementation and utilization of a particular IS system are all that is necessary to facilitate effective knowledge sharing (Hislop, 1999). Instead, this case study shows that successful knowledge sharing is dependent not only on the use of particular information technologies but also on the successful creation of a knowledge-sharing environment with a KM-focused HRM as the co-ordinator of related activities.

Knowledge-intensive organizations can be clearly distinguished by their flatter organization structures and decentralized decision-making processes. Managing these organizations is therefore different from managing traditional hierarchical organizations. At their core lies a particular knowledge-intensive thinking that concentrates specifically on intellect and reflection. Processes of knowledge management are integrated into the fabric of the organization, thus requiring a conceptual shift away from the traditional view of the firm. As such, traditional managerial activities which focus on the improvement of human relations, communications, group and team processes, performance evaluation and improvement, now take on new interpretations and meanings, thereby re-conceptualizing the role of human resource management.

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