Chapter VIII

Distributed Learning Objects:
An Open Knowledge Management Model

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Abstract

This chapter analyzes the emergence of learning objects as a dynamic and interactive relationship between technology and the organization. We examine the way that organizational objectives are embedded within selected technologies. In other words, how is the selected technology addressing the organization's needs? Further, we argue for a socially-constructed model of knowledge management. Specifically, we utilize Demarest's (1997) four-step process of the construction of a knowledge economy. From these processes, via a constructed technological system, a learning object economy emerges, which includes various constituents: the 21st century learner, the subject matter expert (university professor),

vendors who support or enable knowledge management, and populaces that harvest and benefit from the collection of knowledge.

Introduction

As state and federal funds diminish and as higher education resources and university budgets become more restricted, postsecondary institutions are becoming increasingly entrepreneurial in pursuing and developing technological solutions. Meyer (2002) describes a changing marketplace, increasingly global in orientation, where technology enables the provision of adult education, executive training/retraining, competency-based programs, and education to remote geographical areas. Knowledge management,[1] in higher education, is a way to retain and manage knowledge products. As higher education organizations increasingly interact with other organizational types, such as corporations, consortia, and other educational institutions, knowledge products become critical in the exchange process. Technological systems are designed to manage knowledge and are situated in social systems with corresponding cultures, values, and beliefs. As such, higher education, as an organizational structure and a social system, must consider processes, policies, and embedded assumptions about technology, teaching, and learning, not only within their own institution, but also across those with which they interact.

The trend toward knowledge management is evidenced in the myriad of technological artifacts that have emerged to capture, categorize, and manage learning objects. During their evolution, learning objects have come to be defined in a number of ways, depending on the context and culture from which they emerge, for example, computer science, education, instructional technology, and so on. For our purposes, we define a learning object as any digital asset that is intended to be used to achieve a learning objective and can be reused in different contexts. Learning objects may be data or data sets, texts, images or image collections, audio or video materials, executable programs, courses offered through Learning/Course Management Systems (L/CMS), or other resources that can be delivered electronically. Learning objects should be re-useable and re-purposeable over time and location and interoperable across systems and software (see Downes, 2002; Robson, 2001; Wiley, 2000). Additionally, learning objects can be combined or aggregated in different ways providing the potential for individualized learning experiences for specific

learners in which their learning styles, prior knowledge, and specific learning needs are accounted for. They may also offer great value in terms of saving time and money in course development, increasing the reusability of content, enhancing students' learning environment, sharing knowledge within and across disciplines, and engaging faculty members in a dynamic community of practice (Bennett & Metros, 2001). Learning objects may be created by individuals or institutions and therefore require consideration of digital rights as well as storage and distribution.

How learning objects are stored and subsequently accessed has been primarily addressed through technology systems known as digital learning object repositories. Thomas and Home (2004) have identified four rationales, not only for the development of learning objects, but also for their storage in these digital containers.

1. **The Efficiency Route:** The more institutions work together, the less likely replication of efforts and therefore reduced costs based on the idea that learning objects "deliver industrial economies of scale" (p. 12).
2. **The Teacher-Centered Route:** The more that educators share resources and best practices, the more likely teaching will improve. In this manner learning object "creation [is] co-production" (p. 12).
3. **The Pupil-Centered Route:** Learners who have access to a variety of objects designed with different learning needs in mind, can be betters supported. In this sense, learning objects become "scalable and networked" (p. 13).
4. **The Freedom Argument:** Educators should take ownership and be able to disseminate freely to the larger educational community without struggling with or against issues of institutional ownership, intellectual property or even censorship.

These rationales serve to illustrate the value structures within organizational cultures that determine how technology is used to make knowledge accessible and the reasons for doing so. Such positions are reflected in organizational policies and are particularly critical within cross-institutional interactions.

This chapter analyzes the emergence of learning objects as a dynamic and interactive relationship between technology and the organization. We examine the way that organizational objectives are embedded within selected technolo-

gies. In other words, how is the selected technology addressing the organization's needs? Further, we argue for a socially-constructed model of knowledge management. Specifically, we utilize Demarest's (1997) four-step process of the construction of a knowledge economy. Next, we examine the way that knowledge is transmitted through a selected technological system. From these processes, via a constructed technological system, a learning object economy[2] emerges, which includes various constituents: the 21st century learner, the subject matter expert (university professor), vendors who support or enable knowledge management, and populaces that harvest and benefit from the collection of knowledge. We discuss four current models of knowledge management found in higher education: the traditional model, the intellectual capital/appropriative model, the sharing/reciprocal model, and the contribution pedagogy model. We propose a new, relativist model of knowledge management for higher education that accommodates cross-institutional cultures and beliefs about learning technologies, construction of knowledge across systems and institutions, as well as the trend toward learner-centered, disaggregated, and re-aggregated learning objects, and negotiated intellectual property rights.

A Starting Point: Thomas's Theory of Organizational Technology

Thomas (1994) argues that a technical system utilized within an organization can be objective, but also infused with objectives, reflective of the interests or goals of particular groups within the social system. A technological system, he contends, has the ability to define and redefine tasks, responsibilities, and relationships or to evoke or reinforce change. Further, the eventual selection of a specific technology reflects the interests and ideologies of the organizational structure. Organizations are composed of interdependent social and technological systems where changes in one usually occasion adaptation in the other (e.g., a course management system many interact with a registration system). However, the relationship between technology and the organization is dynamic and interactive, that is, technology may cause organizational change and organizational objectives may produce a change in the technological system. Thomas explains that in order for the technology to be incorporated into organizational life, it must be transformed from a physical object into a social one. In other words, organizational members must recognize that the technology exists and then negotiate a set of understandings about what it is, what it

means, and how it defines and redefines tasks, responsibilities, and relationships. Thomas proposes a model of organizational technology whose adoption and use is shaped or determined, to some extent, by the organization that selects it. While he acknowledges that the technological system interacts with the organization and its objectives and vice versa, this model is limited to some extent by those very things: the organization and its objectives.

Current knowledge management models are organizationally-centered and are thus limited by the values and interests of their constituents. However, others are arguing for a transformation of the knowledge economy from one that is proprietary to a freestanding, shared knowledge community (Norris, Mason, & Lefrere, 2003). Norris, et al. point to eight external and internal forces that are producing this shift: 1) Investments in infrastructure and best practices by "early adopters" of e-knowledge (e.g., associations, governmental agencies, corporations, universities) deliver results that encourage wider adoption, and also facilitate new generations of enterprise applications; 2) Global enterprises that increase competitiveness by developing faster ways to manage their knowledge and strategic learning by creating tools that non-experts can use; 3) Growth in expert networks and easier, more productive participation in communities of practice that push e-knowledge practices and competencies; 4) Increasing sophistication by users, who develop an appetite for services that provide significant gains in their capacity to access and assimilate knowledge; 5) Advances in Internet and intranet-based capabilities that enable jump shifts in creating and accessing knowledge stores; 6) Innovations in mobile communications that provide ubiquitous access to perpetual learning solutions, as well as new ways to meet demands for e-commerce in any place or time; 7) Insight into new and more effective ways of experiencing how knowledge drives innovation; and 8) Increased understanding about how to deploy international standards in ways that ensure useful return on investments (e.g. through interoperability) that stimulates continued investment. We believe that these are just some of the local and global changes occurring that are motivating higher education to explore a system of knowledge management that is socially-constructed rather than organizationally-determined. As this trend unfolds, there is an increasing demand for collaborative discourse and negotiation, not just about what technology means, but also how it is designed and how artifacts such as learning objects are shared. This trend is evidenced by such efforts as the IMS Global Learning Consortium, Inc., in which members from around the world work together to develop specifications for e-learning technologies.

Social Construction of Knowledge and Learning Objects

The global nature of education within a distributed learning context requires that higher education, particularly considering learning objects as a valuable commodity that can be traded and exchanged, is part of an evolving knowledge economy. Texts, videos, and other materials have proven the value of institutionally-generated knowledge, but traditionally these products have produced revenue for an individual with value capital for the institution. Learning objects are forcing institutions to examine the economic exchange of the knowledge capital they are generating as they search for strategies to manage and negotiate value.

Following Thomas's theory of the social or organizational construction of technological systems and drawing from an economic business perspective, Demarest (1997) postulates that organizations value knowledge based on "what works." Business uses resource capital in order to develop processes and structures that result in increased sales and revenue. Davenport, DeLong, and Beers (1998) found four distinct types of knowledge management initiatives in corporations that were intended to:

1. Provide repositories for internally generated policy and informational knowledge.
2. Provide access to knowledge or transfer among individuals.
3. Facilitate the generation and use of knowledge.
4. Manage knowledge assets in such a way that value is apparent.

Corporate knowledge management comes from an economic model that is based on a knowledgeable workforce that increases the organization's return on investment. Davenport, et al. believe an economic model is appropriate for learning objects in higher education in that they are, by definition, designed to be re-used and shared. Whether or not they have a monetary value assigned to them is incidental, it is the investment of development and dissemination that belies their institutional value. In higher education, "what works" is similar to that of business, but involves "human capital," which may result in increased enrollments, higher post-graduation employment rates, and academic recognition and prestige for the knowledge generated and disseminated. It is the latter that applies most directly to learning objects in that academic recognition

comes from the intellectual production of knowledge that is to be disseminated across institutions, and to a large extent contributes to the knowledge base of those institutions.

Higher education values philosophical and scientific knowledge that is generated by the scholarship of its members. Such knowledge has traditionally driven innovation and production (Lyotard, 1984). The commodification of knowledge through information distributed through technologies such as the Internet has expanded the power of university-generated knowledge that can reach beyond business and government to everyone with access to the Internet. However, the value of philosophical and scientific knowledge may be confused with knowledge that keeps the organization performing. For Demarest (1997) this includes:

- A shared understanding of how value is determined, assigned, maintained, and communicated throughout the organization and with external groups or individuals with whom the organization interacts.
- A set of processes and systems—technical or human—that support and help channel the [organization's] value-creating activities (p. 1).
- A set of indicators that associate the value-creation process with the measures of the organization's success.
- A set of systems that as a part of the "knowledge management infrastructure that monitor the efficiency and effectiveness of that value creation process, indicate opportunities for performance improvement and generally signal the relative rise or decline in value creation" (p. 1).

Higher education has parallel types of performance knowledge manifested in standards for knowledge acquisition by the learner (program requirements, degree audits, grades), standards of academic knowledge (criteria for merit and tenure, peer review of intellectual property), structures and processes for control of organizational knowledge (publications, events, training), and standards for institutional knowledge (internal reviews, accreditation). The sum total of these types of knowledge and the mechanisms through which their value is determined and tied to performance is what allows the institution to function and yet varies among institutions, challenging the cross-fertilization and reciprocation that goes hand-in-hand with exchange of resources. Demarest believes organizational knowledge is socially constructed, and shared. This

occurs through four processes: construction, embodiment, dissemination, and use.

Construction is "the process of discovering or structuring a kind of knowledge" (p.6). Organizations that are learning-focused (i.e., K-12, higher, and workplace professional development departments) utilize specific processes of identifying valued knowledge. Value propositions in such organizations, and to a certain extent in industry where learning is seen as training, may come from external events or forces (community needs, governmental mandates, etc.) or from experience through interaction with client populations (focus sessions, course or training evaluations, documented complaints, etc.). Valued knowledge emerges through an iterative process of examining and implementing the governing body's mandates (government, professional organization, and certifying agencies), determining community- or client-based values and needs, and identifying best practices and policies that support the identified organizational outcomes.

Embodiment is "the process of choosing a container for knowledge once it is constructed" (p. 6). The container may take a variety of forms, most typically a document: manual, memoranda, report, tutorial, or speech. In higher education, such embodiments may be captured as learning objects and stored in a repository or learning content management system (L/CMS). How the embodiment is conceptualized may reflect the organizational cultural beliefs about the social relationships, communication processes, and the structures of authority. For example, L/CMS that are course-based and only accessible to registered members of the course may indicate intellectual property controls or return on investment as indicated by course registration.

Dissemination "refers to the human processes and technical infrastructure that make embodied knowledge, such as documents, available to the people that use the documents and the bodies of knowledge" (p.6) that serve a function to achieve the organizational goals. Such knowledge dissemination is increasingly digital, although issues of access through systems and (perhaps) limitations of user's technical skills may be why some educational organizations rely on printed media. Digitization has enabled knowledge updates, re-organization, and re-purposing to be quickly and easily possible. Communication about such changes however must be made to the population who uses the knowledge.

Use refers to the ultimate objective of any knowledge management system: the "production" (p. 6) of value. At this point, Thomas's value proposition is most evident. Organizational knowledge may be constructed, embodied, and disseminated but until it is used, its value is only a construct. Use, it can be argued,

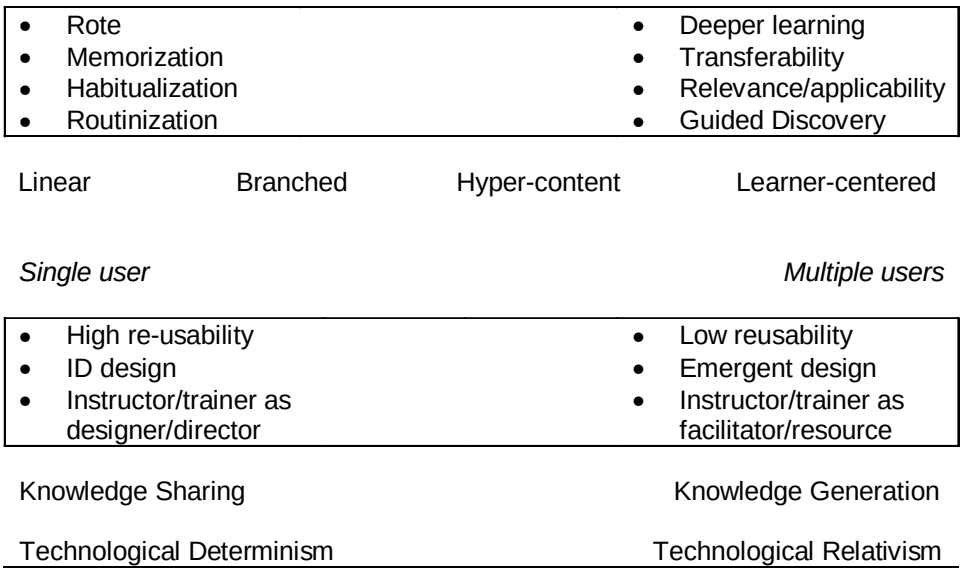
is what determines the value of any knowledge. Learning objects stored in repositories or located by "Googling," but finding out by whom, when, or for what reason (much less for what outcome) is marginally addressed through metadata, but more directly addressed through strategies such as Digital Rights Management (DRM). DRM identifies the rights of holders, permissions, and tracks usage. The Digital Object Identifier (DOI®) system identifies and tracks use of digital objects, primarily to protect and document how intellectual property is being used, but not to discover the knowledge value of an object. As tracking strategies become adopted and uniformly used, we suspect value will be determined more by frequency of use than by other indicators, such as return on investment (ROI), or by the knowledge value to the user. Most importantly, the social construction of organizational knowledge does not address knowledge acquisition, which is a primary function of higher education.

Technology-Supported Knowledge Acquisition and Construction in Higher Education

The US history of funding technology as a strategy for reform illustrates the theory of technological determinism[3], but belies the reality of the application and adoption of technology and the difficulty, if not impossibility of its predictability and control (Hughes, 2001). Technological relativism[4] embraces this ambiguity and better reflects what actually occurs in the post-structuralist learning environment where faculty conduct scholarship and the learner engages in social learning through a variety of technologies, in a variety of ways, in different contexts that support the institutional goals and philosophy. Sørensen (1996) discusses the prevailing discourse about learning through doing, using, and interacting by which a learning economy is produced, based on the notion that learner actions involve production that is supported by various technological systems. As learners increasingly access objects within structured learning experiences they are also generating objects that document, describe, illustrate, or share their own knowledge acquisition. This process reflects Demarest's focus on performance enacted through his social model of knowledge management. In higher education, performance outside of pedagogically-driven environments is less valued because it occurs outside of the economy. The organization assigns value based on the source of the knowledge. Because the learner can access knowledge anywhere or anytime, value propositions erode and are relative, at least for the learner.

The nature of learning object construction and re-use as disaggregated[5] course content that may be re-aggregated in different ways reflects current thinking about the social construction of knowledge espoused in pedagogical models of online learning (Simonson, Smaldino, Albright, & Zvacek, 2003), the commodification of the course (Diaz, 2004), and the instructional use of learning objects (Higgs, Meredith, & Hand, 2003). Figure 1 below illustrates learning designs in distributed learning systems. Linear learning designs are more content-driven with little deviation from the instructional path and low interactivity with others or the content that is predetermined and a strategy for sharing knowledge. Such designs are highly re-usable and functional when concept, principle, and procedural knowledge are the goal. As the learner moves to the right of the continuum they are afforded more choices about the path of instruction, information formats, and sources, and how they will demonstrate and document their knowledge acquisition. The learner becomes, to a degree, a designer of their own instruction and a generator of knowledge. Difficult to replicate and re-use, this design holds more promise for transfer of knowledge to other contexts and deeper learning (Carmean, 2002). The

Figure 1. Learning designs in distributed learning systems



generation of knowledge and eventual dissemination via learning objects represents a shift, not only in who generates and how generation occurs, but also in how constituencies receive the knowledge. Didactic instruction is a universally used approach to teaching in classroom settings. The traditional approach to instruction in higher education is instructor-dependent, content-driven, and situated in knowledge transfer (Gibbons & Wentworth, 2001). This is at odds with what is known about adult learning in college and the workplace (Mentkowski, 2000) and in research indicating that as educators use technology in general, their role as subject matter expert shifts to that of guide and facilitator, reflecting an epistemological shift with a variety of associated outcomes (Reeves, 2002). A learning object pedagogy, unlike the traditional model, is one in which the learner makes decisions and choices about a task or problem as they locate relevant information, and construct and generate knowledge eventually embodied in a learning object. The instructor and LCMS, serve as guide and facilitator.

Objects that are used within larger pedagogical frameworks, classrooms, L/CMSs, or blended learning environments, have embedded systems which determine or sanction the function of the object and which operate within the instructional designer's pedagogical determinism. Although objects that are learner-centered achieve multiple objectives and are more likely to be generative, they are also confined to some degree by the system, process, and technology within which they operate. The disaggregation of the course has provided a natural opportunity for the learner to modify existing objects or create new ones that become a part of the knowledge used by others to learn (Collis & Stijker, 2003). It is the opportunity for knowledge generation that informs the social model of knowledge management through knowledge management learning designs that operate across institutions, through cross-fertilization, be it intentional (determinist) or selected (relativist).

Transmission of Knowledge Across, Through, and in Spite of Organizations

The challenge of any institutionalized knowledge base and system of transmission, transferal, or adoption is that no learner remains within the organizational context throughout their day-to-day life, and they move between context across their learning and working life. As workers who are engaged in continual learning, we move between and among organizations that use technologies, the

use of which, for the most part, is defined for us by the organizations in which we are situated. Learning environments, rules, procedures, and intended outcomes change as we move from school to work to training. Thus within an institution, the individual acts and interacts from a personal point of view.

In post-secondary education, technology is used to support learning, primarily as an Information Communication Technology (ICT) through which knowledge is constructed, learning is managed, or learning objects are disseminated. E-learning has become standard in higher education, as evidenced by the burgeoning and robust market for course management systems, Web-based tutorials and simulations, and mobile computing. Of course, learners in formal educational environments also acquire knowledge from family, social groups, and other social, religious, or civic organizations (Bransford, Brown, & Cocking, 2000). Social learning is ill-structured and not necessarily outcome-driven, while learning that is not situated in work or education is typically uniquely structured and without conditional assessment measures. For most of us, our preparation to learn strategically in formal and organized settings begins at an early age in traditional educational institutions. The nature of this type of learning is so institutionalized that it crosses most cultures, economic groups, and generations. Yet when we leave an educational setting and are required to learn in workplace environments, the nature of learning shifts.

In the workplace, technology is also used as an ICT although the focus is more on job skills training for just-in-time, just-in-need, or just-in-case learning that relates to job tasks, seen as performance support. Designs for workplace knowledge management systems are equally recommended to be learner-oriented in interface and content as well as management design (Raybould, 2002). Over the developmental life of the learner, then, the organizational uses and expectations of technology shifts at the macro level as well as the micro level as discussed by Thomas (1994).

An often-missing component from the decision to implement a technology-mediated learning strategy is evaluation or effectiveness studies to determine if the selected technology has the ability to address institutional goals and concerns. The literature in this area looks at "satisfaction" in a way that does not always address actual learning outcomes and overall, there exists a lack of empirical studies showing that the use of instructional technology actually improves learning regardless of the context (Arbaugh, 2002; Buckley, 2002; McClelland, 2001; McGorry, 2003; Neal, 1998). Studies conclude that the full potential of instructional technology is reached only by a full transformation of the learning process, faculty development, and institutional systems (Buckley,

2002; Jamieson, Fisher, Gilding, Taylor, & Trevitt, 2000; Moore, 2002). The research on the effectiveness of distance education or online learning programs shows difficulty with student-instructor communication, lack of socialization both with the instructor and other students, student engagement and interaction, innovation in teaching, and technical difficulties or support (McGorry, 2003; Salisbury, Pearson, Miller, & Marett, 2002). Finally, the instructor's actual technological expertise (Lea, Clayton, Draude, & Barlow, 2001; Webster & Hackley, 1997) along with their ability to overcome interaction problems (Berger, 1999) has been found to be important both in faculty member's decisions to adopt instructional technology and in students' satisfaction and learning outcomes. These findings are at odds with return on investment (ROI) arguments that distributed education can serve large populations without denigrating effectiveness, a trend seen in higher education.

Technology has shifted the nature of traditional learning and training by removing the learner from contexts, such as school and workplace. Taylor (2001) has developed a model that describes the shift in distributed learning from linear and print-based to flexible and modular/digital based:

- The "correspondence model" relies on print-based resources.
- The "multimedia model" provides learning resources through a variety of media including print.
- The "tele-learning model" incorporates modes of presentation of materials to include audio or video-conferencing and broadcast TV or radio.
- The "flexible learning model" requires that students engage in interactive, online computer-mediated resources and activities.
- The "intelligent flexible learning model" is the next generation model in which the learner accesses learning processes and resources through portals.

Learning through and with learning objects enables the learner to self-direct their experiences and engage with others for purposes that best support their learning, while utilizing objects that best match their needs. Diaz (2004) notes that the more complex and autonomous the system, the more it allows the learner to manage their own learning, but the higher the degree of technical skills necessary, and the larger the institutional investment. Conversely (or perversely), the more the learner is engaged in making choices and directing

learning experiences, the greater the likelihood they will generate knowledge. Personally constructed knowledge is then influenced by the organizational knowledge that shapes our behaviors, values, and norms that we bring to learning or working context. The process of knowledge construction is reflected in the way organizations approach knowledge management. Learner- or worker-generated knowledge is not without limitations and barriers within certain models of knowledge management.

Four Models of Knowledge Management

Existing models of knowledge management have emerged from policy and practice. Although the tradition of distributed instructional materials is not new for higher education, the shift toward digitalization has affected the nature of distribution, as well as policy decisions. Learning objects are a relatively new concept with to knowledge management, and the idea of re-use and re-purposing has necessitated specific management and ownership considerations. Typically, learning objects originate with ideas generated by faculty members and are created with supports from the university, then distributed through a local or external repository. Rights of ownership and attribution are critical as are permissions to re-use, revise, and maintain the objects. Pre-learning object policy has not fully accounted for the unique provisions of reuse. In this evolving context of learning objects, we have identified four models that address control and ownership in varying ways: traditional pre-digital, intellectual capital/appropriative, sharing/reciprocal, and contribution-pedagogy.

Traditional Pre-Digital Model

The traditional model of ownership in the area of copyright predates technology. Up until the passing of the Digital Millennium Copyright Act of 1998 (DMCA), and perhaps after, long established legal principles grant to employees, such as faculty members, the inherent right of ownership to their inventions (Chew, 1992). Intellectual property policy language, especially in the area of digital works such as learning objects, can sometimes be ambiguous. McMillen (2001) finds that academic custom, the informal principles of university practice, impact copyright ownership in two ways. First, if there is ambiguity in a faculty member contract or other written document that expressly assigns copyright ownership, courts may look at custom and usage to determine the

university and professor's intent regarding ownership. In other words, courts could decide to take into account an institution's established practices in deciding who should retain property rights. Second, if no contract, policy, or written document regarding copyright ownership exists, courts are permitted to use the academic custom and usage within or outside the institution to determine what the parties would have agreed to had they addressed copyright ownership.

In Rhoades (1998) examination of the actual ownership of faculty products, he found that, of the contracts analyzed, a majority of them had extensive provision for faculty ownership; in fact, the institution does not always claim ownership, even when it is a "work for hire." The "conditions" of production or use of resources are pivotal in determining ownership and assigning profits. In her analysis of intellectual property ownership in the institution of higher education in the United States, Chew (1992) reexamines ownership via social tradition and case law. Surprisingly, her findings reveal that, despite common assumptions, long established legal principles grant to employees, such as faculty, the inherent right of ownership to their inventions. Faculty members' claims on their inventions and the enforceability of university policies are unclear. However, as distributed learning technology evolves and requires greater use and infusion of institutional resources, ownership, and control may begin to away from individual creators and contributors and toward resources providers. Further adding to the ownership ambiguity is the vast array of digital products that are being produced within commercial and non-commercial collaborations and partnerships.

Intellectual Capital/Appropriative Model

The intellectual capital or appropriative model holds that ownership, control, and maintenance of intellectual property, especially in the area of distributed learning, is important. Under this model, institutional resources expended are carefully monitored and among other factors, become the criteria for ownership and control. Further, the vast majority of higher education institutions' intellectual property policies are increasingly based on this model (Diaz, 2004). The arrival of technology into the area of copyright has created a new market for products that previously had little or no commercial value. In fact, many copyright sections of intellectual property policies differentiate between digital and non-digital property and contain specific and substantial rights over these economically viable products. The intersection of intellectual property rights,

specifically in the area of copyright, and technology in higher education is the realm of distributed learning, including distance education, learning objects, digital repositories, and electronic courseware products.

Consistent with previous studies in the area of intellectual property copyright policy transformation and the corresponding commodification of educational products (Chew, 1992; Lape, 1992; Packard, 2002; Slaughter & Rhoades, 2004), Diaz (2004) finds that policies are evolving to further address distributed learning products in a variety of ways. Findings indicate that institutions are revising policies to further deal with and capture instructional products. Policies are aligned with the organizational change that is occurring in higher education within a larger context of an information-based economy (Castells, 2000). Additionally, the new instructional model is heavily dependent on information technology in the form of network connectivity, infrastructure and support staff, thus making it resource intensive. Policies reflect this change by mimicking the shift in ownership conditions away from those required in a traditional setting to those required in a high technology setting. Use of institutional resources in the instructional process had been nominal (i.e., secretarial support, libraries), compared to those required now: media specialists, instructional designers, and so on. Ownership terms changed to address the new instructional model, but claims on instructional products have appeared where there were previously none.

Institutions are asserting ownership where they previously had not because online courses and course materials present a potential source of revenue from which the institution could benefit. Several explanations exist for this increasingly appropriative behavior. Faculty-developed electronic content and courseware materials (especially in specialized academic areas where the market is deficient) present a potential source of revenue and savings, as the institution will not have to pay costly licensing fees to purchase or utilize externally developed products. Increasing "contracted" education serves the dual purpose of producing salary savings while providing one-on-one attention to students and improving their performance (Twigg, 2000). The appropriation of digital knowledge may also be a preemptive move on behalf of universities that fear faculty members will package their courses and make them available to multiple markets (while employed at the present institution or after they have left), perhaps in competition with the college or university that employs them.

Table 1. eLearning Partnerships

Organizational Partnership	Partners
EDUCAUSE Corporate Partner Program (http://www.educause.edu/partners/about.html)	• IT professionals (public/private) • Technologists • Managers • Higher education executives
Massachusetts Institute of Technology DSpace Federation (http://dspace.org)	• Columbia University, Cornell University, Ohio State University, and the Universities of Rochester, Toronto, and Washington • Hewlett-Packard • MIT Libraries
The Fedora Project (http://www.fedora.info/)	• University of Virginia • Andrew W. Mellon Foundation • Cornell University

Sharing/Reciprocal Model

The sharing reciprocal model is based on shared value and the exchange of learning objects and other digital materials across organizations and institutions (Diaz & McGee, 2004). The focus here is on the support of learning activities. Individual institutions support the assembly of learning objects, which may be shared across departments but, more commonly, objects are imported from many other places. Table 1 below illustrates the many partners that may be involved in these consortia. Organizational support mechanisms and systems moderate costs. Many institutions join consortium in order to create a system for storing and distributing objects in what becomes a mutually beneficial learning object economy (Learning Content eXchange, 2003). Consortia often articulate content and evaluation standardization as a strategy to increase the market value of an object. DRM, Royalty Rights Management (RRM), index, and search functions as well as supporting technologies are collectively addressed and operated through a well-organized consortia initiative. Such collaboration allows members to establish pre-determined policies and proce-

dures that articulate a negotiated value and standard of quality for the objects that are shared.

Learning object registries can provide standards and access for institutions that may not be interested in partnerships. One example is the Learning Object Network (LON) (http://www.learningobjectsnetwork.com) that uses Digital Object Identifier (DOI) as the identifier mechanism and collects object metadata and location information so they can direct potential users to the source. Institutions or consortia must determine the degree of access and set policy that sets the rights of the owner of the object. One approach to DRM is the Creative Commons Project[6] that provides no-cost licenses so that copyright holders can inform potential users about copyright restrictions. Knowledge management systems that can serve consortia provide customizable interfaces that can meet the unique needs and preferences of a group regardless of their funding level or size. For example, EZ Reusable Objects (EZRO) is an open source, free Web application that requires little to no technical expertise to configure and operates to manage learning objects. EZRO is scalable and responds to the specific needs of consortia driven by a variety of goals and directed by institutional policy.

The first three models discussed above fail to address the value of knowledge acquisition acquired through learner-object interaction, which should be an expectation and criteria in the learning object economy. Instead, they focus specifically on the exchange of goods in terms of the agreed-upon market value rather than the knowledge value that informs the "buyer" of whether or not, as Demarest would argue, the product "works." For higher education the value should reside in the object's actual knowledge value.

Contribution Pedagogy Model

The focus of the contribution-pedagogy model is that learners contribute to object development or generate objects themselves, thereby contributing to the knowledge base of the institution. This reflects the shift toward a learning object pedagogy in which learners, not only learn from experience by participating in the generation of the object, but by contributing to the learning of others through object development and re-use. Collis and Striker (2003) suggest that by having learners generate learning objects, and contribute to a course repository that grows with each offering of the course, the burden of producing objects is shifted away from the institution and the instructional process. This results in a

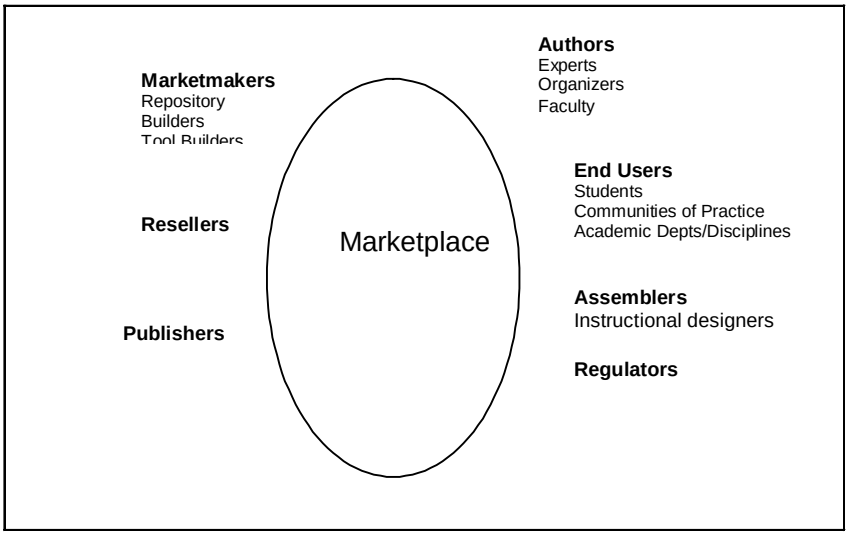
variety of benefits: time is saved for the instructor or content-generator, resources are designed by the population for which they are intended by providing a locally better "fit" with the intended audience, learners can contribute and revise objects over time by updating content or presentation, and the tacit knowledge of the learner is transparent and can be shared or studied by the institution (Collis & Winnips, 2002).

Laurillard and McAndrew (2003) illustrate the contribution-pedagogy model in their design of generic learning activities that shift teaching from a transmission model to a construction model. A design of generic learning activities shifts teaching from a transmission model to a construction model as illustrated by Laurillard's "Conversational Framework" for learning. This iterative process requires the learner to engage, act, and reflect upon what they know and how they come to learn. An analysis of scalable (individuals or groups) and sustainable (efficient and economic) learning designs address how to design for diversity of learner experiences, goal-based learning, re-use of objects, use of online learning tools for learning outcomes, clear and succinct instructions, and dynamic technology function. Specific recommendations are made for the design of objects to be used in multiple courses. When multiple applications are considered at the design stage, there is an increased likelihood of increased re-use across disciplines. Additionally, objects can be easily re-versioned depending on the needs of new or revised courses and pedagogy is wrapped around objects, activities, and supports. The Sharing/Reciprocal and Contribution-Pedagogy models impact how value is attributed, estimated, and assigned to learning objects and reflect Thomas and Home's (2003) Student-centered Route and Freedom Argument for the distribution and access of learning objects that suggests a new economy.

Learning Object Economy

Higher education's new approach to its knowledge products has led to the emergence of a learning object economy. Johnson (2003) notes that the learning object economy has at least five markets of exchange: proprietary, commercial, free, shared, and peer-to-peer. Each of these "markets" has a corresponding culture and has been met with varying degrees of success. He argues that a fully functioning learning object economy would satisfy the needs and requirements of its constituents: market-makers (repository builders), instructors, end users, assemblers, regulators, publishers, resellers, and au-

Figure 2. Learning object economy (Learning Object Economy adapted from Johnson, 2003).



thors. Figure 2 below illustrates the way that various constituents intersect and exchange in this new economy (Johnson, 2003).

Technologies, if they resonate and are adopted, can generate an economy that is derived from the value placed on them by a social group. Groups may have different interpretations of the basis of the value. Since learning objects require group collaboration, represent knowledge construction, and are disseminated across populations, there is a high level of mediating variables and processes.

Technological systems, if they resonate with the organization and are adopted, can generate an economy that is derived from the value placed on them by a social group. Groups may have different interpretations of value, and since learning objects require group collaboration, represent knowledge construction, and are disseminated across varied populations, a high level of mediating variables and processes exist. Johnson (2003) describes five markets, each with a different exchange approach, in which learning objects operate. These markets—proprietary, commercial, free, shared, and peer-to-peer—are described in Table 2.

Table 2. Learning object economy and the five markets

Market	Product Example
Proprietary	Private company training repository
Commercial	E-learning companies selling learning objects
Free	MERLOT or the Educational Learning Object Exchange
Shared	Higher education LO consortia
Peer-to-peer	Sharing systems between higher education institutions

Each of the aforementioned four knowledge management models (traditional-pre digital, intellectual capital/appropriative, sharing/reciprocal, and contribution pedagogy) intersects with one or more of Johnson's learning object economy markets. For instance, the traditional-pre digital, intellectual capital/appropriative models exist within the value system of the proprietary and commercial markets. The last three markets, free, shared, and peer-to-peer, also exist in higher education settings. It is possible for appropriative and non-appropriative models to coexist, for instance within a college or department. Each market satisfies those constituents' needs and is aligned with a set of culture-specific values. Implicit needs must also be met in order for exchange to flourish. For instance, learning objects must be credible or carry some quality assurance regardless of the system within which they operate.

Although the literature (Hart, 2004; Kidwell, Vander Linde, & Johnson, 2000; Norris, et al., 2003) suggests a maturing of knowledge management practices that have resulted in a myriad of systems, the learning object economy in all markets is still weak at best. As Johnson (2003) points out, the current level of activity has not yet reached a "tipping point." The solution, he postulates, is an "economy of content in which individuals and organizations can acquire, adapt, and repurpose content" (p.7). Table 3 presents a summary of Johnson's drivers, enablers, and mediators to a thriving learning object economy.

Table 3. The learning object economy: Drivers, enablers, and mediators (Adapted from Johnson, 2003.

	Definition	Higher Education Example
Drivers	Knowledge, productivity, competition, readiness, infrastructure	Faculty-, student-, staff-produced knowledge; L/CMSs; wireless learning environments.
Enablers	Learning technologies, learning design, standards	A menu of learning technologies available to educators; learning technologists as support staff to enhance learning and teaching functions.
Mediators	Resources, policies, perceived value	Learning technologies centers; flexible and adaptable intellectual property policies.

Several of these drivers, enablers, and mediators are present in the models discussed earlier and suggest some explanation for the under use of learning objects. For instance, higher education intellectual property policies governing the control and ownership of digital instructional products or learning objects are often structured in such a way as to inhibit development and sharing outside of the originating institution (Diaz, 2004). This type of behavior, evident in the Intellectual Capital/Appropriative Model, also prohibits the sharing of resources and distribution of costs: mediators in the economy. The Appropriative Model and other models discussed are limited, to some extent, by their social context. Each is operating within the boundaries of their organizational context and corresponding values and is thus limited by those constraints. In response to these limitations, we propose a new relativist model. We argue that in order for a learning object economy to succeed, it must be able to take advantage of and utilize its drivers, enablers, and mediators independently of a social or organizational context.

Open Knowledge Model

Knowledge sharing and re-construction with intellectual property rights attribution and learner-owner intellectual property rights are necessary in an

increasingly globalized and distributed learning ecosystem.[7] The Open Knowledge Model embodies trends in a variety of disciplines: computer science (see OKI and OSPI), education (see McGee & Robinson, 2004), science (see Cottey, 2003), and social justice (see Open Knowledge Network) in that it utilizes a relativist construction and accommodates cross-institutional cultures and beliefs about learning technologies, the construction of knowledge across systems and institutions, as well as the trend toward learner-centered e-learning, disaggregated and re-aggregated learning objects, and negotiated intellectual property rights.

We build on Thomas' and Demarest's conceptual frameworks in an attempt to address the emergent model of knowledge management in higher education that reflects current beliefs about the learner, the function of the institution, the trend toward knowledge generation, and the evolution of existing models. In that the function, definition, and value of technology are relative to organizational culture and values, we assert that no organizational position is more or less valid than another (Wescott, 2001). The Open Knowledge Model provides for this caveat. This is not to say that value is not shared across higher education systems, but rather that individual organizations and their members have come to contribute to the value given to the knowledge that is generated within them.

The first component of the Open Knowledge Model addresses how the culture and actions of higher education tacitly and explicitly determine the value, purpose, and role of knowledge for the institution at large. The culture of each higher education institution determines the value and use of knowledge, rather than the technology. This is clearly reflected in institutional efforts such at MIT's OpenCourseWare project in which course syllabi and materials are accessible to all in an effort to support their "mission to advance knowledge and education, and serve the world in the 21st century. It is true to MIT's values of excellence, innovation, and leadership" (MIT, 2004). MIT has chosen to share intellectual property that represents the values, norms, and standards of learning of their unique and specific mission. We see such efforts as supporting the inherent purpose of higher education: as a primarily generator of bodies of knowledge that should be made freely available to the public. Traditional models of knowledge dissemination that are tied to processes of tenure and promotion (peer-referred journals with limited circulation) restrict knowledge access. In the Open Knowledge Model, intellectual property is digitized and distributed with rigorous standards of review, but made available to anyone who is interested, rather than a privileged few through repositories (Crow, 2002).

Traditionally, intellectual property rights policy has indicated the market value higher education has placed on learning objects, however, documented knowledge acquisition (through learner generation) and use of learning objects (through tracking) is a more authentic indicator of value. In the Open Knowledge Model, intellectual property rights are determined by the generator and negotiated by the end user who may choose to re-purpose the content through licenses allowed through systems. The growing number of repositories and referatories indicates that learning objects are a valid and valued knowledge source both within and outside of any one institution. Additionally, we propose that knowledge value is reflected in use and re-use of learning objects.

The second area of focus deals with the ways in which knowledge is created, embodied, disseminated, and used in higher education; the relationship between knowledge and technological innovations; and the relationship between knowledge, innovations, and performance standards that higher education requires in order to meet its strategic objectives. Higher education, as an institution, embodies cultures that are both shared and not. For instance, sharing and collaboration in a learning object economy can occur within and across disciplines, departments, and the institution as a whole. In this sense, the academic setting is unique in that cross-cultural/organizational generation, sharing, and re-purposing, is possible and brings the added benefit of greater innovation and diffusion of knowledge. Further, repositories and referatories, as technological systems, make this possible as learning objects grow and become more meaningful with use and reuse. With successful cross-pollination comes increased funding; consortia and leveraged resources and capital, standardization by industry in accordance with established values to support reuse.

The third area of focus deals with the strategic and material commercial benefits that higher education expects to gain from more effective knowledge management practices and performances. These may include increased revenue, prestige, partnerships, cross-organizational fertilization, and higher skilled faculty and graduates. Several factors have contributed to the development of knowledge management. The literature in the area of globalization in higher education points to information technology, organizational change, and productivity growth (Castells, 1997, 2000; Tiffin & Rajasingham, 2003). The development of new intellectual property policies, and the extensive revision of existing ones (Olivas, 1994), is one signal of the organizational transformation and the effort to harness productivity to the benefit of the institution. Globaliza-

Table 4. Stages of organizational learning

ß	▪ Proliferation of information technology (IT) in higher education (HED) ▪ Increased entrepreneurial behavior in HED ▪ Increased competition or economic pressure
Learning Stage I	▪ Emerging HED IT profession ▪ Established HED entrepreneurial behavior (patents) ▪ Collaborative HED/IT professional organizations (EDUCAUSE) ▪ Elite organizational behavior (MIT's OKI, DSpace)
Learning Stage II	▪ higher education develops L/CMSs ▪ Current technology is expensive and insufficient ▪ Organizations seek to "retain" knowledge
Diffusion	▪ Social consensus via organizational leaders (in process) ▪ Lower level orgs mimic behavior
Institutional Copyright Policy Transformation	▪ Whole policy revisions ▪ Addendums to existing policies ▪ Instructional technology/software clauses

tion, increased competition among non-profit and for-profit educational entities, and changes in funding structures has all contributed to changes in the way higher education institutions deliver services and leverage their instructional products.

The utilization of distributed learning technologies and systems has several benefits for the academy: increased research productivity, generation of tuition revenue via increased access, institutional acquisition of instructional products, and improved learning. While some of these outcomes are yet unproven, they are well documented in the language that surrounds policy. Several studies have suggested higher education's move toward commercializing instructional products (Anderson, 2001; Slaughter & Rhoades, 2004; Welsh, 2000). One can speculate on what has prompted such activity in this area. Organizational learning theory tells us that a number of precipitating jolts, both external and internal to the organization, can prompt such changes (see Table 4). Such jolts

can come from the changing economy, changing technology, and pressure to improve learning outcomes (Castells, 2000).

The Open Knowledge Model represents the drivers of knowledge management: the methods for management and the conceptual framework that guides processes of knowledge generation. It supports a new economy based on authentic knowledge value in which human capital is embraced and recognized as the core of educational institutions and that which higher education can best support and sustain.

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Endnotes

1 "Knowledge management involves recognizing, documenting, and distributing the explicit and tacit knowledge resident in an organization" (Rossett & Marshall, 1999).

2 A learning object economy requires that individual objects are created and shared across institutions (Johnson, 2003).

3 Technology drives change and events. In teaching and learner this means that pedagogy and learner's actions are determined by technology and indeed effect changes in practice. The authors see this more as a result of technological drift (Winner, 1997) through which organizations have been inattentive to the determinism that has become enculturated (see Perdue, 1994).

4 In our view, technological relativism means that the function, definition, and value of technology are relative to the organizational culture and values and the beliefs about the value within the higher education community. Additionally, we assert that no organizational position is more or less valid than another (Wescott, 2001), but equal consideration must be given to each value position. Additionally, individuals choose what and how they use and adapt technologies to their own purposes (Chandler, 1996).

5 Learning objects typically are parts of a larger course or unit of study. Aggregation involves combining objects to create a scope of learning content.

6 Creative Commons (2004) is a free licensing service that "uses private rights to create public goods: creative works set free for certain uses. Like the free software and open-source movements, our ends are cooperative and community-minded, but our means are voluntary and libertarian. We work to offer creators a best-of-both-worlds way to protect their works while encouraging certain uses of them — to declare "some rights reserved.".

7 An ecosystem is a combination of systems that interact to support the survival and generation of organisms that exist within it. The authors see the tools, resources, people, and experiences accessible to the higher education student as constituting a digital learning ecosystem that contributes to a digital knowledge ecosystem (Por, 1997).

Section IV

Case Studies

Introduction to the Case Studies

The following section of this volume presents six case studies. Each is a presentation of a real-world situation of information management in a higher education setting. As the authors of the previous chapters and I have broadly conceptualized the field of Knowledge Management (KM) to be any information technology or information management process that is implemented in the knowledge-intensive setting of postsecondary education, the case studies do not necessarily pertain to the direct application of KM techniques. Rather, the case studies present situations where the social, political, and economic realities of higher education organizations intersect with knowledge and information management.

The first case study, by Richard Smith, Brian Lewis, and Christine Massey of Simon Fraser University (Canada), is titled, "Policy Processes for Technological Change." The authors present concepts of organizational change and strategic IT planning as related to online learning policy in Canada. This case has been included because it highlights that information management, KM in particular, is reliant upon the development of sound organizational policies. In higher education, IT policy is often intertwined with strategic planning, the method by which academic leaders attempt to prepare for the future. Often the

process of strategic planning is information-centric, relying on demographic projections of future students, forecasts of endowment payouts based on market trends, and institution-specific data such as faculty retirements, etc. Planning for the future IT needs of an institution is also an important task, one that is often connected to the instructional function of the organization.

Next, Bongsug Chae (Kansas State University) and Marshall Scott Poole (Texas A&M University) present a case titled, "Enterprise System Development in Higher Education." The authors highlight the challenges faced by educational organizations when enterprise systems from the corporate sector are introduced. In particular they find that the unique circumstances presented in the nonprofit postsecondary education sector, such as state mandates and requirements, make the implementation of enterprise systems difficult. The case illustrates why KM principles and structures that were created in the private sector need to be adapted to higher education settings.

Third, Kandis M. Smith of the University of Missouri presents "Higher Education Culture and the Diffusion of Technology in Classroom Instruction." Using Roger's theory of innovation diffusion, the author presents evidence of the various attitudes faculty hold toward the use of instructional technology. As an example of theory-driven research, this case provides a useful induction to Roger's concepts. Students of KM will find that the case also provides an excellent introduction to the notion of academic cultures, including the academic profession, the various scholarly disciplines, specific institutions, and institutional types.

In the fourth case study, "Wiring Watkins University: Does IT Really Matter?" Andy Borchers of Kettering University questions whether or not various technologically-intensive initiatives at a particular university were successful in achieving the desired organizational effects. The case documents what happened when a university asked, "Could a strategic advantage be found through IT?" As KM is often directly tied to strategic planning issues, this case provides an understanding of some of the perceived benefits and actual challenges that are weighed during the process of change management.

The fifth case is titled, "Challenges of Complex Information Technology Projects: The MAC Initiative" by Teta Stamati, Panagiotis Kanellis, and Drakoulis Martakos of the University of Athens (Greece). The case presents the difficulties encountered when a consortium of universities in Britain attempted to integrate their data systems. The integration posed several challenges in the areas of student information systems, financial systems, the staffing model, the physical resources of the universities, research computing and

consulting services, payroll, and a management information system. The case provides an account of large-scale information restructuring and some issues to consider when systems from different higher education institutions are to be integrated.

Finally, the sixth case, by Bing Wang and David Paper of Utah State University, is titled, "A Case of an IT-Enabled Organizational Change Intervention: The Missing Pieces." The setting of the case is a university-owned research foundation, which allows readers to consider the various ancillary programs that are affiliated modern universities and the information relationship that exists between a main campus and an external research unit. Also of note in this case is the focus on intellectual property management, a key component of academic KM at research institutions. The authors present a compelling story of information management, change resistance, and power structures within the research foundation.

At the end of the case studies is a set of questions for use in an instructional setting. The questions may be used in conjunction with the case studies, or with the earlier chapters in this volume. Instructors might wish to utilize the case studies as examples for research papers as well.