E-learning communities, virtual markets and knowledge creation

Glenn Hardaker and
David Smith

The authors

Glenn Hardaker is Principal Lecturer (e-Learning Innovation) and **David Smith** is Dean, both at Huddersfield University Business School, Huddersfield, UK.

Keywords

Learning, Knowledge management, Communications, Internet

Abstract

From this push for non-linear innovation has come a fragmented market of hardware, software, and services branded as, knowledge-management solutions. Virtual knowledge networks provide a dynamic way of working relevant for the emergence of a post-industrial economy. E-learning is seen as a driver of knowledge creation across unstructured virtual communities. The paper considers the role of managed learning environments (MLEs) in the context of information-intensive organisations operating in virtual markets (software, publishing, education, music, consultancy services plus many more), the relationship with knowledge creation across distributed networks, and finally strategies for building knowledge networks through the creation of e-learning communities.

Through its Information Society policy the European Commission formally recognises the significant impact of developments in computing and information technology on economic and social life, as the following quotation illustrates:

> Information technologies and communication are bringing about an industrial revolution based on information, on the scale of that which rocked the 19th century. These technologies and the advances of digital electronics are now allowing the creation of new multimedia telematic services and applications which combine sound, image and text and for which all means of communication – telephone, telefax, television and computers – are used in a complementary way. The development of these new means of communication represents an element of increased competitiveness for enterprises and opens up new perspectives in terms of both work organization and job creation. The diffusion of these new technologies at all levels of economic and social life is thus gradually transforming our society into an "information society" (from the European Commission Information Society Thematic Website, http://www.europa.eu.int/information_society/).

The research reported in this paper considers one increasingly important area of these more general, wide-ranging developments. It starts by looking at the role of managed learning environments (MLEs) in the context of information intensive organisations capable of operating in virtual markets. Such organisations exist in sectors such as publishing, computer software, education, music and consultancy services. The research then develops to look at knowledge creation across the kind of knowledge networks made possible by MLEs. Finally strategies are considered for building knowledge networks through the creation of e-learning communities.

Since emerging forms of representation such as hypermedia and virtual reality are in their early stages of development, we are just beginning to understand how they shape not only the messaging and communications process but also the ways of working in virtual teams (Johnson *et al.*, 2001). Many are still attempting to adapt from the first impact of high performance computing and communications. We now need to rapidly adjust from the challenge of working with limited information to the challenge of surviving information overload. The core skill we all must master is the ability to harness value added information, through immersing

ourselves in data to identify and gather knowledge through the learning driven process. Cross (1976) eloquently stated:

> It takes no special knowledge of research to recognise that we have characteristic "styles" for collecting and organising information into useful knowledge.

There have been many detailed studies from the 1960s onwards considering the diversity in how people learn. The learning style may be partly based on stable personality characteristics and sometimes conscious preferences influenced by contextual factors (Reynolds, 1997). It is proposed by Curry (1983) that learning styles and their supporting instruments can be viewed in three layers resembling an onion. This model views the core as being a stable "cognitive personality style", an intermediary layer of "information processing style" and the outer layer called "instructional format preference indicator" allowing individuals a choice of learning environment. The mixed support for cognitive learning styles is extended further by Laurillard's (1979) persuasive comment:

> It would therefore be hazardous for an investigation of learning to proceed on the assumption that learning is a process that is independent of external factors, or that students possess inherent, invariant styles of learning.

Understanding how to structure learning experiences with a specific consideration for quality of engagement, social context, and conditions, is the core of new modes of learning styles (Reynolds, 1997). Expanding traditional definitions of literacy and learning methods into "immersion-centered" experiences of interacting with information and the on-line community is fundamental to preparing ourselves for full participation in post-industrial society. Three forms of expression are shaping the emergence of distributed learning as a new pedagogical approach:

(1) Knowledge webs complement experts, texts, libraries, and archives as sources of information.
(2) Interactions in virtual communities complement face-to-face relationships in teams and classrooms.
(3) Immersive experiences in shared Internet environments extend learning experiences in real world settings.

Interactive multimedia technologies, especially the Internet, have the potential to present ideas in almost any mediated form that may offer either very structured routes through the learning process or provide the opportunity for knowledge seeking individuals to roam freely as a means of creating their own meaning and understanding. The Internet offers immense potential as an enabler for interactive e-learning infrastructure in the creation of distributed knowledge and intelligence networks.

For many, the use of interactive multimedia technologies has the potential to overcome many of the limitations of the "individualistic" learning style typically adopted for management development education through e-learning communities. The individualistic psychological approach is attractive because it appears to be humanistic, concrete, direct and immediate, but for many it neglects attention from the larger social system and as a consequence is itself viewed by many as "decontextualizing" learning experience (Sarup, 1986). Below we consider in more detail the relevance of the Internet in shaping learning styles and its impact on knowledge creation.

Hypermedia tools for managed learning environments (MLEs)

The development of software applications that support the learning process must consider core issues that transcend the various learning styles outlined. Clearly the ability to build interactive software tools relevant to both individual and collaborative learning are key issues of importance for the development of both individual, group and organization-wide knowledge. We will now explore further the notion of interactivity and the potential of hypermedia tools in being the primary enabler in enriching the processes of learning and knowledge management.

Interactivity is an essential element of being human and as a consequence the evolution of on-line effective communities. The process of interaction between a person and a machine is quite difficult to define but in broad terms encompasses a wide range of information technology related products. What is true interaction and what is the relevance of interactive products to the continued development of the Internet as a viable on-line communications tool? It is proposed

true interactivity, via two-way information flow, needs to provide the opportunity to influence and be influenced by the exchange of ideas.

The word "interactive" is frequently used for a diverse selection of software, including Internet applications, of which much is nothing more than an interactive phone book (Boyarski, 1997). For the majority of applications there is a set of complex and predetermined places and actions one can explore. For many, true interactivity works only if it adds or is completed by the process undertaken. This is a holistic approach to interactivity and differs drastically from the widely accepted role of the passive user. True interactivity, as we know it in real life, is rich, complex, and difficult to replicate at present with computer technology. What are frequently missing are the opportunities to affect and be affected by the exchange of ideas. This leads to situations of spontaneity and responsiveness to frequent volatile and turbulent environments. We propose that the issue is partly concerned with the level of interactivity, but more importantly if the interaction (when present) is appropriate and meaningful at a specific point in time. What is vital in such interaction processes is our human approach, reflecting who we are and the ways in which we express our fundamental human qualities. Being aware of the human aspects of the interaction processes explored above enables designers to design appropriate and sometimes compelling interactive devices. Interaction design needs to address such problems by understanding and responding to the needs of individuals involved in the interaction process. Successful interaction design includes: understanding the user, an effective design process, a final product that is learnable and usable, desired but also required and appropriate for a specific task, quality and manageable experience.

Hypermedia offers many opportunities in the pursuit of furthering the development of interactivity and in terms of e-learning through further development of MLEs. In hypermedia-based environments, such as the World Wide Web, the participant navigates through information sources and in the process of doing so shapes the content being viewed. Our challenge, as participants of the information age, is to create products that allow for interaction that are natural, seamless

and rich in conversation. The responsibility for structuring content will be integral to the interaction process. This may mean giving up control over some aspects of the product. Examples of such changes in the exchange process of goods and services is becoming more prevalent with the "open source" software movement, with companies such as Red Hat Software and Sendmail Inc., providing the source code to consumers for further development and specialist needs. In return, specialist open source communities on the Internet share developments by forwarding outcomes, through specialist news groups and Web sites. The "open source" approach illustrates organizations that have developed very loose dynamic knowledge networks that are driven by new forms of interaction and virtual team working through e-learning communities. Developments by Bluetooth in relation to mobile technology, supported by organizations such as Ericsson, provide similarities with regards to virtual team working in the pursuit of industry sector development, rather than solely at an organizational level.

Figure 1 identifies many of the commonly used communications tools to support both person-to-person and also person-to-machine forms of interaction. Consideration needs to be given to communications and level of interaction at the individual, group and organisational level. The tools to support such activities and processes are considered in Figure 1 while greater consideration to individual and group working is evaluated in detail through Figure 2. Figure 1 outlines the tools that typically represent an MLE in supporting e-learning.

Quadrant A, in Figure 1, identifies tools that support relatively high levels of interaction but with a focus on person-to-machine rather than person-to-person. Market research surveys and evaluation tools illustrate clearly how the Web has the ability to build the user directly into the product or service offering but at an individual level. With questionnaires and surveys on the Web typically becoming database driven, this also allows the individual to undertake the survey at their convenience by completing it in chunks if desired, rather than all together in one instance. Many questionnaires also give instant feedback to the individual on the process through automated tools. Quadrant B similar to A provides high levels of interaction

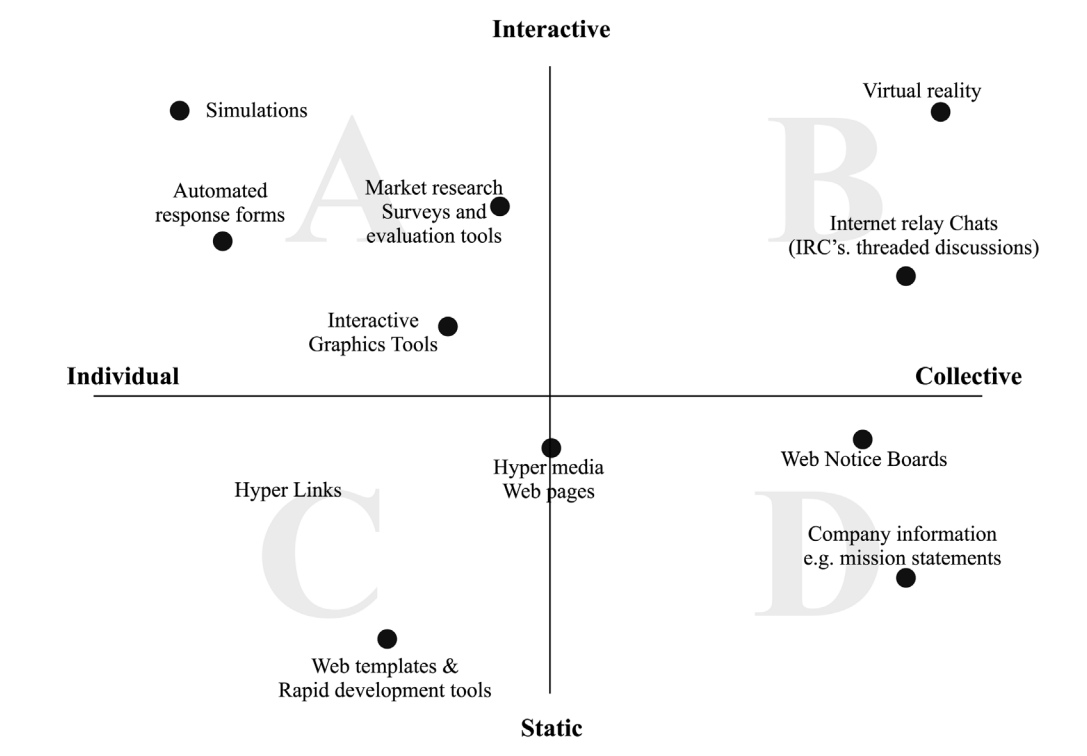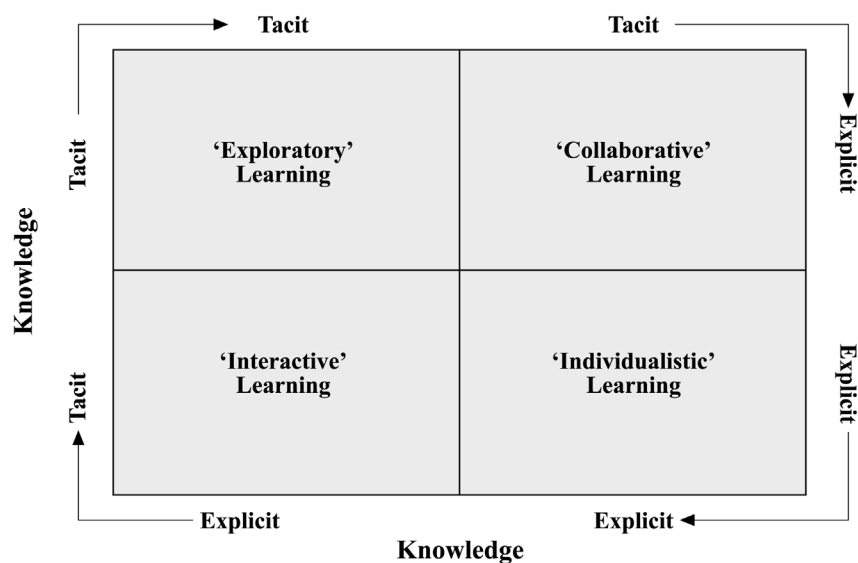**Figure 1** Hypermedia tools for managed learning environments

Figure 2 E-learning communities for knowledge creation

but in this instance may be either person-to-machine or machine-to-machine and in the future we can expect computers interacting with each other. Quadrant B illustrates software tools with a greater group focus than quadrant A. Managed learning environments typically include Internet relay chat software (IRCs), threaded discussion facilities and the increased use of broadband communications with the increased use of video and audio-based applications. Quadrant D is similar to B, with the focus on groups but includes tools that are more static in nature and as a consequence are viewed as offering support tools for group processes. Even though support based and generally less sophisticated in nature, they are still widely used applications that undertake a value purpose. Notice boards are fundamental examples an extensively used group-based application. Finally, quadrant C is similar to quadrant A with its individual-based focus and is also person-to-machine focused but is relevant to software applications that are more

static by nature. For example, hypermedia links in Web pages generally change infrequently but still provide an important role to the user in providing avenues and routes to further information of potential relevance.

Technical Internet designers provide the structure to hypermedia environments but it is up to the visitor to give it shape. We must be prepared to accept the shape of hypermedia environments to change and evolve, based on the participants' interactions with the site and content providers. Participants therefore are not directly interacting with the technology but are using the technology as a means to interact with each other. In the human-based interactive communications process, the most important factors are what are frequently called the "enrolments" (who shows up) and the "hybrids" they produce in their interaction. The ability to interact with the moment is just as important, and thought by many as more important, as the calculation and often repetition of that reality on the hypermedia-based Internet environment. It is proposed that the montage of information, via hypermedia links, more faithfully reflect the process of human perceptions than do traditional linear-structured sources. The potential for e-learning communities to facilitate spontaneous communications will offer, as a consequence, more immediate exchange of knowledge.

E-learning communities for knowledge creation

In considering the role of e-learning styles as fundamental enablers in managing the knowledge creation process, we need to consider more closely environmental conditions. For the purpose of this article the conditions focused upon are based on the notion of e-learning community building in the context of information-intensive products operating in a virtual market place. E-learning communities of this kind are enablers of distributed intelligence, through shared space for emerging relationships, and have the potential to realise, as a consequence, knowledge creation. In considering how to manage the knowledge creation process through e-learning communities we can gain a significant insight through the research by

Nonaka and Konnoo (1998) in the evaluation of the notion of "ba". Ba can be thought of as shared space, either virtual of physical, that provides a platform for advancing individual and collective and/or collective knowledge. Nonaka and Konnoo (1998) stated:

> It is from such a platform that a transcendental perspective integrates all information needed ... according to the theory of existentialism, ba is a context which harbors meaning. Thus we consider ba to be a shared space that serves as a foundation for knowledge creation.

Accepting such a perspective leads directly into the direct relevance of e-learning communities undertaking a facilitating role in managing the knowledge creation process across virtual space. There are two types of knowledge to consider, explicit knowledge and tacit knowledge (Earl and Scott, 1999). Explicit knowledge is typically quantifiable data such as words and numbers, specifications formulae and has been the primary form of data sources driving typical transaction payment systems across most industry sectors. In comparison, tacit knowledge types are not as easily visible and quantifiable. Typically, tacit knowledge is hard to formalise, due frequently to its personal form, and as a consequence often problematic to communicate in a controlled way across computer networks. In the West, explicit knowledge has been emphasized while Japan and many other South East Asian countries place far greater emphasis on tacit forms.

The building of e-learning communities is viewed as a fundamental driver of both explicit and tacit knowledge creation and reflects directly the rich forms of technology now being realised to mass markets through the Internet. The knowledge transformation framework below (see Figure 2) serves to outline the role of e-learning in the knowledge creation process and the direct relationship between tacit and explicit. In addition, the framework builds on the work of Nonaka and Konnoo (1998) through adopting the conceptual underpinning provided through the SECI model, which explores the evolution of knowledge creation and the self-transcending process.

Exploratory learning involves the transformation and sharing of tacit knowledge through on-line social interaction. This typically would have been viewed as only being possible through physical one-to-one

communications but new multimedia-based technology is allowing individualised and small group forms of communication. Immediately, mass market videoconferencing facilities for the Web has clearly opened up diverse possibilities. Various customer relationship management systems (CRM) are also including such facilities into their support software. This illustrates further convergence of telecommunications and computer networking technology. In the educational sector, the sharing and transformation of tacit knowledge is being realised through personal Web tutors acting as mentors through specific e-learning initiatives such as an individual project or exploratory-based research such as PhD supervision. For example, the need for postgraduate supervision to be based on a specific campus is changing, through the use of Internet-based technology allowing exploratory learning from geographically remote locations. This is typically realized through MLEs and exploratory-based learning may use software tools such as: e-mail, videoconferencing, and private notice boards/threaded discussions and "chat" facilities. Exploratory-based learning through the Web directly supports action-based learning in the workplace and as a consequence fuels distributed intelligence networks and the creation of emerging knowledge-based economies.

Collaborative learning through the Internet is seen as a natural extension to the exploratory-based style and provides a vehicle for the transformation from tacit to explicit knowledge creation. As it indicates, this type of learning is group based and as a consequence typically relies on customizable Groupware products that are now widely available through "off-the-shelf" MLEs, designed specifically for the Internet. Software applications are also available specifically for collaborative learning. For example, LearningSpace from IBM provides specific groupware tools that are highly customisable to specific target markets and for many companies builds naturally onto existing Lotus Notes applications. The primary difference between the general MLEs and specialist collaborative learning software is the level of customisation of the tools. Typically, the software is a smaller application and significant emphasis is place on the overall look and feel of the product for the target audience, e.g. the names of "icons" and

software tools. Group working, typically in the workplace, requires customised forms of learning specific to group needs, which provides the potential to reap direct benefits from the group dynamics. Such a personal form of learning can be an expensive form of learning, typically relying on synchronous communications tools, but provides the ability to drive knowledge from the learning process but, just as importantly, can act as a vehicle for the transition from tacit to explicit knowledge creation. The mainstream use of the Web is making such forms of learning far more cost effective and also relevant to international business through virtual team working. This style of learning could be used for group-based "brainstorming" sessions at the idea generation stage for new product development, allowing the transition of tacit knowledge to explicit knowledge creation. LearningSpace software's latest release reflects the need to reap the benefit of group dynamics through far greater emphasis being placed on the development of synchronous communication applications.

"Individualistic" environments are specifically based on an instructional learning style. Such an approach, as indicated earlier, has evolved from a behaviorist/empiricist perspective towards learning, but more recently, unprecedented speed of development is directly attributed to the commercial acceptance of the World Wide Web (WWW). An "individualistic" style is typically driven at a group and organisation-wide level, which is common in higher education with large numbers of students in lectures and also group-based tutorials. For example, the instructional-based model has been widely adopted in universities in the pursuit of providing education to a large student population. Business organisations commonly use a similar approach in the design and delivery of skills-based training programmes. The Web offers an individualistic learning style to employees, on demand, and is now frequently called "just-in-time" learning. Clearly the learning is individual based, with a focus on explicit knowledge creation at a group and organisational level. Universities for example, are now using various Internet-based managed learning environments that are typically sector specific. Many software applications are now available for the university and college sectors, including

Blackboard, WebCT, LearningSpace plus many more. Some of the products are more customisable than others and as a consequence this affects if they are specific to the education sector or if they are also applicable to more commercial organisations of various industry sectors. For example, WebCT and Blackboard are directly aimed at the university and college sector and are particularly focused on what we have termed "individualistic" and "interactive" styles of learning. In summary, the individualistic style supports the creation of explicit knowledge from explicit knowledge, driven through an instructional-based learning perspective.

The "interactive" learning perspective has similarities with the collaborative perspective but in the context of the framework presented, the collaborative approach has a stronger exploratory focus in group-based learning, while the interactive style has greater emphasis on performance outcomes in a specific context. Interactive learning, as indicated earlier, is rooted in the cognitive model and in relation to knowledge creation is able to allow specific performance-based projects that enable tacit knowledge from explicit knowledge creation. Even though group based, it is the individual explicit knowledge that drives group-based tacit knowledge exchange. This is frequently being realised across organisational intranets through the use of Web-based group tools and also the endless specialist text-based interest groups. This type of learning is based on information repositories and e-mail-based systems plus groupware tools including videoconferencing. This is now more frequently being driven by Internet-based managed learning environments. These may be through in-house designed communications and database driven applications or industry specific software application. In the educational sector, WebCT and Blackboard are directly focused on supporting the "interactive" style of learning along with the "individualistic" approach. In comparison, the "interactive" style of learning is also of fundamental relevance to what we have interpreted as the more anarchic learning communities and is, in particular, routed in the "open source" software communities.

The fundamental driver of sustainable success in all the proposed learning styles, in the above framework, focus on the creation of both explicit and tacit knowledge in the development of on-line communities. To be able to sustain knowledge management across organisations, which are typically becoming more distributed in terms of structure, e-learning communities provide fundamental drivers for their successful application and relevance.

Building a foundation for e-learning community

The "open source" approach illustrates organizations that have developed very loose dynamic knowledge networks that are driven by new forms of interaction and virtual team working through e-learning communities. To understand the dynamics of such networks is clearly complex and calls for extensive empirical research across various sectors operating in information-intensive markets. This article has primarily focused on organisations operating in markets that have the potential to be purely virtual in nature, such as publishing, education, music, consultancy, plus many more that are emerging as a consequence of the Internet and frequently termed "market makers". In particular we have considered the role of e-learning in driving the process of knowledge creation with consideration also to its relationship with distributed intelligence. The model below is intended to provide a guide to building a knowledge network through establishing an e-learning-based community. It is intended to illustrate the dynamic nature of e-learning communities across an entire supply chain. Within the on-line community, communication provides the foundation that is typically a hybrid mix between digitally driven person-to-person and person-to-machine modes of communications. McLuhan stated that the medium is viewed by most as the message but now we need to view the medium as the market (Hoffman and Novak, 1996). Communications has also moved from a one-to-many form (mass broadcast media) to a many-to-many form (interactive TV). Such technological developments on the Internet are allowing the e-learning communities described in this article to become more immersive in nature through embedding richer human dynamics and behaviour into the learning process. In particular, we need to consider the need for a

strong market focus in the development of effective e-learning communities in relation to knowledge creation. The technology is clearly blurring the boundaries between markets and in particular the relationship between producer and consumer where in information-intensive markets the consumer is frequently part of the process of production. Finally the models in Figure 3 also indicate the importance of both individual and group dynamics for e-learning and distributed intelligence as enablers of sustainable knowledge networks.

Managers in the increasing number of information intensive organizations cannot afford to ignore business concept innovation and the importance of knowledge management. We believe that virtual knowledge networks have a key role to play in this process. In sustaining successful distributed knowledge networks through e-learning communities, managers need to consider (Cothrel and Williams, 1999; McDermott, 1999):

- focusing on the needs of members when building e-learning applications and initiatives;
- the temptation for too much control of the learning process;
- the e-learning community direction and required guidance, even though over time it may become more able to self-sustain;
- letting the community decide what to share and the most appropriate way of sharing;

- related environmental factors;
- a culture change is an on-line community issue;
- possibility to extend on-line community building beyond the organisational boundaries;
- informal roles adopted by participants including "advocate", "leader" and "instigator"; and
- distributed intelligence develops through the practice of learning in linking perception and action and, as a consequence, is fundamental to learning and the knowledge creation process.

The "open source" community is a clear exponent of such developments and the success of what is viewed by many as unconventional in nature is best illustrated through the global acceptance and use of products from Linux, Sendmail and Apache. E-learning communities, when used effectively, clearly allow for the effective management of complex and often anarchic distributed knowledge and provide real opportunities for realising the value creation process in information-intensive products operating across virtual markets.

European businesses in general now recognise the importance of knowledge management but dealing with the implications of knowledge management, particularly in rapidly developing sectors, can be difficult. Ultimately, however, the real barriers are not likely to be technological but to stem from established ways of managing

Figure 3 E-learning communities, virtual markets and knowledge creation

Distributed Knowledge Networks through e-Learning Communities
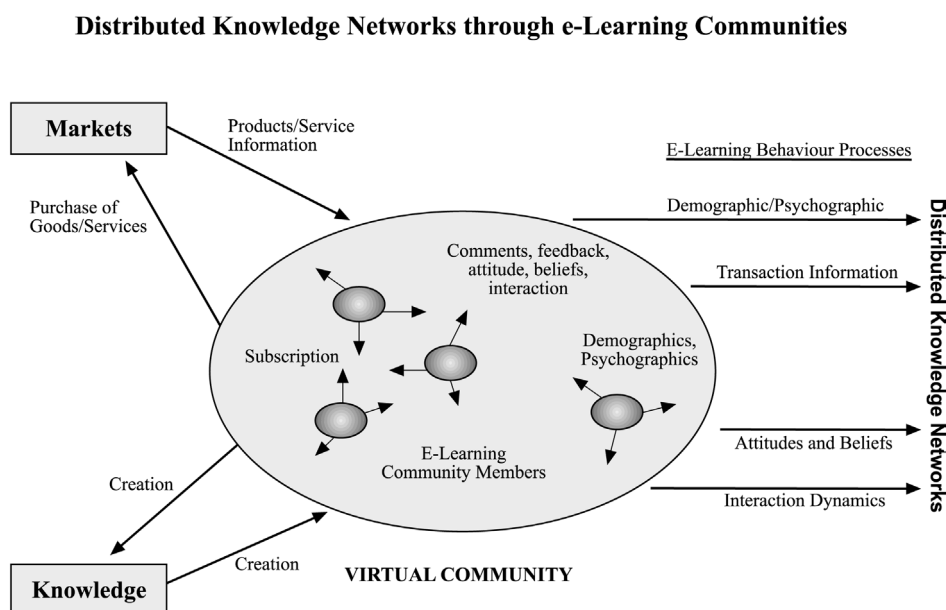
and entrenched organizational cultures. An indication of this difficulty, as small dynamic start-ups become giant corporations, can perhaps be gleaned from the fact that within a period of a few weeks in early 2001, three high profile chief executives left leading European Internet businesses:

(1) Fabiola Arrendono from Yahoo Europe;
(2) Bob Davis from Terra Lycos; and
(3) James Kinsella from Tiscali.

Developing effective e-learning communities will require organizations that have not already done so to learn new ways of dealing with the complexities of the digital era and seek to change them and benefit from some of the more extreme success stories found in, for example, the "open source" community.

References

Boyarski, D. (1997), "What is hierarchy?", *Design Management Journal*, Summer.

Cothrel, J. and Williams, R. (1999), *Knowledge Management Review*, Issue 6, pp. 20-5.

Cross, K.P. (1976), *Accent on Learning*, Jossey-Bass, San Francisco, CA.

Curry, L. (1983), *An Organisation of Learning Style Theory and Constructs*, UUUS Department of Education, Eric document 235 185.

Earl, M.J. and Scott, I.A. (1999), "What is a chief knowledge officer?", *Sloan Management Review*, Vol. 40 No. 2, Winter, pp. 29-38.

Hoffman, D.L. and Novak, T.P. (1996), "Marketing in hypermedia computer-mediated environments: conceptual foundations", *Journal of Marketing*, Vol. 60, July, pp. 50-68.

Johnson, P., Heimann, V. and O'Neil, K. (2001), "The 'wonderland' of virtual teams", *Journal of Workplace Learning*, Vol. 13 No. 1, pp. 24-9.

Laurillard, D. (1979), "The process of student learning", *Higher Education*, Vol. 8, pp. 395-409.

McDermott, R. (1999), "Why information technology inspired but cannot deliver knowledge management", *California Management Review*, Vol. 41 No. 4, pp. 103-17.

Nonaka, I. and Konnoo, N. (1998), "The concept of 'Ba': building a foundation for knowledge creation", *California Management Review*, Vol. 40 No. 3, pp. 40-54.

Reynolds, M. (1997), "Learning styles: a critique", *Management Learning*, Vol. 28 No. 2, pp. 115-33.

Sarup, M. (1986), *The Politics of Multiracial Education*, Routledge & Kegan Paul, London.

Further reading

Firdyiwek, Y. (1999), "Web-based courseware tools: where is the pedagogy?", *Educational Technology*, January-February, pp. 29-34.

Hamel, G. (2000), "The end of progress", *Business Strategy Review*, Vol. 11 No. 3, pp. 69-78.

Hansen, M.T., Nohria, N. and Teirney, T. (1999), "What's your strategy for managing knowledge", *Harvard Business Review*, March-April, pp. 106-16.

Lally, V. and Barrett, E. (1999), "Building a learning community on-line: towards socio-academic interaction", *Education*, Vol. 14 No. 2, pp. 147-63.

Leonard, D. and Sensiper, S. (1998), "The role of tacit knowledge in group innovation", *California Management Review*, Vol. 40 No. 3, pp. 112-32.

Quinn, B., Anderson, P. and Finkelstein, S. (1996), "Managing professional intellect: making the most of the best", *Harvard Business Review*, March-April, pp. 71-80.

Rayport, J.F. and Sviokla, J.J. (1994), "Managing in the marketspace", *Harvard Business Review*, November-December, pp. 141-50.

Resnick, L.B., Greeno, J.G. and Collins, A.M. (1996), "Cognition and learning", in Berliner, D.C. and Calfee, R.C. (Eds), *Handbook of Educational Psychology*, Macmillan, New York, NY, pp. 15-46.

Sarvary, M. (1999), "Knowledge management and competition in the consulting industry", *California Management Review*, Vol. 41 No. 2, pp. 95-107.