Beyond Knowledge Management:
Introducing Learning Management Systems

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EXECUTIVE SUMMARY

In the knowledge economy, a firm's intellectual capital represents the only sustainable source of competitive advantage; accordingly, the ability to learn, and to manage the learning process are key success factors for firms. The knowledge management approach to learning in organizations has achieved limited success, primarily because it has focused on knowledge as a resource rather than on learning as a people process. Many world-class organizations, such as Procter & Gamble, Cisco Systems and Deloitte Consulting, are now employing a new breed of systems known as Learning Management Systems (LMS) to foster and manage learning within their organizations[1]. This article reports on the deployment of an LMS by a major US multinational, CEM Corporation, and proposes a framework for understanding learning in organizations, which highlights the roles that LMS can play in today's knowledge-intensive organizations.

Keywords: *case study; computer systems implementation; innovative technology; intellectual capital; IS training and development; knowledge transfer; personnel training*

ORGANIZATIONAL BACKGROUND

CEM Corporation[2] is a world leader in the design, development and manufacture of Internetworking storage IT infrastructures. The company's core competencies are in networked storage technologies, storage platforms, software, and, also, in services that enable organizations to better and more cost-effectively manage, protect and share information. CEM was founded in 1979 and launched its first product in 1981 — a 64-kilobyte integrated circuit memory board developed for the then popular Prime minicomputer platform. CEM's sales passed the $3 million mark in 1982 and reached $18.8 million two years later. In the mid-1980s, CEM launched a series of memory and storage products that improved performance and capacity for minicomputers made by IBM, Hewlett-Packard, Wang, and Digital Equipment Corporation. The company went public in April 1986; a year in which sales hit $66.6 million and a net income of $18.6 million was achieved.

In the late 1980s, CEM expanded strongly into the auxiliary storage arena, where it remarketed other suppliers' magnetic disk drive storage subsystems, often coupled with its own controller units. In 1987, the company introduced solid state disk (SSD) storage systems for the mini-computer market and its headquarters moved to Hopkinton, Massachusetts. In 1988, its stock was listed on the New York Stock Exchange and in 1989 CEM accelerated the transition from a supplier of memory enhancement products to a provider of mass storage solutions. In 1997, more than 70% of the company's engineers were dedicated to software development for mass storage technologies. Software sales rose from $20 million in 1995 to $445 million in 1998, making CEM the fastest growing major software company in the industry sector. In 2001, CEM was named as one of *Fortune's* 100 best companies to work for in America. In the same year, the company launched a major new global branding initiative. CEM Corporation's total consolidated revenue for 2002 was $5.44 billion.

SETTING THE STAGE

From its inception, CEM recognized the importance of learning within the organization: accordingly, it facilitated learning development and support for its employees, including: technical skills; business skills; IT skills; management skills; and individual personal development. Prior to 2000, learning development and support was facilitated through a number of training services, which included:

- A Corporate University, which provides training throughout CEM, including induction training for new staff, corporate guidelines, professional and project management guidelines, and computer skills.
- A Professional Global Services Training department, which supports field and sales staff at CEM.
- A Global Technical Training Department, whose main aim is to address the advancing technologies in the ever-evolving hardware, software products, and support applications and processes.
- Human Resources Training Centers, which support the soft skill training of managers, supervisors and individual employees.
- Technical Libraries and Personal Development Libraries.
- A Continuing Education Program, which provides financial support and study leave.

These diverse training services within CEM had, for some time, been successfully delivering training and learning support to a number of distinct areas within the corporation. However, by the year 2000, CEM recognized that it was facing a number of key challenges in relation to its organizational learning processes. These included the following:

- As a large multinational organization with a constantly growing global workforce of 20,000-plus employees, the overall management of the learning of all employees using multiple training organizations was becoming increasingly difficult. In par-

ticular, the management of course enrollments, training paths and individual competency levels posed a significant challenge.

- There was some duplication of effort across many of the training services and a distinct lack of consistency in how training was being developed and delivered. Specifically, there was a lack of coherence in relation to how content was being created and administered. From the point of view of an employee, there was no overall catalogue of courses available that outlined the training or learning programs available from each of the training services.
- By 2000, the business environment in which CEM Corporation operated was rapidly evolving and becoming more intensely competitive: hence, learning and the management of learning began to play an increasingly critical role in the ongoing success of the organization. Within this context, CEM needed to replace the isolated and fragmented learning programs with a systematic means of assessing and raising competency and performance levels of all employees throughout the organization.
- In addition, CEM wished to establish itself as an employer of choice by offering its people extensive career planning and development opportunities.

In response to these challenges, CEM decided to implement an enterprise learning solution. The stated business drivers for deploying this enterprise learning solution were to:

- Decrease time-to-competency.
- Develop and manage skill sets for all employees.
- Leverage global, repeatable and predictable curriculum.
- Integrate competency assessments with development plans.
- Accelerate the transfer of knowledge to employees, partners, and customers.
- Provide a single learning interface for all internal and external users.

CEM went to the market looking for an off-the-shelf corporate-based learning management system (LMS) that could be used to formulate and manage learning across multiple functions within the organization, including: technical functions; business functions; IT professional functions; and management functions. The system would also need to facilitate the delivery and tracking of disparate training programs, including the tracking of individual personal development training. Having considered several LMS then available from different vendors, CEM Corporation chose Saba Learning Enterprise™ (see Appendix A for a brief overview of Saba Software Inc.). In February 2001, CEM deployed its enterprise learning solution, incorporating this new LMS to employees across the entire organization as well as to CEM customers and business partners.

Based on an exhaustive analysis of previous research in the area and an extensive case study of the deployment and use of Saba Learning Enterprise™ at CEM Corporation, this article proposes a framework that places LMS in context with other categories of IS said to underpin learning in organizations. The framework also highlights the roles that LMS can play in the support and management of learning within knowledge-inten-

sive business enterprises. Thus, it is hoped that this framework will deepen the IS field's understanding of the contribution of LMS to learning within organizations.

Motivation for the Study

Significance of Learning in Organizations

The importance of facilitating and managing learning within organizations is well accepted. Zuboff (1988), for example, argues that learning, integration and communication are critical to leveraging employee knowledge; accordingly, she maintains that managers must switch from being drivers of people to being drivers of learning. Harvey and Denton (1999) identify several antecedents that help to explain the rise to prominence of organizational learning, viz.

- The shift in the relative importance of factors of production away from capital towards labor, particularly in the case of knowledge workers.
- The increasing pace of change in the business environment.
- Wide acceptance of knowledge as a prime source of competitive advantage.
- The greater demands being placed on all businesses by customers.
- Increasing dissatisfaction among managers and employees with the traditional "command control" management paradigm.
- The intensely competitive nature of global business.

Deficiencies in the Knowledge Management Approach

During the 1990s, there was a major shift in focus from organizational learning to knowledge management in both applied and theoretical contexts (Alvesson & Kärreman, 2001; Easterby-Smith, Crossan & Nicolini, 2000; Scarbrough & Swan, 2001). Knowledge management systems (KMS) sought to facilitate the sharing and integration of knowledge (Alavi & Leidner, 1999; Chait, 1999; Garavelli, Gorgoglione & Scozzi, 2002). However, these systems had limited success (Shultz & Boland, 2000), with reported failure rates of over 80% (Storey & Barnett, 2000). This was because many of them were, for the most part, used to support data and information processing, rather than knowledge management (Borghoff & Pareschi, 1999; Butler, 2003; Garavelli et al., 2002; Hendricks, 2001; Sutton, 2001) and also because many implementations neglected the social, cultural and motivational issues that were critical to their success (Huber, 2001; McDermott, 1999; Schultze & Boland, 2000). Indeed, some argue the knowledge management paradigm may be little more than the latest "fad" to be embraced by the IS field (Butler, 2000; Galliers & Newell, 2001; Swan, Scarborough & Preston, 1999), and its popularity may have been heightened by glossing over complex and intangible aspects of human behavior (Scarborough & Swan, 2001).

New Potential Offered by Learning Management Systems

It is perhaps time to admit that neither the learning organization concept, which is people oriented and focuses on learning as a process, nor the knowledge management concept, which focuses on knowledge as a resource, can stand alone. These concepts

compliment each other, in that the learning process is of no value without an outcome, while knowledge is too intangible, dynamic and contextual to allow it to be managed as a tangible resource (Rowley, 2001). She emphasizes that successful knowledge management needs to couple a concern for systems with an awareness of how organizations learn. Researchers believe that what is needed is to better manage the flow of information through and around the "bottlenecks" of personal attention and learning capacity (Brennan, Funke & Andersen, 2001; Wagner, 2000) and to design systems where technology services and supports diverse learners and dissimilar learning contexts (McCombs, 2000). In response to these needs, learning management systems (LMS) evolved; accordingly, an increasing number of firms are using such technologies in order to adopt new approaches to learning within their organizations. This new learning management approach has been led primarily by practitioners and IT vendors; as it is a relatively new phenomenon, there is a dearth of empirical research in the area. Therefore, an important challenge for the IS field is to better understand LMS and to examine the role that these new systems play in organizations.

CASE DESCRIPTION

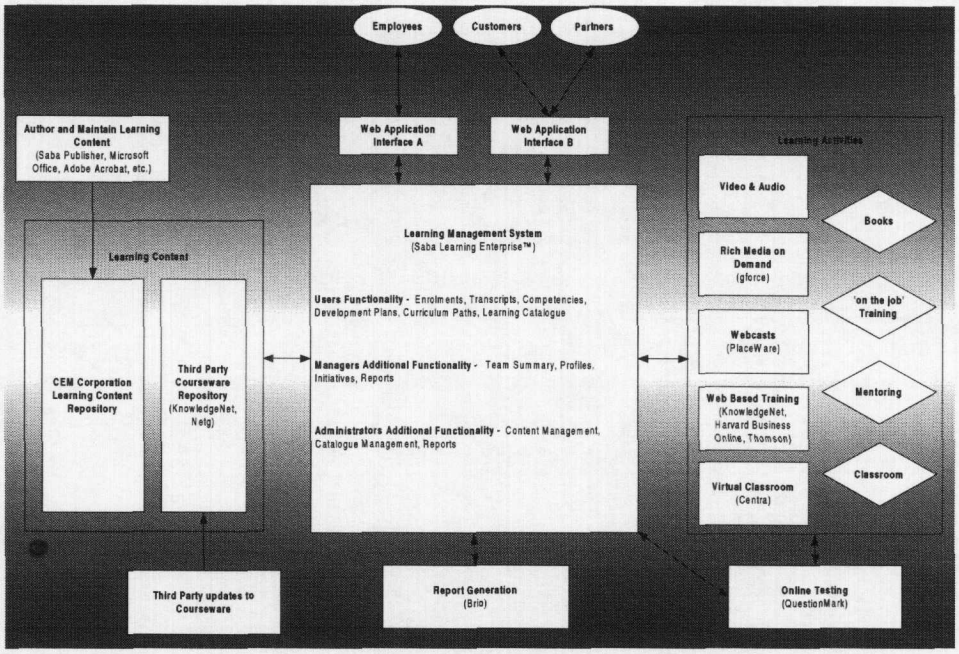
Conduct of the Study

This case study was conducted over a period of 11 months from October 2002 to August 2003. The LMS in use at CEM is a complex and multifaceted system; hence, it was necessary to first conduct several exploratory interviews with the subject matter expert. Five such site visits occurred over a six-month period and each meeting lasted between one and one and a half hours. This type of elite interviewing (Marshall & Rossman, 1989) is sometimes necessary to investigate little understood phenomena. In one of these sessions, a detailed demonstration of how the system operates was provided by this expert. A second demonstration of the system was subsequently obtained from a training manager within CEM Corporation. This provided the researchers with an understanding of the system's capabilities and an insight into how the system is used on a day-to-day basis. The human resources manager was also interviewed at this stage. Subsequently, the researcher carried out eight semi-structured interviews with key personnel, including an administrator of the system, a number of employees and managers who use the system, and several training specialists, one of whom had responsibility for knowledge management initiatives at CEM. Appendix B provides an outline of the interview guide used in the semi-structured interviews.

The Enterprise Learning Solution

The Enterprise Learning Solution implemented by CEM Corporation consists of several components, one of which is an LMS called Saba Learning Enterprise™ (Figure 1). Much of the learning material is created and maintained by CEM employees using a range of off-the-shelf products that includes Microsoft Office, Adobe Acrobat and Saba Publisher, while the systems learning content is stored in CEM's own on-site storage

Figure 1: CEM Corporation – Enterprise Learning Solution Components



repository. In addition, courseware is created and maintained directly by third parties including KnowledgeNet and Netg, and is stored offsite in the storage repository of both third-party organizations.

Employees at CEM manage their own learning processes by accessing the LMS through the Internet. Using the Web, they can enrol in classroom courses; search for learning material; engage in online learning activities; and look at what development options are suitable for their role within the organization. Managers also use the system to administer the employee learning processes; for example, managers can examine the status of the learning activities of their employees; assign learning initiatives to their employees; and generate reports on learning activities. Administrators and training personnel use the system to supervise employee training; for example, they publish and manage learning content; manage a catalogue of courses; and create reports on learning activities. While much of the required reporting is provided by the LMS, administrators also use a third-party software application called Brio to generate more sophisticated reports.

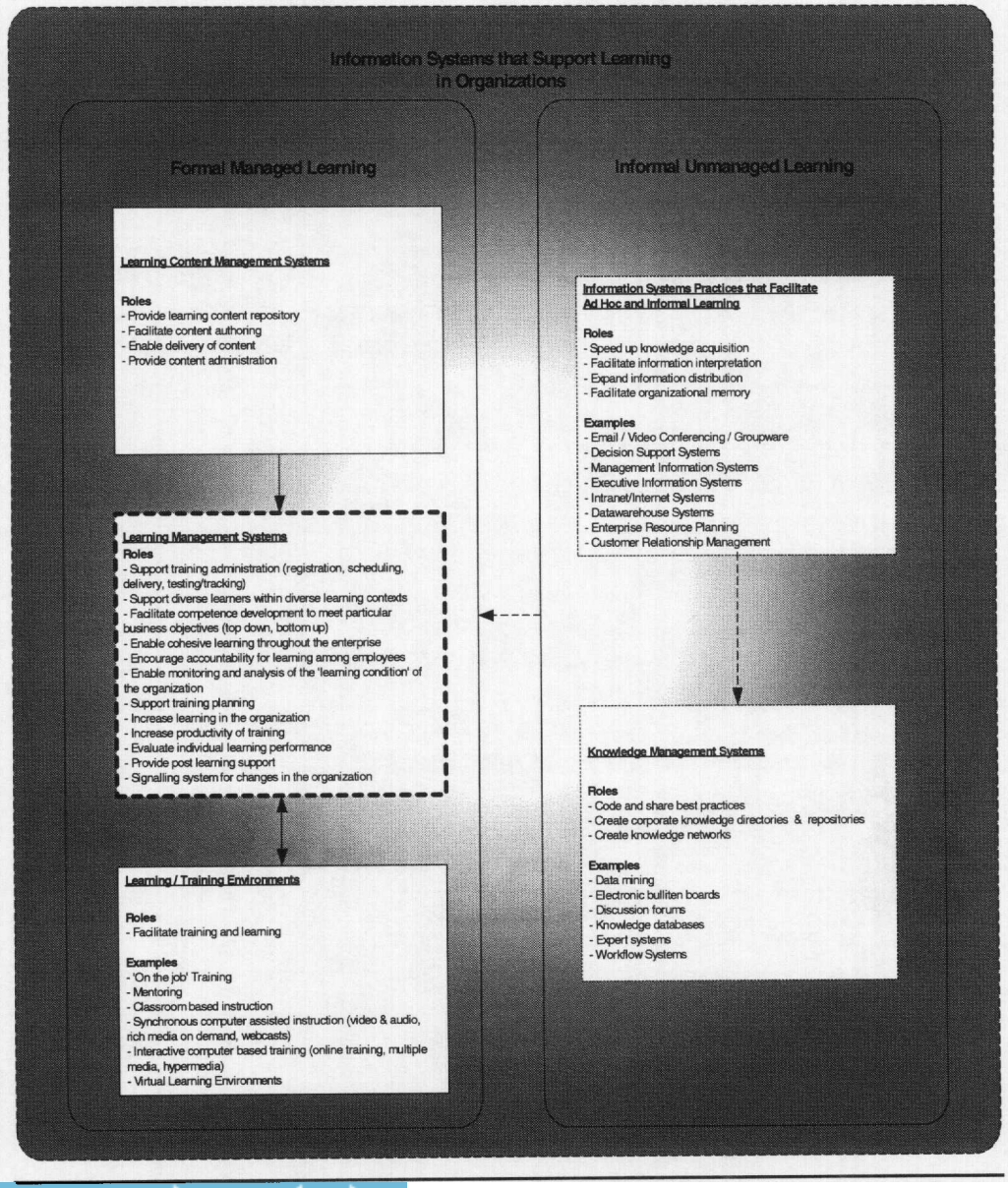
The Saba Learning Enterprise™ LMS has the capability of managing and tracking offline activities (e.g., books, "on the job" training, mentoring, classroom training) and online activities (e.g., video and audio, Webcasts, Web-based training, virtual classroom training, and rich media). Learning content for online activities may be accessed and delivered through the Web application interface either from CEM's own learning content repository or from a third party's storage repository. Certain post-training testing is built into the learning content itself, but additional pre-training testing and post-training

testing may be invoked, and this is provided by another third-party product called QuestionMark.

LMS: Toward a Better Understanding

Figure 2 summarizes the case study findings. In this diagram, an empirically tested framework is presented that places LMS in context within a wider topology of the key categories of IS that underpin learning in organizations. Furthermore, the framework describes the principal attributes of each category of IS and highlights the roles that

Figure 2: Learning in Organizations – Framework Incorporating LMS



LMS can play in the support and management of learning within an organization. The categories of IS have been segregated into two groups: those that support formal managed learning within the organization, and those that support informal or unmanaged learning. The IS category of LMS is highlighted within the framework to emphasize that this new breed of system is central to the strategic "people oriented" approach to managing learning that is now emerging in many organizations.

LMS: In Context

On one hand, the findings illustrate that CEM found that their new LMS, learning content management systems (LCMS), and learning/training environments all contributed to the process of formal managed learning in the organization. On the other hand, it was clear that informal unmanaged learning within the organization was facilitated through IS that supported ad hoc learning in concert with the extant knowledge management system (KMS). The reason for this situation is that KMS, while supporting knowledge management in a formal way, only support informal learning, as learning is not facilitated in a structured way, nor is it measured or validated by the KMS.

In Figure 2, the arrows describe the links that exist from one IS category to another (i.e., LMS, LCMS, KMS, etc.), signifying the interrelationships between them. For example, the case study findings indicate that LMS are fed content directly by LCMS (as illustrated by the solid arrows lines). The LMS Manager elaborated on this: "a link is created in the LMS that contains the address where content is located, either on CEM's own storage repository or on the third party courseware repository." The findings also highlighted that LMS have a strong two-way relationship with learning/training environments, as training programs are often initiated from within the LMS and information on the outcome of this training is often captured directly by the LMS. It was clear that LMS had only a tenuous link to other information systems that support ad hoc or informal learning (as illustrated by the broken arrowed lines). In describing this type of linkage, the LMS Manager pointed out that "the link from these systems consists primarily of a need which they generate for formal learning and training programs to be carried out." He added that "the content for this training will often stem from the IS itself and the type of environment used will, more than likely, be decided by the nature of the system in question." He indicated that KMS often store information on problems and solutions relating to other systems that support informal learning; hence, there is a tenuous link between these two categories of IS.

LMS: Key Roles

The framework shown in Figure 2 lists a number of key roles that LMS can play in supporting and managing learning. These roles indicate the dimensions, factors, or variables that future researchers should try to capture when evaluating the roles of LMS. One of the more significant roles listed is that LMS can support the *administration of training*[3] across large organizations with a variety of training needs (Barron, 2000; Brennan et al., 2001; Zeiberg, 2001). A training manager within CEM Corporation com-

mented that "the main role of the LMS is to automate training administration and then to add value." He also maintained that "with the LMS, the amount of work that you can get through is greater...it improves the efficiency of delivering and managing training." Thus, the LMS facilitates an *increase in the productivity of training*. From a learner's perspective, the principal role of the LMS is that it can provide a central repository for a range of learning material in a structured way that enables the system to *support a diverse body of learners within diverse learning contexts* (Brennan et al., 2001; McCombs, 2000; Wagner, 2000). As one user of the LMS within CEM Corporation put it, "employees who work in areas of the business can identify their role and cross reference the LMS for recommendations on what training is appropriate for that role...the system also provides guidance with recommended paths through several training courses." Another user of the LMS emphasized that "before, it was known that the Training Organization facilitated training, but you couldn't put your finger on something you wanted...now there is a central repository and you can see all the training that is being delivered." This leads to the most critical role of all, which is that it can increase the degree to which training is utilized and hence, *increase learning in the organization.* Also, from the perspective of the learner, the research findings identified two other significant and emerging roles of the LMS, which are listed within the framework. The first of these is the *provision of post learning support*, whereby, as the LMS manager explained, "the LMS enables employees to return to material from a course or download documents associated with a course that they have already completed." The second emerging role of the LMS is that it acts as a *signaling system for changes in the organization.* This was highlighted by one user of the system, who holds a software development role within the organization. He argued that "when new training becomes available on the LMS within our area, this normally signals that either new software product features have been released or that software product changes have taken place."

CEM's LMS also allows for competency mapping and facilitates career development paths. Using the LMS, an employee's competencies may be assessed using a predefined competency model for their particular job role. Subsequently, a number of development options or learning activities are suggested by the system, which may be carried out by the individual in order to fill any skill gap or competency deficiency for their role type. Thus, the LMS *facilitates competence development to meet particular business objectives* (see also: Brennan et al., 2001; Hall, 2001). The competency assessment process enables a dual approach to learning management (i.e., top-down and bottom-up). From a top-down perspective, training managers can use the LMS skill-assessment process to automate the training needs analysis process, which will assist them in the identification of training needs and will *support training planning*. Furthermore, from a management perspective, it is possible for a manager to get an overall picture of the competency levels within their department. One technical manager maintained that "although it started as just automation of training needs analysis, managers then saw that they can get a picture of training gaps and competency levels ...they can also see overlaps in competencies." The LMS manager also commented on the bottom-up approach facilitated by the system viz. "self assessment and self directed learning is offered, which has passive approval." In this context, passive approval means that if an employee registers for a particular course or learning activity, they are automatically

approved for that training unless the training is specifically disapproved by their manager within a certain limited time period. In this way, employees are encouraged to self-manage their own learning using the LMS: this has the added benefit of *encouraging accountability for learning among employees* (see also Hall, 2000).

The use of competency models for assessing and developing employee capabilities forms the basis of a number of other evolving roles of the LMS. Through standardizing role-based competency requirements and development options, the LMS can enable more *consistent and cohesive learning throughout the enterprise* (see also Greenberg, 2002). The LMS manager pointed out that "the status of competencies within the organization may be reported on at a number of different levels, using the LMS." This enables the *monitoring and analysis of the "learning condition" of an organization* (see also Nichani, 2001). Furthermore, a department manager described how "the LMS can support a manager in assessing an employee's role-based competencies and having agreed development plans with that employee, a subsequent competency assessment can help that manager to determine the employee's 'learning performance' in acquiring the new competencies, as per the development plan." Thus, by reviewing progress between one competency assessment and the next, the *evaluation of individual learning performance* for an employee is facilitated. This may then form part of the individual's overall performance evaluation.

CEM Corporation: Overall Benefits of the Enterprise Learning Solution

The deployment of the enterprise learning solution has enabled CEM Corporation to address many of the challenges that it faced in 2000, prior to the system's implementation. In particular, CEM has achieved the following:

- CEM now has a single enterprise system that supports the administration of all training across the entire organization. From the point of view of the employees, the system provides a centralized mechanism that enables them to search for and to enrol in selected courses or training programs; it also offers guidance on recommended training paths and curriculums. Furthermore, the competency assessment facility enables employees to determine and rectify competency gaps as well as providing management at CEM with a means of monitoring and managing overall employee competency levels within the organization.
- The enterprise learning solution supports all training content whatever its subject matter or form and enables the management and control of access to this content using one system. This has the added advantage of highlighting duplication of training material in different parts of the organization and paves the way for streamlining the efforts of different training services within the company.
- The flexibility and dynamic nature of the system allows CEM Corporation to unilaterally introduce and to quickly implement new training requirements across the organization in response to changing business needs or new technical advances.

- The Saba Learning Enterprise™ LMS may help to attract or retain key personnel by offering them a unique opportunity to monitor and develop their competencies and to manage their careers within the organization.

CURRENT CHALLENGES/PROBLEMS FACING THE ORGANIZATION

As outlined earlier, CEM Corporation is a hi-tech organization that operates in a very competitive and dynamic business environment. Managing learning and measuring learning outcomes are in themselves difficult tasks, but they are made even more problematic within complex learning domains, such as those that exist at CEM. It is unlikely that the LMS will enable the full management of all of the learning in the organization in a truly scientific way, though it will assist greatly in managing the diverse and extensive array of learning contexts and learning processes that must be supported. The system's strengths lie in the new approach and attitude that it will encourage and inspire in the hearts and minds of individuals within the organization, as it enables learning that is highly visible, structured, and more accessible within the organization. This stimulation of the hearts and minds is a major contributing factor to learning and is known as "emotional quotient" (Goleman, 1996). Having deployed the enterprise learning solution, CEM Corporation now faces a number of key challenges. These are outlined next:

Control vs. Creativity: Managing the Delicate Balance

The findings of this case study demonstrate that CEM's new LMS can play a vital role in increasing learning within across the organization. This will be achieved by improving the control and management of employee competency levels, and also by empowering employees to be creative in managing their own learning and competency development. Thus, the key challenge for management at CEM is to increase their influence and control over training and learning within the organization, while at the same time increasing employee commitment to managing their ongoing self-development by taking responsibility for improving their knowledge of the business and building related competencies. These objectives are delicately balanced and must therefore be handled carefully. Too much control may de-motivate employees and discourage them from engaging with the system, but at the same time, enough control must be exerted to ensure that employees are developing competencies that support the day-to-day operational requirements of the organization, as well as being in sync with the overall goals and objectives of the company.

Exploiting the Benefits of the LMS: Incorporating all Training & Learning

Another key challenge presently facing CEM Corporation is that they have a long way to go before all of the benefits offered by their new LMS can be fully exploited. Not all formal training is currently being tracked and managed through the LMS and some departments independently organize their own training outside of the system. One engi-

neer argued that "there doesn't appear to be a large amount of suitable training available for our department." The benefits offered by this enterprise learning solution will not be fully realized until sufficient training or learning programs are offered to all employees in all departments within the organization. Furthermore, while it is possible to take certain online training directly through the Internet, it is not possible to track or manage associated learning outcomes, as this training is initiated and completed outside of the LMS, and is not currently recorded by it. It is understandable that it will take some time to incorporate every training program for all employees onto the system, but it is critical that this is achieved as quickly and efficiently as possible, to ensure support for the system and ongoing use of the system across the entire organization.

Drawing Up Competency Models for All Employees

Role-based competency models have not yet been drawn up for all roles within the organization. As the LMS Manager pointed out, "there is difficulty in having accurate competency models for all roles when there is such a vast array of diverse technical positions." He added that "as you drill down, you find that there are a lot of specialist functional competencies and you get into the ROI question...because there is such a large investment in time and effort involved in devising competency models for all technical roles, it has to be driven by the local business needs". Competency assessments are instrumental to determining if positive learning outcomes have been achieved and they will also demonstrate if the organization is obtaining a return on its investment in implementing and deploying the LMS. Furthermore, competency assessments offer management at CEM an opportunity to identify and rectify gaps or overlaps in competency levels as well as providing a means of assessing and managing overall competency levels within the organization. CEM Corporation is now faced with the daunting task of drawing up and maintaining competency models for the vast array of role types of its 20,000-plus employees, many of whom work in dynamic and highly technical areas.

Managing the Competency Assessment Process

Even where competency models are available, the study revealed that the process of self-management of career development has, for the most part, not yet been taken up within the organization. Moreover, many employees, and indeed managers, have not yet engaged with the competency assessment process. A structured plan or roadmap needs to be formulated in conjunction with local business needs for the formal migration of all employees onto the system for competency assessment and competency development planning to take place.

Fully Mobilizing the LMS within the Organization

One manager observed that "many employees still feel that the system is primarily designed for course registration and the other elements of the system may need to be

emphasized more internally." Another user of the LMS argued that "although the initial rollout of the LMS seems to have been good and although there is a growing awareness of the system, people still have not got to grips with using it." The challenge facing CEM Corporation is to raise internal awareness of the functions and capabilities that are now provided by the LMS, and to educate the employees on how these functions and features operate. This education program needs to address cultural issues, as well as dealing with the fears and anxieties that employees may have in relation to the use of the system. This finding was supported by one manager who noted that "some employees may fear that if they use the system to log their competencies, their career may be negatively affected."

CEM Corporation needs to encourage the active participation of senior management in the mobilization of the LMS and perhaps consider the appointment of an overall champion for the initiative at senior management level. This chief learning officer[4] could promote the utilization of the system at a senior level within the business units and ensure that any synergies that exist between them are exploited. Finally, a number of managers felt that CEM needs to publicize and promote the benefits of engaging with the LMS and find ways of formalizing and integrating this novel strategic learning management system with extant business processes and work practices.

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Zuboff, S. (1988). *In the Age of the Smart Machine: The Future of Work and Power.* New York: Basic Books.

ADDITIONAL RESOURCES

The following is a list of other resources that may be relevant for obtaining additional information related to the case:

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Hall, B. (2003). *LMS 2003: Comparison of Enterprise Learning Management Systems.* CA: bandon-hall.com.

Hodgins, W., & Conner, M. (2002). Learning objects and learning standards. IEEE Learning Objects Groups Overview. Online: *http://www.learnativity.com/standards.html*

Lennox, D. (2001). Managing knowledge with learning objects. A WBT Systems White Paper. Online: *http://www.wbtsystems.com/news/whitepapers*

ENDNOTES

1 *http://www.saba.com/english/customers/index.htm*

2 For reasons of confidentiality, the organization on which this case study is based cannot be identified; it will be referred to as CEM Corporation throughout the document.

3 Bold text within this section indicates that this is a role fulfilled by the learning management system.

4 Akin to a chief information officer (CIO) or chief knowledge officer (CKO).

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Tom Butler (tbutler@afis.ucc.ie) is a senior lecturer in information systems at University College Cork, Ireland. Before joining academia, Tom had an extensive career in the telecommunications industry. His research is primarily qualitative, interpretive and case-based in nature and has two related major streams: IT capabilities and the development and implementation of information systems in organizations; and knowledge management systems. Other research interests include hermeneutics, e-learning, educational informatics, IT education and the digital divide. Tom received his PhD from the National University of Ireland at UCC, where his doctoral research examined the role of IT competencies in building firm-specific IT resources in knowledge-intensive organizations.

APPENDIX A

Saba Software Inc. Overview

Founded in 1997, Saba Software Inc. (quoted on the NASDAQ stock exchange as SABAD) is a global company headquartered in Redwood Shores, California, and is a leading provider of Human Capital Development and Management (HCDM) solutions. The Saba vision is to make it possible for every enterprise to manage its human capital by bringing together learning, performance, content and resource management in a holistic, seamless way. To satisfy this vision, Saba offers two key products sets, namely, its "Enterprise Learning Suite" and "Saba Performance". "Saba Learning" is an Internet-based learning management system within the Enterprise Learning Suite that automates many of the learning processes for both learners and learning providers. Table A(1) lists some of Saba Software's major customers.

Table A(1): Saba Software Incorporated – Major Customers

Business Area	Customers
High Tech	Cisco Systems, Cypress, EMC^2, Xilinx, i2 Technologies, VERITAS Software
Telecommunications	ALCTEL, Telecom Italia, CENTEC, Lucent Technologies
Professional Services	Kendle International, Deloitte & Touche, EDS, Bearing Point (Formerly KPMG)
Financial and Insurance Services	ABN Amro, Royal & Sun Alliance, Scotiabank, Principal Financial Group, BPM, Standard Chartered, Wells Fargo
Government	United States of America Department of the Army, Distributed Learning Services, LearnDirect Scotland
Life Science	Aventis, Novartis, Procter & Gamble, Medtronic
Automotive	Ford Motor Company, General Motors, Daimler Chrysler
Transportation	Continental Airlines, BAA
Energy	Duke Energy, Energy Australia
Manufacturing and Distribution	Caterpillar, Cemex, Grainger.
Consumer Goods and Retail Distribution	Best Buy, Kinkos

APPENDIX B

What are the roles of the LMS in managing learning within the organization?

1.1	Does LMS support training administration? - registration - scheduling - delivery - testing - tracking/reporting of individual learning
1.2	Does LMS support diverse learners within diverse learning contexts? - large number of learners - diverse learning contexts - online and offline learning
1.3	Does LMS facilitate competence development to meet particular business objectives? - skills specification needed to fulfil particular objective - skills assessment to establish gap in learning - recommended learning to fill identified gap in learning
1.4	Does LMS enable cohesive learning throughout the enterprise? - learning development plan for organization - learning plan for individuals in sync with overall learning plan
1.5	Does LMS encourage accountability for learning among employees? - self-service learning - self-planning and self-assessment of career development
1.6	Does LMS enable monitoring and analysis of "learning condition" within the organization? - overall picture of competencies within the organization - overall picture of learning achieved in organization - overall picture of learning required within the organization
1.7	What are the other key roles/attributes of the LMS? - provision of any content authoring - provision of any content management - provision of any knowledge management - synchronization with HR system - provision of post-learning support - adherence to learning content standards - integration of incompatible systems for learning management - support for large range of third-party courseware - other

- **What is the relationship between the LMS and other IS that support learning?**

2.1 What types of learning/training environments are used in EMC and how does LMS incorporate them?

- classroom
  - onsite
  - offsite
- computer-based instruction (video and synchronous training programs)
- computer-based training (interactive online training)
  - multiple media
  - hyper media
- virtual learning environments (instructor led)
- other

2.2 What knowledge management systems are used in EMC and how does the LMS Incorporate them?

- coding and sharing of best practices (e.g., knowledge databases)
- corporate knowledge directories and repositories (e.g., data mining, expert systems)
- creation of knowledge networks (e.g., electronic bulletin boards, discussion forums)
- other

2.3 What content management systems are used in EMC and what functionality do they provide to LMS?

- provide learning object repository
- facilitate content authoring
- enable delivery of content
- provide content administration
- other

2.4 Is there any relationship between LMS and other IS that facilitate ad hoc or informal learning?

- e-mail
- video conferencing
- groupware
- decision support systems
- management information systems
- executive information systems
- Internet/intranet systems
- data warehousing systems
- enterprise resource planning systems
- customer relationship management systems
- other