INFORMATION TECHNOLOGY AS INTELLECTUAL CAPITAL?: INSTRUCTIONAL PRODUCTION AT THE TECNOLÓGICO DE MONTERREY

by

Martín Gerardo Velázquez Osuna

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____ Date: 12/03/2007
Gary Rhoades

____ Date: 12/03/2007
Jenny J. Lee

____ Date: 12/03/2007
Alma Maldonado-Maldonado

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I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

____ Date: 12/03/2007
Dissertation Director: Gary Rhoades

STATEMENT BY AUTHOR

SIGNED: Martín Gerardo Velázquez Osuna

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The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.
Marcel Proust

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DEDICATION

I will always remember my final oral examination. My wife, two daughters and my friends were with me. In my role as a father, I have attended events at my daughters' schools to watch them participate in activities and receive academic recognitions. This time, the roles were reversed. I was the one being examined while my family and friends supported me with nervous anticipation.

Looking at my wife and daughters' eyes and faces, I understood they were proud of the work I had accomplished. Although I had successfully completed a PhD program, I realized more importantly that we had grown together as a family, faced challenges, and shared special moments in life. This indeed had been an invaluable moment in our lifelong family project.

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ABSTRACT

Globalization and the new knowledge economy have far-reaching implications for higher education mainly in the economic, political, social and technological aspects of knowledge production. Higher education institutions are the main providers of both knowledge and knowledge workers. While research and teaching are the main processes for producing knowledge at colleges and universities (Clark, 1983), information technology has been an enabling infrastructure for globalization and the main vehicle for the dissemination of knowledge as well as for facilitating knowledge in becoming a commodity (Altbach, 2006; Altbach & Teichler, 2001; McBurnie, 2001). This has led to the penetration of higher education institutions by market forces and the business sector. The commercial value of these knowledge assets in the new knowledge economy has brought economic, political, and social implications for higher education institutions. Now, they seek to strategically manage their organizational knowledge (Metcalfe, 2006; Trow, 2001). Information technology has become embedded in higher education's knowledge production and has led to reorganization of conventional academic structures, faculty work, and teaching practices.

This research addresses diverse fields of study such as organizational change, sociology of organizations, and political economy of organizations, and focuses on a single developing country. The structurational model of technology, the power-process perspective of technology, the theory of academic capitalism, and the framework for strategic management of intellectual capital were joined in this study to examine: (a) the

intellectual capital created through instructional production and delivery of information technology enhanced courses and its strategic management; and (b) the impact of information technology on the organization of higher education and faculty's academic work with regard to instructional production and delivery.

Findings show that information technology is not regarded as an opportunity to develop intellectual capital; thus, dependency on foreign technology is favored. An academic capitalist knowledge/learning regime is still incipient in developing countries; therefore, intellectual property policies and commercialization of intellectual assets are new to higher education institutions. The vast majority of these institutions are teaching-oriented; hence, the incorporation of information technology has re-structured their organization and in turn had an impact on managerial capacity, academic work and the academic profession.

CHAPTER I: INTRODUCTION

Overview

New labeling concepts for society have emerged in the new global economy, such as “the knowledge society” or the “information society,” which try to characterize the world’s population into a single society that shares the same distinguishing characteristics. It must be determined whether these new concepts are a reality or a myth. However, several scholars discuss globalization and the new global economy as the major idea informing higher education policy development and reform around the world (Eckel, Green & Hill, 2001; Gumport & Sporn, 1999; McBurnie, 2001; Scott, 2000; Slaughter, 1998).

Globalization has far-reaching implications for higher education mainly in the economic, political, cultural and technological aspects of knowledge production. In a knowledge society, higher education institutions are the main providers of both knowledge and knowledge workers, thereby becoming a useful asset for the new knowledge economy. Research and teaching are the main processes for producing knowledge at colleges and universities (Clark, 1983).

Information technology has been an enabling infrastructure for globalization and the main vehicle for the dissemination of knowledge as well as for facilitating knowledge in becoming a commodity by capturing it and digitizing it (Altbach, 2006; Altbach & Teichler, 2001; McBurnie, 2001). The impact of information technology has become a major force for organizational change in higher education institutions contributing to the restructuring of universities and colleges (Bullen, Robb, & Kenway, 2004; Green & Hayward, 1997; Gumport & Pusser, 1999; Gumport & Sporn, 1999).

In their thought provoking book "Does technology drive history? The dilemma of technological determinism," Smith and Marx (1994) argue that "most people in modernized societies have become habituated to the seeming power of advancing technology (and its products) to change the way they live. For them, indeed, the steady growth of that power is just another self-evident feature of modern life …" (p. ix). To them, on one hand, "hard" technological determinists reify information technology as an "independent entity, a virtually autonomous agent of change" (p. xi). On the other hand, "soft" technological determinists defend human agency as the power behind information technology driven change. Regardless of technological determinism's form, the authors argue that "technological innovation is a major driving force of contemporary history, if not the primary driving force" (p. xiv).

Higher education institutions have been forced to change in response to the revolution in information technology and the increasing incorporation of diverse information technologies in administration and in the teaching and learning processes. Not only new organizational forms of higher education have come into existence; the organization of traditional colleges and universities has been affected by utilization of new educational information technologies. Beyond the organization, information technology has blurred and weakened the boundaries between higher universities and the private sector, non-profit and for-profit organizations, research and teaching, the physical boundaries of the university itself, and the role of the physical library. Educational information technology has also had an impact on faculty members' academic work, changing the roles of faculty and traditional norms of the academy. Information technology has led to the "mass customization" of higher education and has transformed it into a commodity that has great commercial potential (Hanna, 1999; Olcott & Schmidt, 1999; Trow, 2001; Wilson, 2001).

The transformation of knowledge into a commodity has led to the penetration of higher education institutions by market forces and the business sector. The commercial value of these knowledge assets in the new knowledge economy has brought economic, political, and social implications for higher education institutions; now, they seek to strategically manage their organizational knowledge (Metcalfe, 2006; Trow, 2001).

Statement of the Problem

In many ways, the unprecedented global demand for a wide variety of high-quality higher education services catering to a highly diversified mass of learners in the knowledge-driven economy has placed tremendous pressure on universities and colleges to reinvent the teaching and learning delivery process. It is therefore no surprise that information technologies and promising new learning paradigms enabled by these technologies have increasingly become critical to sustain high-level performance by modern higher education institutions. Already mission-critical for supporting administrative business processes, information technology is now making significant inroads into the core process of teaching and learning in colleges and universities to enhance and support educational systems as they deal with the multifaceted demands of society, the enrichment and improved efficiencies of learning, the increasing demand for access, increasing demand for academic productivity, increasing costs of providing higher education services, and the ability to attract the best and the brightest professors and students. This has indeed enriched e-learning environments and opportunities available to everyone aspiring to learn. One type of application that has grown in popularity is the *learning management system* or LMS. It is a courseware product that combines a range of course administration and instructional tools which has been adopted by a vast number of higher education institutions in the United States and abroad. Learning management systems are the vehicle most effectively and efficiently being used by higher education institutions for instructional production and delivery and for academic administration of such technology-enhanced courses.

With the incorporation of learning management systems into the teaching and learning process, a new body of organizational knowledge has emerged: digitized academic course content, effective pedagogical approaches for e-learning, efficient ways to produce and implement online courses, and the design and development of various software tools including the learning management systems' software platform itself. Business companies have paid attention to this stock of knowledge and have transformed it into valuable products and services that are now being provided to higher education institutions. Examples of the latter are WebCT and Blackboard; both were learning management systems developed by academics who worked at prestigious higher education institutions, but later these initiatives were converted into spin-off companies. Nowadays, these software companies are currently producing commercial cartridges of course content for their diverse educational clientele that have incorporated their learning management systems as well.

In the new knowledge economy, business corporations understand that the organization's collective knowledge, efficient use of this knowledge, and how readily the organization acquires and applies new knowledge represents its only sustainable advantage (Davenport & Prusak, 1998). Universities and colleges have come to realize the value of this organizational knowledge. They are now revising their previous decision to outsource their learning management systems and considering implementation of a non commercial, open-source code learning management system or developing their own, in-house learning management system application as well as their own digitized courses.

The Campus Computing Project has conducted a series of surveys among higher education institutions in the United States and shows that a large number of universities and colleges have incorporated educational information technology in their classrooms. The adoption rate of learning management systems by higher education institutions has risen from around 15% in 2000 to around 80% by 2003, at which period about 33% of the courses taught at higher education institutions used learning management systems (Green, 2000, 2003).

The EDUCASE 2004 Core Data Service Summary Report shows that 90% of all the survey responding universities and colleges (n=908) reported using learning management systems. More than 78% of the institutions reported supporting at least one commercial learning management system product and only 12% reported supporting a homegrown learning management system. The majority of higher education institutions are outsourcing their learning management systems with three particular commercial vendors: Blackboard, WebCT and Desire2Learn (Hawkins, Rudy, & Nicolich, 2005).

A recent study conducted by the Centre for Educational Research and Innovation of the OECD shows that by 2004 almost all of the participating institutions reported the use of learning management systems. Moreover, 73% of the surveyed institutions worldwide claimed to have learning management systems in place institution-wide (Centre for Educational Research and Innovation, 2005).

Even though, learning management systems have been recently developed over the past decade, this software industry segment has grown tremendously in very little time. Therefore, higher education institutions are able to find 17 commercial and 14 non-commercial learning management systems available in the market (Angelo, 2004). Among the most well known commercial products are Blackboard, Desire2Learn, eCollege, and WebCT.

Most of the non-commercial resources are developed and are being used in universities. In some cases, the software application code is distributed as an open source license by its developer. The most well-known non-commercial learning management systems are Moodle and the Sakai Project.

Open-source code initiatives allow higher education institutions to develop, share, and adopt a non-commercial learning management system. Faculty members and technology-enhanced course designers develop or adopt instructional tools and applications that best serve their own pedagogical purposes and share them with the higher education community. As an example, shared course content is available to academe at several sites like MERLOT, the Harvey Project, SMETE, or the Educational Object Economy (Malloy, Jensen, Regan, & Reddick, 2002).

The figures above confirm how embedded information technology has become in higher education's core process which has led to the reorganization of conventional academic structures, teaching practices, and faculty work. The substantial use of educational information technology re-structures faculty work by "unbundling" or breaking down the teaching functions, and de-centering the role of faculty (Duderstadt, Atkins, & Houweling, 2003; Noble, 2002; Rhoades, 1998). For example, conventional courses require the academic work of only the instructor, whereas the production of a course that relies heavily on learning management systems requires that a professor works with a team of instructional designers, graphic designers, and information technology hardware and software specialists. This new mode of production not only involves more people, but these new actors are non-faculty, professional specialists who directly intervene in the teaching and learning process.

Higher education institutions that engage in the utilization of learning management systems have enabled organizational structures to support instructional production and delivery as well as organizational structures for strategic management of digitized course content (Hanna, 1999).

Moreover, the adoption of commercial learning management systems has led business organizations and higher education institutions to cross the boundaries of what is considered to be the province of colleges and universities. Similarly, by outsourcing a learning management system, universities and colleges may be compromising important elements of the teaching and learning process by working intimately with a non-educational partner whose key interests are dictated by a market ethos and ideology. The interaction among these organizations is not trivial because they have dissimilar missions and interests.

Business corporations like Blackboard and Desire2Learn regard the higher education sector as an industry. They have marketing offices, sales offices and client managers to service different domestic and international markets such as higher education institutions, K-12 school districts, corporations, professional associations, and government agencies. These business corporations work closely with colleges and universities all around the world in a “market order” pattern of relationships. Higher education institutions that work with these for-profit organizations engage in an outsourcing agreement for learning management systems. Their relationship as “providers” and “clients” is regulated by means of the price mechanism and contractual arrangement where each participating organization seeks to maximize its satisfaction and economic welfare (Velazquez, 2005). In this case, universities and colleges include an outside, non-educational supplier in part of their teaching and learning process raising provocative questions with regard to who really knows how to use information technology for education and who is setting the agenda for educational innovation.

When universities and colleges work together in open-source code initiatives, they form a “network order” pattern of relationships where the socio-economic coordination of activities is achieved by means of the cooperation, consensus, and mutuality of the organizations that interact for a common purpose towards a collective result. Higher education institutions become "members" of this nonprofit organization and engage in an exchange agreement that requires them to collaborate in a community source model based on the open source development initiative. Examples of this type of nonprofit organization are CampusEAI and the Sakai Project (Velazquez, 2005).

The use of information technology to enhance and support learning in higher education creates an e-learning environment in which the new mode of course production connects faculty and non-faculty professionals to the teaching functions. In addition, the managerial decision to outsource learning management systems serves as an occasion to intersect higher education's core process with business operations. Both the use of information technology and the outsourcing decision raise provocative questions about the effect that these circumstances have on the development of *intellectual capital* (the sum of the organizational knowledge and the organization's capabilities and experience assets) in higher education institutions. In this regard, organizations usually are unaware of the knowledge management implication when they outsource their business process. The fate of organizational knowledge in an outsourcing strategy has received very little attention because "Typically, organizations lack the means and experiential research to assign value to the knowledge they are transferring and receiving" (Willcocks, Hindle, Feeny, & Lacity, 2004, p. 7). Moreover, an organization's intellectual capital could be "lost, missed, or evolved and leveraged" in an outsourcing arrangement depending on the organization's intellectual capital management capabilities. Therefore, the strategic management of an organization's intellectual capital that is created and shared in an e-learning enterprise, especially in an outsourcing arrangement, deserves utmost consideration to ensure that what can be effectively gained, as well as lost, clearly serves the interests of the institution and its current and future institutional stakeholders

Statement of Purpose

The purpose of this study is to examine the effect of educational information technology on organization, faculty members' academic work and practices, and on the creation of intellectual capital through instructional production and delivery.

This study documents the increasing adoption of learning management systems as an essential element for e-learning in tertiary education worldwide and looks at traditional higher education institutions that engage in extensive utilization of learning management systems in their core process of teaching and learning.

The university selected for conducting this study was the Tecnológico de Monterrey. The Tecnológico is the largest, private, higher education institution in México. It is a multi-campus university system which encompasses 33 campuses located in different cities. The Tecnológico has a student body of 92,875 and 8,448 faculty and staff members. This university system is a comprehensive, teaching-oriented institution that provides elite access to higher education. As an elite access university (Trow, 1984, 1997), the Tecnológico is highly selective, has a high ratio of teachers to students, its programs of study are intensive and difficult, and it provides extra-curricular activities combined with regular curriculum that tend to shape the student's mind and character.

The Tecnológico engaged in extensive utilization of learning management systems in its teaching and learning process since 1997 and developed and implemented a particular education model. In addition, the Tecnológico has not only outsourced learning management systems from commercial vendors, but also committed to developing its own in-house learning management system.

The Tecnológico's educational model was implemented throughout the entire system, across the curriculum, and involved more than 8,400 faculty members and a substantial investment in information technology infrastructure, human resources, and training.

The nature of this study required a qualitative exploratory case study approach based on a multiple-case studies design. For the purpose of this study, data collection was primarily based on two sources of information: interviews and documents. Several individuals at different campuses were interviewed to fully display multiple perspectives from different actors who met the criteria and were from key groups in the organization. Interviews were in-depth, face-to-face, and semi-structured. In addition to several interviews, a vast number of institutional documents were collected for corroborating and complementing the information provided by the interviewees.

The theoretical perspective utilized in this study interlaces theories of technology and organization with theories and models for strategic management of intellectual capital and with the theory of academic capitalism (Slaughter & Rhoades, 2004). The two theories of technology in organizations used in this study are the structurational model of technology (Orlikowski, 1992) and the power-process perspective of technology (Thomas, 1994). For the purpose of this study, it was deemed appropriate to use the framework for strategic intellectual capital management developed by Choo and Bontis (2002).

Research Questions

Three research questions were developed for this study to deal with the issues related to the effects of information technology on organization, faculty member's academic work and practices, and creation of intellectual capital through instructional production and delivery:

1. What is the interpretive technological framework of administrators and faculty members regarding the role of learning management systems in higher education?
2. To what extent, if at all, are the different strategies of in-house development and outsourcing of learning management systems related to different patterns of organizational structures?
3. To what extent, if at all, are administrators considering different ways of organizing learning management systems and consciously managing the organization's intellectual capital?

The first question examines how traditional higher education institutions perceive the role of educational information technology. The role that information technology plays in traditional institutions of higher education is of utmost importance for the successful implementation of organizational change. In the case of the Tecnológico, this organizational change is its educational model.

Various key-groups in an organization may perceive the role of informational technology differently. Oftentimes, if not always, one frame of reference is dominant which, therefore, guides the organization's decision-making process and the choice of technology (Morgan, 1997).

Mechanistic organizations emphasize the importance of rationality and seek to increase efficiency. As a result, they adopt business management practices and struggle to adopt organizational forms suited to technology (Morgan, 1997). Hence, the second question examines whether and how traditional higher education institutions organize around the extensive use of educational information technology in the teaching and learning process. The analysis takes into account possible differences due to the sourcing strategy for information technology used by the higher education institution.

The third and last question examines whether and how higher education institutions utilize information technology for instructional production and delivery to develop their intellectual capital potential from their instructional and operational knowledge.

An organization's core business oftentimes becomes vitally dependent on some form of technology. Therefore, the organization establishes policies, rules, organizational structures, and operating procedures according to the context in which the organization operates (Morgan, 1997). In the case under study, the context for higher education institutions is a knowledge-driven economy in which the research and instructional knowledge produced at colleges and universities should be regarded as strategic and, hence, managed accordingly.

Significance of the Study

This study contributes to the scholarly literature in different ways. The challenges posed by globalization and the knowledge-driven economy are examined in a higher education institution located in a developing country. In particular, the examination focused on the role and implications of information technology in developing digitized instructional knowledge as intellectual capital.

The effect of incorporating information technology on re-structuring a post-secondary organization and its academic work has been of utmost concern to researchers. For example, recent studies have examined extensively utilizing information technology for instructional production and delivery and its effect on academic work and teaching practices in traditional institutions of higher education. However, prior focus has been on community colleges and some academic departments at universities in the United States. This case study focused on the largest, private, Mexican higher education institution which incorporated information technology across the institution and across the curriculum.

Other studies have focused on the effect of information technology on organizational forms, but few have focused on higher education institutions. In regard to knowledge production, studies of higher education have focused on the production of research-based knowledge. This study examined the effect of instructional production and delivery mediated by information technology on organization as well as on instruction-based knowledge production and its strategic management.

Another contribution to scholarly literature is the theoretical framework utilized. This study brought together and intertwined theories from different fields of study: technology and organization, higher education and political economy, and organizational knowledge.

The work carried out in this study will help to conceptualize and frame the existing literature on intellectual capital in higher education as a foundation for further research. This study represents a significant contribution to existing scholarly literature on the development and management of intellectual capital in higher education, particularly regarding utilization of a learning management system in the teaching and learning process.

For the Tecnológico de Monterrey, this study contributes to the research conducted at this institution by few scholars (Burkle & Sayed, 2002; Mortera-Gutiérrez, n.d.; Shapiro, Carrillo, & Velázquez, 2000). Findings in this study will provide valuable information for decision makers, administrators, and faculty members at the Tecnológico and other higher education institutions that incorporate information technology in their teaching and learning process and are interested in instructional production as intellectual capital.

Organization of this Study

The present study has been organized into five chapters. Chapter I provided a contextualization for stating the research problem. The purpose of this study, the research questions, and the study's significance to higher education were stated. Chapter II reviews the literature on the implications of using information technology in the teaching and learning process, the influence of information technology on organizational structures, and intellectual capital and outsourcing in higher education. The theoretical framework presented interlaces theories of technology and organization with theories and models for strategic management of intellectual capital and with the theory of academic capitalism.

In Chapter III, research questions are reintroduced and further discussed with the purpose of providing a wider context to better describe the qualitative research method employed in the study. In addition, the research approach, the rationale implied in its selection, and the chosen strategy of inquiry are presented. Justification for selection of the site and sub-sites is included as well as for the sample population of the study. The chapter also addresses methods of data gathering and data analysis, the researcher's positionality, and the limitations of the study.

Chapter IV is organized into three sections. The first section addresses the perceptions of administrators and faculty members about the purpose of using learning management systems at the Tecnológico. The second section describes the different organizational structures that were created to support the incorporation of information technology for instructional production and the ways that information technology is enacted by its designers, users, and decision makers. The last section addresses the findings in regard to the intellectual capital that is created as a consequence of information technology mediating organization and instructional work and the manner in which the Tecnológico de Monterrey manages this intellectual capital.

Finally, based on findings presented in the previous chapter, Chapter V provides a response for each research question. First, the purpose of this study and research questions are revisited. Then, findings are presented as they relate to the role of information technology in higher education, organizational structures, and intellectual capital. Next in order, implications are stated for literature and practice; and finally, recommendations are conveyed for future research.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

Today, educational information technology has made significant inroads into the core process of higher education with the promise to enhance and support teaching and learning. A vast number of universities and colleges in the United States and abroad have adopted learning management systems which are a courseware product that combines a range of course administration and instructional tools. For that reason, many scholars and practitioners are interested in studying the impact of educational information technologies in student learning, and others are interested in studying the effect of these technologies in faculty academic work and the organization of higher education (González & Luca, 2006; Mars & Ginter, 2007; Musselin, 2007; Noble, 2002; Rhoades, 1998, 2007; Smith & Rhoades, 2006, Stine, 2004). This research focuses on the latter as well as on the organizational knowledge that higher education institutions acquire by extensively utilizing information technology as the medium for instructional production and instructional delivery.

The literature reviewed in the first part of this chapter includes scholarly work produced in various disciplines and addresses different aspects of higher education, technology, organization and administration, and organizational knowledge.

In the second part of the chapter, the theoretical framework that guides this study is presented. This theoretical perspective interlaces theories of technology and organization with theories and models for strategic management of intellectual capital and with the theory of academic capitalism. The third and last part of this chapter provides some concluding remarks.

Literature Review

The first part of this chapter addresses the literature with regard to the implications of utilizing learning management systems in the teaching and learning process in higher education. A more detailed description of learning management systems is provided to the reader followed by the perspective of different authors about the effects of information technology on teaching and learning, on the production process of instructional material, and on organizational structure. Immediately after, a definition of *intellectual capital* and the ways that it could be applied to higher education are examined. The intellectual capital developed in a higher education institution in regard to instructional production and delivery could be lost or leveraged by way of outsourcing learning management systems. These concerns are addressed afterwards.

Implications of Utilizing Learning Management Systems in Teaching and Learning

Learning management systems (LMS), also referred to as “course management systems” or “learning platforms,” combine a range of course content management and instructional tools to provide a means to design, build and deliver online learning environments. These learning environments can either be face-to-face combined with online instruction, or fully online. Learning management systems typically provide tools for course administration and instructional functions of differing sophistication and potential, such as: (a) synchronous and asynchronous communication: discussion forums, bulletin boards, and group e-mail; (b) content development and delivery: learning resources, multimedia, and other digital content, and links to internet resources; (c) formative and summative assessment: submission, automated multiple choice testing, collaborative work and feedback; and (d) class and student management: registration, enrollment, grade posting, student portfolio pages, posting timetables, and managing student activities and electronic office hours (Coates, James & Baldwin, 2005; Warger, 2003).

Alexander (2001), a professor and Director of the Institute for Interactive Media and Learning at the University of Technology in Sidney, Australia, contends that one of the main reasons for using technology in higher education is to improve the quality of learning. Learning management systems have a positive and a negative side. The positive side of learning management systems is that they provide faculty with an assortment of easy-to-use tools to post and manage course content, but the negative side is that they confine faculty’s innovations into the familiar classroom categories of lectures, discussions, and exams (Weigel, 2005).

Advocates of instructional technologies claim that educational information technologies have enriched and enhanced the teaching and learning process and transformed and revolutionized education. This transformation is driven by the characteristics of digital technology and that its pervasive nature suggests a much broader application to enrich the learning experiences in the classroom (Duderstadt, Atkins, & Houweling, 2003). Privateer (1999) presumes that academic technology promises a meaningful change to teaching and learning. The conversion of instructional technologies into learning management support tools combined new ways of knowing with new ways of learning that have the potential to revolutionize education. Fuchs (1998) considers that higher education institutions are capable of using instructional technologies to create effective tools for teaching and learning and at the same time improve academic and administrative productivity, but their success depend on the way and extent that technology is used to complement and supplement the curriculum.

In his book chapter "Becoming Digital: The Challenge of Weaving Technology throughout Higher Education," Tomlinson-Keasey (2002) provides an account of several programs that have incorporated information technology in ways that have positively transformed the teaching-learning process. Nevertheless, the author mentions many sociological issues surrounding the complexity of integrating information technology into the curriculum. These issues include: (a) considering the appropriateness of technology mediated instruction for different audiences; (b) re-thinking and organizing faculty and student roles; and (c) insuring that the interactions among student-content, student-faculty, and student-student are not impaired.

Educational information technology has influenced everyday life of higher education. Gumport and Chun (2005) group the effects of information technology in higher education into three domains: (a) the nature and grounds of knowledge; (b) the teaching and learning process; and (c) the social organization of teaching and learning. According to these scholars, the use of technology saturated learning materials and learning processes shape the conception of knowledge, its traditional epistemology, how it is valued, and its production and dissemination. The incorporation of information technology has affected the teaching and learning process making traditional teaching and learning activities more efficient or expedient. Information technology has the potential to transform the basic assumption about the education process by altering the ways that knowledge is constructed, obtained, classified, utilized, and represented, and by changing the roles of professors and students.

Information technology has also altered the aspects of time and place, accommodating student's individual needs of time and pace as well as geographical location. However, the use of information technology in education has also given way to new educational providers who play a prominent role in education.

Another important effect of incorporating information technology into higher education has been on the social organization of the teaching and learning process. Learning management systems provide an infrastructure to convert conventionally delivered courses into on-line courses (Gumport & Chun, 2005). They allow faculty to develop and administer on-line courses, but it is the instructor who must provide the course content. Nevertheless, there are commercial learning management system vendors who can provide previously developed course content (Malloy, Jensen, Reagan & Reddick, 2002).

The use of learning management systems has led to the creation of a new mode of instructional production that connects faculty and non-faculty professionals to the teaching functions. Several scholars argue that the use of instructional information technology leads to the re-structuring of faculty work by "unbundling" or breaking down the teaching functions and de-centering the role of faculty (Duderstadt, Atkins & Houweling, 2002, 2003; Noble, 2002; Rhoades, 1998; Slaughter & Rhoades, 2004).

Production of a course that heavily relies on information technology requires that a professor works with a team of instructional designers, graphic designers, and information technology hardware and software specialists. The professor becomes a "content specialist" in this production scheme, and his role in the classroom becomes more a facilitator for learning and a designer of learning activities. This mode of teaching places less emphasis on lecturing by the professor.

Smith and Rhoades (2006) show how instructional technologies changed the way faculty work and how instruction is produced at a community college district. The authors describe three models for producing and delivering courses in an e-learning environment: the craft model, the collegial model, and the virtual assembly line. In the craft model, the single faculty member maintains his/her central role in instruction by working largely on his/her own in the production and delivery of a course. The level of unbundling the faculty role is low in the craft model.

The collegial model involves the collaborative efforts of small groups of faculty members to produce, deliver, and maintain a course. This model implies a low to moderate level of unbundling. The virtual assembly line model implies the highest level of unbundling the role of faculty in the production, delivery, and maintenance of a course. In this model, the single faculty member is part of an assembly line and performs only a few of several tasks involved in the production and delivery of a course. This model encompasses a content expert, instructional designers, and part-time faculty members to deliver the course, review and grade assignments, interact with students, and provide student advising. Other professionals perform separate tasks. Examples of these other professionals are: graphic designers, web designers, assessment specialists, editors, and proofreaders.

Information technologies have also changed instructional production at public research universities in the United States. Rhoades (2007) reports a pattern in which the organization of the faculty's instructional production has changed with the use of information technology. He calls this pattern "Mode III" of instructional production. This instructional production pattern of on-campus, technology-enhanced courses involves more than the traditional single faculty member. It involves "a matrix of professional, technical, and support personnel, as well as an institutional infrastructure involved in supporting and delivering instruction" (pp. 1-2). Rhoades also argues that in Mode III of instructional production there is a greater possibility for the commercialization of knowledge and curriculum as marketable intellectual property.

Information technology has also had an effect on the organization of colleges and universities. Higher education institutions have created new organizational structures and have increased their managerial capacity to support the implementation of learning management systems in this new mode of instructional production. Examples of the latter are the learning technology centers that universities now have in place (Anderson & Bonefas, 2002; Singer, 2002).

Technology's Influence on Organizational Structure

The relationship between technology and organizational structure has long been of interest to organizational researchers (Barley, 1986, 1990; Burkhardt & Brass 1990; DeSanctis & Scott 1994; Gerwin, 1979; Harvey, 1968; Mohr, 1971; Orlikowski, 1992, 2000; Pfeffer & Leblebici, 1977). Burkhardt and Brass (1990), and Barley (1990) used a network analysis approach to explore the effects of technology on organizational and occupational structures. Barley (1986), DeSanctis and Scott (1994), and Orlikowski (2000) have used structurational models to study the interaction between technology and organization and show that technology influences structure and, at the same time, structure influences technology. Barley (1986) showed how identical technologies occasioned similar structuring processes but led to divergent forms of organization. DeSanctis and Scott (1994) examined the types of structures that are embodied in information technologies and the structures that emerge as people interact with these technologies. Orlikowski (2000) examined how people enact structures as they interact with a technology in their ongoing practices and, recursively, these structures shape their situated use of that technology.

In the higher education sector, Mars and Ginter (2007) found that organization has an effect on information technology. In the community colleges studied, they concluded that "organizational environments are highly influential in how and to what degree community college faculty integrate technology into their instructional practices" (p. 338).

Stine (2004) provides a theoretical framework for understanding organizational change within higher education related to information technology. Changes are examined through the economic-based rational perspective and the perspectives of transaction cost theory, power dynamics-based resource dependency theory, and cultural assumptions and beliefs-based institutional theory. The rational perspective highlights the growth in the quantity of information technology staff required to cover the demand for information technology services and the growing importance of computer security. The transaction cost perspective explains the outsourcing strategy for information technology, while the resource dependency perspective provides an explanation for the change in leadership and power in favor of faculty and staff who become information technology experts. Institutional theory explains that the adoption of information technology had become a matter of isomorphism for “keeping up with the Joneses.”

The literature shows that the incorporation of information technology into the teaching and learning process mediates academic work and structures the faculty’s recurrent teaching practice, creating a new mode of instructional production and delivery. It also shows that information technology affects and is affected by the organizational properties and institutional context.

Intellectual Capital

In the new mode of instructional production, faculty and non-faculty professionals pour their individual knowledge, skills, and expertise to create a course in an e-learning environment. They also develop new organizational processes for the efficient production and the effective implementation of a course. Furthermore, at some point, they contribute to the design, development, and improvement of the learning management systems. The concept of intellectual capital addresses the individual and collective knowledge that can be captured in ways that can be described, shared, and exploited. The digitized content of the course and the knowledge embedded in routines, processes, and practices that the individuals in an organization are able to transform into valuable products and services constitute the organizational stock of knowledge or intellectual capital possessed by an institution.

The concept has been around for years as a form of common sense, but its formal study began only recently. Organizations have always been interested in the knowledge of its employees, in their experience, and the know-how they develop. Zuboff (1988) asserts that a worker's know-how is the knowledge that derives from practical action of production work and is displayed in action, "knowledge that meant knowing how to do, to make, to *act-on*" (p. 41). This knowledge is rarely made explicit because people are not able to explain, rationalize, or articulate it. Therefore, this type of knowledge is acquired through observation, imitation and practical action.

It is not new that organizations value individual knowledge. What is new is that organizations recognize its value as a strategic resource to gain competitive advantage in a knowledge economy; therefore, organizations allocate resources and develop processes to create, share and exploit an individual's knowledge (Edvinsson & Malone, 1997).

The research on intellectual capital has primary evolved from the desires of practitioners. Stewart (1991, 1994, 1997, 2001), one of the first to write about the subject, considers that "Intellectual capital is packaged, useful knowledge" (Stewart, 1997, p. 67). "Simply put, knowledge assets are talent, skills, know-how, know-what, and relationships -- and machines and networks that embody them -- that can be used to create wealth" (Stewart, 2001, p. 11).

Edvinsson and Sullivan (1998a) define intellectual capital as "the knowledge that can be converted into value" (p.358). The scholars Nahapiet and Ghoshal (1998) use the term to refer to “the knowledge and knowing capability of a social collectivity, such as an organization, intellectual community, or professional practice” (p. 245). In spite of the elusiveness of its definition, scholars and practitioners concur that intellectual capital is a valuable organizational resource that can be used to create differential advantage (Bontis, 1999; Edvinsson & Sullivan, 1996; Nahapiet & Ghoshal, 1998; Stewart, 1997). Part of the elusiveness of its definition resides on the fact that much of the knowledge in an organization is tacit rather than explicit and is therefore difficult to explain or even to see. Much of it exists in the intangible and uncodified talents of experts and the experience of employees.

Edvinsson and Malone (1997) consider that intellectual capital represents a new way of looking at organizational value. According to them, an organization’s intellectual capital has two major components: human capital and structural capital. Their definition follows:

> *Human Capital.* The combined knowledge, skill, innovativeness, and ability of the company’s individual employees to meet the task at hand. It also includes the company’s values, culture, and philosophy. Human capital cannot be owned by the company.
> *Structural capital.* The hardware, software, databases, organizational structure, patents, trademarks, and everything else of organizational capability that supports those employees’ productivity –in a few words, everything left at the office when the employees go home. Structural capital also includes customer capital, the relationships developed with key customers. Unlike human capital, structural capital can be owned and thereby traded (p. 11).

Stewart (1997) argues that intellectual capital takes two forms: (a) the semi-permanent body of knowledge, that is, the expertise that is developed around a task; and (b) the tools that augment the body of knowledge. An individual’s accumulated knowledge, know-how, abilities, skills, and expertise can be compiled into structural capital by converting this tacit knowledge into explicit knowledge. Thus, explicit and codified structural capital can be reproduced and shared to create value. Furthermore, Stewart underscores that intellectual capital is constituted by "the sum of its human capital (talent), structural capital (intellectual property, methodologies, software, documents, and other knowledge artifacts), and customer capital (client relationships)" (2001, p. 13).

For Sullivan (1998b), an organization's intellectual capital is composed of human capital, structural capital, and customer capital. Human capital is the tacit knowledge or know-how that resides in the minds of the organization's employees and cannot be owned by the company. Structural capital relates to the knowledge from which an organization can derive value as well as the knowledge that "describes or defines the ways in which the firm operates" (p. 179). The latter includes the definition of the structure and organization of the company, operational or technical methods and procedures, administrative and managerial methods and analysis, and the "collective ethos or way of doing business" (p. 179). Customer capital includes the knowledge embedded in the relationships with the company's customers.

According to Sullivan (1998b), structural and customer capital encompass both tacit knowledge and knowledge codified and captured in a format that can be described and used by others. Codified, explicit knowledge is considered the *intellectual assets* owned by the organization. Some of these intellectual assets can be commercialized and thus legally protected. Sullivan emphasizes that organizations seek to develop intellectual assets and leverage them.

Based on the “organizational knowledge” literature, Bontis (1996, 1999) conceptualizes intellectual capital as a second order multi-dimensional construct which includes three sub-domains: (a) the human capital, the tacit knowledge in the minds of the employees; (b) the structural capital, the organizational routines of the business; and (c) the relational capital, the knowledge embedded in the relationships established with customers and the outside environment.

Davenport and Prusak (1998) have expressed that the organization’s collective knowledge, efficient use of knowledge, and ready acquisition and use of new knowledge represents its only sustainable advantage. Over time, an organization accumulates a stock of knowledge that becomes an intangible organizational resource: its intellectual capital.

Choo and Bontis (2002) propose a framework for strategic management of intellectual capital:

> A firm generates value from what it knows through the organizational processes of knowledge creation, knowledge transfer, and knowledge utilization. In knowledge creation, the firm produces new knowledge through the dynamic conversion and externalization of its tacit, embedded knowledge. In knowledge transfer, knowledge is shared within a firm across different functional groups, product families, geographical locations, and time periods. Knowledge is also transferred between firms through interorganizational alliances and linkages. In knowledge utilization, the firm integrates and coordinates its different forms of knowledge in order to take action and to produce goods and services. Tacit knowledge plays a crucial role in knowledge creation; codified or explicit knowledge facilitates knowledge transfer; “common” knowledge or shared understanding about goals and purpose guides knowledge utilization (p. 16).

The literature shows that the concepts of “knowledge management” and “intellectual capital” overlap. However, there is a difference between these two concepts, although some scholars interchange them. Intellectual capital is an organizational resource: the stock of tacit (intangible) and explicit (tangible) knowledge that an organization possesses. Knowledge management (KM) deals with the processes and artifacts that help organize and distribute explicit knowledge, whether this knowledge is of value or not (Choo & Bontis, 2002; Ariely, 2003). Umemoto (2002) clarifies that knowledge management relates only to the management of existing organizational knowledge and is merely based on information technology practices. The scholar points out that knowledge management "has become a most lucrative industry in itself, as evidenced by scores of KM books being sold worldwide, KM programs being promoted by consulting firms, and KM software being marketed by IT vendors" (p. 463).

Knowledge management is part of the structural capital of the organization. Managing intellectual capital is concerned with the relevance and value of tacit and explicit organizational knowledge related to organizational strategies. According to J. Roos, G. Roos, Edvinsson and Dragoneti (1998), intellectual capital focuses on the creation and use of knowledge as well as the relationship between knowledge and success or value creation. Knowledge management (KM) is more concerned with developing an information system. Stewart (1997) remarks that:

> If the subject of intellectual capital ever spawns a business fad, it will be under the guise of "knowledge management," because there's money to be made selling software, systems, and consulting services with the touted goal of allowing every person in an organization to be able to lay his hands on the collected know-how, experience, and wisdom of all his colleagues" (p. 111).

Edvinsson and Malone (1997) argue that the concept of intellectual capital is not confined strictly to business organizations. Since it entails human and structural factors as value generators, not just financial and physical factors, the concept is also applicable to nonprofit organizations, higher education, the military, and even governments.

Intellectual Capital in Higher Education

The concept of managing intellectual capital has begun to be considered at higher education institutions and other organizations. For example, the United States Department of Defense (DoD) developed a definition of intellectual capital appropriate for use in governmental settings and also developed an operational model to manage intellectual capital within the DoD. As applied to DoD specific entities, intellectual capital is “the value associated with the knowledge, applied experience, organizational technology, synergistic interface, and professional skills that provide an organization with relevance within the DoD” (Fondo & Wright, 2004, p. 7).

Recognition of the importance and value of intellectual capital in higher education institutions has been addressed by few scholars (Cronin & Davenport, 2001; Hargreaves, 2001; Kelly, 2004; Steyn, 2004). With an interest toward improving schools in which faculty teach more effectively, Hargreaves developed a theory of school effectiveness and improvement based on the concepts of intellectual capital, social capital, and leverage. He defines intellectual capital as “the sum of the knowledge and experience of the school’s stakeholders that they could deploy to achieve the school’s goals” (p. 490). Similarly, in his theory of intellectual capital for schools under the knowledge improvement approach and the knowledge effectiveness approach, Kelly defines intellectual capital as “the capital resource that comes from relationships between stakeholders and partners, from an organisation’s ability to innovate and manage change, from its infrastructure, and from the knowledge, experience and transferable competencies of its staff” (p. 9).

From a parallel perspective on the improvement of higher education, Steyn (2004) emphasizes that the knowledge embedded in the experiences, skills, and abilities of faculty and non-faculty members are of most value to improve the organization. Therefore, this knowledge should be transformed systematically into intellectual capital that can be utilized and shared by the organization. Steyn highlights the benefits of managing the intellectual capital in higher education and urges higher education institutions to take a wider perspective of the role of intellectual capital.

Cronin and Davenport (2001) present three approaches for higher education institutions to leverage their intellectual capital. These three approaches are concerned with discovering and extruding new knowledge from existing processes and content, codifying and organizing knowledge in ways that can be transferred, and providing an infrastructure that promotes and fosters the creation of new knowledge.

The management of intellectual capital is of particular importance in an e-learning environment. Business organizations that provide learning management systems to higher education institutions through an outsourcing arrangement intersect and cross the boundaries of what is considered to be the province of colleges and universities.

Outsourcing and Intellectual Capital in Higher Education

Outsourcing is not new for higher education institutions which have increasingly engaged in outsourcing strategies not only for many auxiliary services (Angelo, 2005; Schuch, 2003a, 2003b), but also for information technology infrastructure (Blumenstyk, 1999; Warger, 2003).

Bartem and Manning (2001) argue that outsourcing should be seriously considered by universities as an institutional strategy for any product, service, facility, or function, so long as it helps fulfill the institution's mission. Palm (2001) provides the top ten reasons for higher education institutions to outsource: (a) reduce and control operating costs; (b) improve institutional focus; (c) gain access to world-class capabilities; (c) redirect resources for other purposes; (d) obtain resources not internally available; (e) accelerate re-engineering benefits; (f) eliminate a function that is difficult to manage or out of control; (g) share risks; (h) make capital funds available; and (i) create a cash infusion.

Quinn (1999) indicates that organizations should concentrate their limited resources on a relatively few knowledge-based core competencies where they can develop best-in-world capabilities. Quinn further underscores that in order for organizations to leverage their knowledge potential, they should keep core capabilities in-house.

According to Bartem and Manning (2001), higher education institutions should concentrate on what they do best and let others do the outsourced task if it can be accomplished better and at a lower cost. They argue that business enterprises can run business functions more efficiently than universities with no apology. Palm (2001) argues that outsourcing technology makes sense because higher education institutions "cannot use their limited resources to upgrade their technology continually and devote time and energy to the latest developments" (p. 7). In the examples provided by Palm, outsourcing is not a central process for educational institutions. In the case of outsourced learning management systems, higher education institutions involve a business corporation (a non-educational supplier) in part of the teaching-learning process. Subsequently, that in itself may compromise part of their critical process and the knowledge generated by the utilization of learning management systems.

Willcocks, Hindle, Feeny and Lacity (2004) are certain that, in an outsourcing arrangement, the intellectual capital created in an organization could be "lost, missed, or evolved and leveraged" (p. 7); therefore, it needs to be carefully managed by the organization. By the same token, higher education leaders have to be aware of the intellectual capital created and they should assign value to the intellectual capital that is transferred and exploited.

Outsourcing instructional technology in the United States is a growing trend and that this issue is not being properly addressed. The educational technology market is dominated by business companies influencing the way that educational resources are created, mediated, organized and disseminated. In the future, these companies may control who will use these resources and how they will be used. Therefore, universities should strengthen their academic communities through furthering open source code initiatives and fostering collaboration among higher education institutions (Addison, 2001).

There is a lack of scholarly literature surrounding the description and discussion of intellectual capital management regarding the extensive use of information technology in the teaching and learning process in higher education, particularly in instructional production and instructional delivery. Hence, a study of this topic would better inform the discipline and higher education leaders of the value of this intellectual capital and the way it can be managed to the individuals' and institution's advantage.

Theoretical Framework

In the present study, this researcher draws on theories of technology and the theory of academic capitalism to approach the issue of organizing strategies employed by traditional higher education institutions regarding extensive use of information technology in the teaching and learning process. The theory and models for strategic management of intellectual capital coupled with the theory of academic capitalism are used to address how those institutions (a) value the intellectual capital developed in the recurrent practice of instructional production and delivery and (b) design and develop an in-house learning management system.

Two theories of technology in organizations used in this study are the structurational model of technology (Orlikowski, 1992) and the power-process perspective of technology (Thomas, 1994). These two theories examine the role of technology in organizational change, the impact of technology on organization, as well as the impact of organization on technology.

The Structurational Model of Technology

Orlikowski's (1992) structurational model of technology examines the interaction between information technology and organization. Understanding this interaction provides insight into the limits and opportunities of human choice, technology development and use, and organizational design.

The model comprises three elements: (a) human agents, (b) technology, and (c) institutional properties. Human agents encompass key groups in the organization: decision-makers, users, and technology designers. The notion of technology conflates the technological artifact and the use of the technology. The institutional properties of the organization include “structural arrangements, business strategies, ideology, culture, control mechanisms, standard operating procedures, division of labor, expertise, communication patterns, as well as environmental pressures such as government regulation, competitive forces, vendor strategies, professional norms, state of knowledge about technology, and socio-economic conditions” (Orlikowski, 1992, p. 409).

The structurational model of technology uses Giddens’ (1984) theory of structuration in her model and proposes that information technology can be considered as one kind of structuring property of organizations where information technology is being developed or used. Orlikowski argues that information technology cannot be decoupled from the human actors who design it or use it. Information technology is enacted by human agency; this is to say that it comes into existence only when people use it and people can use it in different ways. Therefore, “the interaction of technology and organizations is a function of the different actors and socio-historical contexts implicated in its development and use” (Orlikowski, 1992, p. 405).

The structurational model of technology is based on two important premises: the *duality of technology* and the *interpretive flexibility of technology*. The duality of technology is a recursive notion of technology: technology is created by human actors, but is enacted by those who used it to accomplish work. In their recurrent interaction with technology, people change technology, physically or interpretively. The model underscores that human agency and structure are dependent upon each other.

The interpretive flexibility of technology refers to factors that influence the interaction between technology and its designers and users. These factors are: the characteristics of the material artifact, the characteristics of the human agents, and the characteristics of the organizational context. These three factors constrain, but at the same time enable human action.

The structurational model of technology describes four influences on the relationship between human agents and information technology: (a) technology as a product of human action; (b) technology as a medium of human action; (c) institutional conditions of interaction with technology; and (d) institutional consequences of interaction with technology.

As a material artifact, human actors produce technology, but human action constitutes technology through using it. Humans interact with technology in the design mode and the use mode. When designing technology, designers insert particular interpretive schemes, facilities and norms. In the use mode, a user’s appropriation of technology is influenced by the interpretive schemes, facilities and norms that are built into the technology. However, users can always choose their degree of engagement with the technology.

As a medium of human action, technology conditions social practices by facilitating as well as constraining human activity in the organization. How technology mediates human activity depends on the way technology is designed and implemented, the institutional context in which the technology is deployed, and the agency of particular users.

The institutional conditions of interaction with technology refer to the organizational structures that influence the design and use of technology. The nature of human action in an organization is situated and thus shaped by these organizational structures. Nevertheless, technology is a negotiated and enacted environment; therefore, the way people appropriate and use technology affects organizational structures and can be either reinforced or transformed. Technology users can conform to the technology's embedded rules and resources that sustain the organizational structures in which the technology is deployed; or, they can undermine and transform those organizational structures by not using the technology the way it is intended. These effects comprise the institutional consequences of interaction with technology.

The organizational structures or institutional properties that constitute the structurational model of technology differ from the organizational structures described in the business administration literature. Scholars from that discipline refer to organizational structures as the arrangement of organizational parts and concentrate on their aspects of complexity, formalization, and centralization (Hall, 2001). Robbins (2004) points out that "An organizational structure defines how job tasks are formally divided, grouped, and coordinated" (p. 452), and indicates that organizational structures encompass six elements: work specialization, departmentalization, chain of command, span of control, centralization, and formalization. These scholars address the visible forms of organizational structures. The structurational model of technology is concerned with the recursive function of organizational structures for “structuring” human activity. The model emphasizes on the mutual dependency of human agency and structure. Shilling (1992) views structure and agency as a coupled phenomena and recalls that structures are “rules and resources which are both the medium and outcome of social interaction” (p. 83). Sewell (1992) stresses the importance of human interactions in the formation of structures since “structures shape people’s practices, but [it] is also people’s practices that constitute (and reproduce) structure” (p. 4). According to Sewell, human agency and structure presuppose each other.

Since Giddens’ (1984) theory of structuration is central to Orlikowski’s (1992) structurational model of technology, an attempt to describe Giddens’ theory follows below.

A Note on Giddens’ Theory of Structuration

Giddens’ (1984) theory of structuration studies human social practices ordered across space and time. In systems of social practices, human agents interact in a continuous flow of conduct which interlaces the aspects of meaning, normative elements, and power. In their ongoing interaction, people communicate meaning, operate normative sanctions, and exercise power. These three elements of human interaction are separated only for analytical purposes. Social interaction is regarded as everywhere and, in all circumstances, a contingent accomplishment of human action.

Social practices are bounded by the conditions that make possible human interaction. These conditions “structure” human action and create a system of social interaction. However, the structuring conditions are dynamic, not static. They are produced by human agents and, through their actions, human agents reproduce them. Thus, the structuring conditions are enacted and re-enacted by individuals in their ongoing interactions. In other words, the structuring conditions "are both the medium and the outcome of the practices that constitute those systems" of social interaction (Giddens, 1979, p. 69). Furthermore, these structuring conditions can restrict but also facilitate human action.

Structuration is the dynamic process of production and reproduction of systems of social interaction through the *duality of structure*. The latter is a recursive notion whereby human action is both constrained and enabled by *structures* which in turn are produced and reproduced by that human action (Giddens, 1977, 1979, 1984). Duality of structure relates to the "fundamentally recursive character of social life, and expresses the mutual dependence of structure and agency" (Giddens, 1979, p.69).

Structures are the generative source to produce and reproduce social interaction as ongoing activity. Structures act upon social actors to produce and reproduce social interactions but, as the duality of structure implies, social actors also act upon structures to constitute and re-constitute them. In this flux of human action, structures are dynamic since they are enacted and re-enacted; therefore, they could be transformed in the process.

According to the theory of structuration, structures are in fact structuring properties or structuring conditions which "can be understood as rules and resources, recursively implicated in social systems" (Giddens, 1979, p. 64). The theory of structuration further explains that rules are "techniques or generalizable procedures applied in the enactment/reproduction of social practices" (Giddens, 1984, p. 20), and can either be constitutive or regulatory. Constitutive rules "help define what work is" (p. 18), and regulatory rules "specify how work is to be carried" (p. 19). "Resources are the media whereby transformative capacity is employed as power in the routine course of social interaction; but they are at the same time structural elements of social systems as systems, reconstituted through their utilization in social interaction" (Giddens, 1979, p. 92). Rules and resources enable and constrain human interaction.

The theory of structuration examines the modes whereby a system of social interaction is produced and reproduced through the application of generative rules and resources (structures). The process of structuration occurs in three modalities: interpretative schemes, facilities, and norms. These modalities "serve to clarify the main dimensions of the duality of structure in interaction, relating the knowledgeable capacities of agents to structural features" (Giddens, 1984, p. 28).

In their interaction to communicate meaning, human actors draw upon interpretative schemes to produce and reproduce structures of *signification*. In their evaluative judgment of conduct, they draw upon the normative components of interaction to enact and re-enact structures of *legitimation*. Norms are central to the operation of sanctions for acceptable or unacceptable behavior. Finally, in order to exercise power, human actors make use of unevenly distributed facilities to constitute and reconstitute structures of *domination.* The structures of signification, domination, and legitimation are three distinguishable structural dimensions of systems of social interaction (see Figure 1).

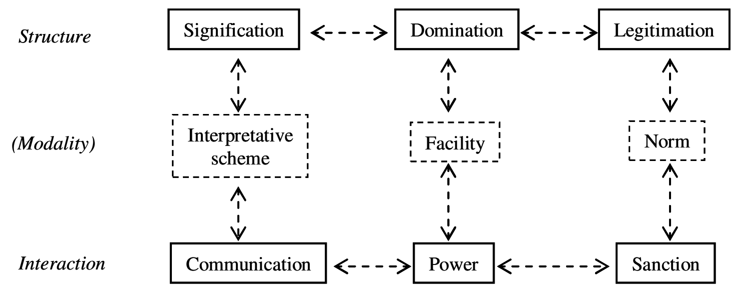

Figure 1. Dimensions of the duality of structure (Giddens, 1984).

Structures of domination involve the mobilization of two distinguishable types of resources: allocative and authoritative. Allocative resources refer to capabilities or forms of transformative capacity which generate command over objects, goods or material instances. The former refer to types of transformative capacity that generate command over individuals or actions.

In summary, the theory of structuration examines the modes whereby human actors generate structures and continue regenerating them through time in their ongoing activity. Structures are rules and resources that constrain and enable human action. They are a medium to produce and coordinate human activity and interaction and, at the same time, they are also the outcome of that human activity.

The Power-Process Perspective of Technology

Winner (1986) asserts that "technologies encompass purposes far beyond their immediate use" (p. 25). From the power-process perspective of technology (Thomas, 1994) "the *purpose* of a new technology can be understood only in terms of the objectives or ends that its proponents (or creators) seek to achieve by means of its use" (p. 227). Technological change is viewed as a series of choices; therefore, purpose is central for its analysis. Furthermore, “technological choice represents a vehicle for the expression and enactment of the worldviews of its advocates and designers” (p. 229).

Thomas (1994) argues that the power-process perspective of technology “parallels and extends” Giddens’ (1984) theory of structuration as applied to the relationship between technology and organization. Thomas asserts that the structuring process between technology and organization is purposive. Therefore, “it is purposive action inside organizations to alter structure by means of technology that separates organizations that create or successfully adapt to radical new technologies from those that don’t” (p. 210).

The power-process perspective of technology explains that worldviews are interpretive frameworks which include norms, beliefs and expectations. People make sense and explain the world around them through their interpretive framework. Technological change is likely to happen when there are differences in the worldviews of the actors involved. In most of the cases, one worldview may be dominant and may shape the worldviews of all the participants in an organization. The power-process perspective of technology contends that organizational leaders seek to guide the organizational members’ worldviews via structures of meaning, domination, and legitimation. Worldviews are also of utmost importance to leaders because new technologies “will attract attention only to the extent that they can be assimilated within an interpretive framework already resident in the organization” (Thomas, 1994, p. 207). In summary, the choice of technological change and the assimilation of new technology are both framed by people’s worldviews.

The power-process perspective of technology explains the organizational impact of a given technology as a dynamic and dualistic process. Technology affects structure, but structure and interests embedded in it also affect technology.

The Theory of Academic Capitalism

Gumport and Pusser (1999) argue that, in the face of emerging political and economic demands, higher education institutions respond with specific strands of contemporary restructuring, re-engineering, reconfiguring and privatization with significant implications for both institutional autonomy and faculty autonomy.

Academic capitalism is one such institutional response to environmental demands. In contrast to other processes, Slaughter and Leslie (1997) claim that restructuring under academic capitalism brings together topics usually treated separately (particularly undergraduate and graduate education) and the issues related to them: teaching and research, student aid policies, and federal research policies.

The theory of academic capitalism explains the restructuring process of higher education institutions in response to political economic changes. Slaughter and Rhoades (2004) define academic capitalism as the institutional and the individual’s efforts to secure external funds by engaging in market and market-like activities.

Academic capitalism involves competition for monies from external sources: grants and contracts, endowments funds, university-industry partnerships, institutional investment in a professor's spin-off company, and student tuition and fees. Market activities are for-profit activities such as patenting, copyright, trademarks and licensing, spin-off companies, arm’s length corporations (Slaughter & Leslie, 1997), and undergraduate and graduate research education activities that turn on the selling of products, processes, and services (Slaughter & Rhoades, 2004).

Slaughter and Leslie (1997) concentrated their study of academic capitalism on technology transfer at public research universities. Slaughter and Rhoades (2004) expanded the institutional scope and added the commercialization of instruction, educational materials, and software/courseware in relation to institutional and national copyright policy changes. They concentrated on non-profit, public and private higher education institutions in the United States. Furthermore, rather than focusing on individual organizational boundaries, Slaughter and Rhoades centered their attention on networks of actors: faculty, students, administrators, and academic professionals who cross boundaries among universities and colleges, business and non-profit organizations, and states. The scholars describe how these actors use state resources to enable the emergence of interstitial organizations. These interstitial organizations bring the corporate sector inside the university and develop new networks that mediate between private and public sector. They also describe how universities expand their managerial capacity in order to supervise new flows of external resources, invest in research infrastructure for the new economy, and invest in infrastructure to market institutions, products, and services to students. The theory of academic capitalism argues that expanded managerial capacity is also directed toward restructuring faculty work to lower instructional costs.

The theory of academic capitalism assert that, in the new global economy, higher education institutions are restructuring and shifting from a public good knowledge/learning regime to an *academic capitalist knowledge/learning regime*. The theory of academic capitalism explains the process of integrating into the new global economy by colleges and universities in the United States and abroad .

In Latin America, Torres and Schugurensky (2002) argue that there has been an increasing presence of market values and forces in academia in recent years. Faculty members of public and private universities are increasingly engaging in market-like behavior competing for funding, grants, contracts, and student selection. "Public universities are experiencing government financial cutbacks, which put pressure on diversification of revenue sources, cost-recovery programs, and contracts with the business sector. At the same time, the funding is becoming increasingly dependent upon evaluation according to 'criteria of performativity' established by government and market forces" (p. 446). These scholars argue that Latin American universities are restructuring to meet the challenge of the new global perspective and the demands of the knowledge-based economy.

Various scholars (Albornoz, 1993; Torres & Schugurensky, 2002) coincide that universities in developing countries are not independent of globalization influences. Due to the pressure to implement the "American model," it should not be surprising to find some universities that share certain common characteristics vis-à-vis universities in developed countries. However, Albornoz argues that most institutions remain national institutions engaged primarily with parochial concerns far from the international flow of knowledge. In the case of Latin American universities, "changes would be expected along the lines of the relationship between the university and political changes, but are not expected to happen dramatically in the internal pattern of academic endeavor, which is rigid, in many cases, and difficult to change, in spite of the patent need for reform and modernization" (p. 143).

Recent changes in Mexican universities are due to globalization. In the face of emerging political and economic demands, higher education institutions are creating new organizational forms which blurry boundaries between the university, market and the State. The future of the university is being debated between those forces that support the consolidation of a neo-liberal style university and those wishing to redirect it by means of a very different logic (Ibarra Colado, 2002a).

Altbach (1998) argues that universities from developing countries are, "without exception," peripheral higher education institutions in an international context and are "basically 'consumers' of knowledge, dependent on industrialized nations for research, interpretations of scientific advances, and, in general, for information." (p. 48). Arocena and Sutz (2004) point out that globalization reshapes underdevelopment in such a way that it widens knowledge asymmetries between developed and developing countries. They report that the neo-peripheral insertion of Latin America in the knowledge economy is weakly connected with higher education and endogenous generation of knowledge. Therefore, universities are not really being required by society to become main actors in economic growth. From the perspective of these three scholars, the restructuring process of higher education institutions under academic capitalism will not take place or will be delayed because knowledge is less directly influential than in developed countries.

Higher education in developing countries is far away from the higher education and scientific-technological realities of developed countries. Nevertheless, it can be observed an increasing presence of academic capitalism in certain areas of higher education institutions where it is beginning to operate (Ibarra Colado, 2002b). Academic capitalism takes a diversity of forms depending on market proximity and the process of adoption is shaped by disciplinary and institutional cultures. There are also trends countering the growing market-orientation where academic capitalism does not displace traditional academic practices, values, and ideals (Ylijoki, 2003).

The theory of academic capitalism does not see the restructuring process as inexorable; it could be resisted or, more likely, alternative processes could be developed. From the perspective of the theory of academic capitalism, restructuring higher education calls for: (a) substantive organizational change and associated changes in internal resource allocations; (b) substantive change in the division of academic labor with regard to research and teaching; (c) establishment of new organizational forms; and (d) organization of new administrative structures or streamlining or redesigning old ones. Based on the aforementioned, academic capitalism may not be the unique and solely restructuring process that all higher education institutions are following in developing countries, but it may explain some of the re-organization processes and market-like behaviors in which public and private universities in Mexico are currently engaging.

For example, Arocena and Sutz (2004) mention that neo-liberal policies are not well received by universities in Latin America and the Universidad Nacional Autónoma de México (UNAM), the largest and most important public university, is not the exception. Castanos-Lominz, Didricksson and Newson (1998) illustrate how cultures, histories, people, and even existing economic arrangements may provide the basis for resisting globalization. They describe the case of how UNAM is resisting the “new order of business” which collides with historically based social, cultural, and political divisions that deeply penetrate the institution. However, López Leyva (2001) has identified that even UNAM has relented and incorporated some market behaviors as in the case of the Secretaría de Investigación y Desarrollo (SID, by its Spanish acronym), a department within the Coordinación de la Investigación Científica. The SID is an example of an interstitial organization within UNAM which has been charged with developing university-industry partnerships, promoting technology transfer and patenting, and generating revenues from external sources.

Padilla López and Marúm Espinoza (2004) describe the program called “Acuerdo Universitario para el Desarrollo Sostenible del Estado de Jalisco” (ACUDE, by its Spanish acronym) that the Universidad de Guadalajara has in place to foster university-industry partnerships considered a priority. The Universidad de Guanajuato created its Centro de Vinculación con el Entorno (VEN, by its Spanish acronym) to encourage the linkages between the university and industry sectors and to generate funds from external sources. According to López Leyva (2001), other public universities have created similar interstitial organizations to bring the corporate sector inside the university, but face serious difficulties to institutionalizing these offices. It is important to mention that there are few accounts in the literature of academic capitalist behavior in Mexican public higher education institutions and there are none from Mexican private higher education institutions.

Under the lens of the theory of academic capitalism, the few examples of academic capitalism encountered in Mexican public university literature are not representative to conclude that academic capitalism is the unique and solely restructuring process that all higher education institutions are following in developing countries such as México. Furthermore, these cases do not represent a radical shift in public higher education institutions from a public good knowledge/learning regime to an academic capitalist knowledge/learning regime. In Mexico, academic capitalism seems to be taking place as a slow, incremental process in some areas of public higher education, but does not seem to be representative of a single institution.

With regard to the purpose of this study, the theory of academic capitalism (Slaughter & Rhoades, 2004) explains how higher education institutions deliver educational materials, courses, and on-campus programs in traditional classrooms although mediated in various ways by information technology. In the emergence of the so-called new academic capitalist knowledge/learning regime, business corporations and higher education institutions interact openly in considering and treating knowledge as raw material that is repurposed through technology. The growing integration of instructional information technologies in higher education institutions is due to their interest “to increase their efficiency, expand their services, and minimize labor costs” (Rhoades ,1998, p. 176).

Academic capitalism examines new networks of actors (faculty and non-faculty professionals within the university, and other professionals from outside), the changes in the academic profession, and the structure of faculty work. The theory provides the opportunity to consider faculty as consumers of commercial learning management systems and the institution as a marketer of learning management systems. Higher education institutions have created new organizational structures and have increased their managerial capacity to support the implementation of learning management systems. Examples of the latter are the learning technology centers that universities now have in place (Anderson & Bonefas, 2002; Singer, 2002).

In the new academic capitalist knowledge/learning regime, higher education institutions engage in market and market-like behaviors. In their efforts to provide education as a service, they engage in business-like arrangements such as outsourcing learning management systems as well as its implementation. Leading commercial learning management systems might be adopted by higher education administrators as part of the university's branding strategy and to legitimize utilization in the academe, regardless of the pedagogical appropriateness for supporting and enhancing the teaching and learning process and the extent to which it is being used by faculty members. The theory of academic capitalism focuses on the value of knowledge in the new economy where universities play a critical role and also on the fact that higher education institutions and business corporations are crossing boundaries. In some cases, colleges and universities serve as test beds for commercial educational software. By using this type of software, public institutions of higher education are not only using state money to finance the private business sector but also transferring organizational knowledge that is of great commercial value for software developing business companies at no cost to them.

The perspective of academic capitalism will allow examining the view of institutional leaders regarding the role of learning management systems in higher education. Additionally, the perceived value of intellectual capital created by faculty and non-faculty members is also examined as it pertains to the production and delivery of on-campus, face-to-face courses for a mixed e-learning environment.

Strategic Management of Intellectual Capital

Several authors have developed models for managing an organization's intellectual capital (Choo & Bontis, 2002; Daniele, 1998; Davenport & Prusak, 1998; Edvinsson & Sullivan, 1996; Jajko & Prime, 1998; Laento, 1998; Petrash, 1998; Quinn, Anderson & Finkelstein, 1998; Roos, J., Roos, G., Edvinsson & Dragonetti, 1998; Edvinsson & Malone, 1997; Sullivan, 1998c). For the purpose of this study, it was considered appropriate to use Choo and Bontis' framework for strategic intellectual capital management. Their framework encompasses four aspects: (a) locus or levels of learning, (b) organizational knowledge processes, (c) types of intellectual capital, and (d) strategic levers (2002, p. 16).

The knowledge resulting from individual learning and experience, work groups, the organization, and the organizational network can be consciously and intentionally generated, accumulated, and productively exploited. This is accomplished through the organizational processes of knowledge creation, knowledge transfer and knowledge utilization. The accumulated stock of knowledge is the organization's intellectual capital from which it can generate value. Organizations are able to engage in a number of actions to leverage its intellectual capital.

Bontis (1999) explains that intellectual capital can be divided into three types of intellectual capital: human, structural, and relational. Human capital relates to each individual's tacit knowledge which is intangible by nature and difficult to codify in order to make it explicit. "The essence of human capital is the sheer intelligence of the organizational member" (p. 443); therefore, organizations must set the conditions to further the development of its human capital.

Structural capital includes the tacit knowledge embedded in human interaction and organizational routines as well as the codified, explicit knowledge integrated to procedures, routines, working tools, goods and services. Relational capital relates to the knowledge embedded in customers, suppliers, government, and other organizations in the industry or field and the relationships with and between them. This knowledge is beyond the organization but can be transferred inside the organization. Edvinsson and Malone (1997) underscore that "corporate value does not arise directly from any of its Intellectual Capital factors, but only from the intersection between *all* of them" (p. 145); therefore, human, structural and relational capital must be in alignment so as to complement one another.

The strategic management of an organization's intellectual capital involves three organizational processes defined by Choo and Bontis (2002). These processes are: knowledge creation, knowledge transfer, and knowledge utilization. In knowledge creation, the organization sets the conditions that enable its members to generate new knowledge and undertakes specific actions to codify that knowledge into a form that is accessible to others. Davenport and Prusak (1998) consider four ways to generate new organizational knowledge: (a) acquisition by buying or renting it; (b) dedicate internal resources for research and development; (c) install a sense of crisis before it exists and strive for continuous organizational innovation and adaptation to changes in the environment; and (d) nurture informal, self-organizing networks within the organization.

The process of knowledge transfer requires the organization to structure and formalize conditions for sharing its intellectual capital among all its members. It requires the organization to develop a "common language" to convey meaningful knowledge. It also requires the organization to actively promote available knowledge for its sharing. Successful knowledge transfer requires organizational members to absorb the intellectual capital available; therefore, "knowledge transfer involves two actions: transmission (sending or presenting knowledge to a potential recipient) and absorption by that person or group" (Davenport & Prusak, 1998).

Organizations need to establish processes for knowledge utilization in order to productively exploit its intellectual capital. Sullivan refers to "strategic value extraction" (1998c, p. 39) as the outcome of the organizational processes for knowledge utilization. J. Roos et al. (1998) remark that knowledge created at an organization is of no use if it cannot be applied to its business operation; therefore, "Knowledge application is the first and foremost aim of any commercial endeavour, as it creates value from the knowledge accumulated in the company" (p. 18).

The model for strategic management of intellectual capital establishes that through the processes of knowledge creation, knowledge transfer and knowledge utilization, an organization integrates, coordinates, maintains, and administers its intellectual capital to produce goods and services and advance its competitiveness (Choo & Bontis, 2002).

Conclusions

The literature reviewed corroborates that educational information technology has influenced higher education in many important ways. The incorporation of learning management systems into the teaching and learning process has changed academic work with regard to instructional production and delivery. The widespread use of information technology has led to changes in the organization of traditional higher education institutions in order to support, foster and promote its utilization. Faculty and non-faculty members are developing vast amounts of instructional knowledge that is digitized in learning management systems and thus can be treated as raw educational material and repurposed through the use of information technology. At the inter-organizational level, colleges and universities are intersecting with business corporations in higher education's core process of teaching and learning. By doing so, higher education institutions may be allowing the business sector to influence the educational process while simultaneously transferring valuable instructional knowledge to businesses that is developed by faculty members.

The coupling of the structurational model of technology, the power-process perspective of technology, and the theory of academic capitalism all provide a useful lens to examine: (a) the role of educational informational technology in higher education; (b) how information technology has impacted academic work with regard to the production and delivery of instruction; and (c) how information technology has impacted the organization of higher education institutions.

Interlacing the strategic management of intellectual capital, the structurational model of technology, and academic capitalism creates one suitable theoretical lens to analyze instructional knowledge produced by faculty and non-faculty members in different sourcing strategies of learning management systems. Final examination includes how this instructional knowledge is treated by higher education institutions.

CHAPTER III: METHODS

Introduction

This chapter presents the research method employed in this study. The purpose of the study and the research questions were described in the introductory chapter. Due to the nature of its purpose and its research questions, this particular study called for a qualitative research method.

According to several scholars, qualitative research is a way of approaching the empirical world. Based on observation and/or experience, researchers think about and study social reality (Taylor & Bogdan, 1998; Strauss & Corbin, 1998). Creswell (1998) underscores that qualitative research is a process of inquiry based on five traditional methodologies: biography, phenomenology, grounded theory, ethnography, and case study. The overall approach taken in this study is described in detail in this chapter. The techniques and procedures utilized for data gathering and analysis are also explicitly described herein.

Qualitative research explores a social or human problem in a natural setting (Creswell, 1998); therefore, the setting and context of the sites where this study was conducted are also described. Similarly, the sampling strategy and a description of the sample population that participated in the study are presented as well.

Since qualitative research is interpretative research, the researcher is directly involved with each participant's experiences. This implies a range of ethical and personal issues for the researcher. These ethical considerations and the researcher's positionality are covered here, identifying researcher's biases, values and personal interests, and how they were dealt with during the research process. Likewise, the limitations of this research are presented in this chapter to help identify its potential weaknesses. Of course, limitations are an inherent characteristic of every research project regardless of the method employed.

Research questions are reintroduced and further discussed next with the purpose of providing a wider context to better describe the qualitative research method employed.

Discussion of Research Questions

This study addresses the issues of how traditional higher education institutions perceive the role of educational information technology, whether and how they organize around the extensive use of educational information technology in the teaching and learning process, and whether and how they build their intellectual capital potential from their instructional knowledge. To deal with these issues, the following research questions have been developed:

4. What is the interpretive technological framework of administrators and faculty members regarding the role of learning management systems in higher education?
5. To what extent, if at all, are the different strategies of in-house development and outsourcing of learning management systems related to different patterns of organizational structures?

6. To what extent, if at all, are administrators considering different ways of organizing learning management systems and consciously managing the organization’s intellectual capital?

The first question comes from the need to understand the role that information technology plays in the process of organizational change in traditional institutions of higher education. The socially constructed meaning of technology determines the technological choice and enacts the mode of using the technology. In studying the relationship between technology and organization, Thomas (1994) underscores that the worldviews of different organizational actors are ways to frame technology. The dominant worldview or interpretive framework will guide the definition and choice of technology. Different organizational actors may envision technology as a tool, as an organizational capability for innovation, or as a means by which to achieve what people believe to be the organization’s objectives.

From a social cognition perspective, Orlikowski and Gash (1994) use the term *technological frame* “to identify that subset of members’ organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations. This includes not only the nature and role of the technology itself, but the specific conditions, applications and consequences of that technology in particular contexts” (p. 178). The technological frames of key groups in an organization can be significantly different and can have different implications for technology development, implementation, and use.

Understanding the interpretive technological framework of administrators and faculty members can help establishing the role of educational information technology in higher education. Is it regarded as a tool for efficiency, as a symbol of modernity, or recognized as a strategic resource to develop the organization's intellectual capital?

The second research question is: To what extent, if at all, are the different strategies of in-house development and outsourcing of learning management systems related to different patterns of organizational structures? This question acknowledges the structuring property of information technology on an organization and examines different levels of higher education. At the individual level, changes are examined in the structure of academic work with regard to instructional production and delivery of courses mediated by learning management systems. At the institutional level, organizational structures are examined that support, foster and promote the use of learning management systems. This includes organizational structures adopted to conform to learning management systems that are outsourced and to learning management systems that are developed within the organization.

According to Winner (1986), technologies are ways of ordering human activity in the organization; thus, they influence how people work. Along the same vein, Orlikowski (1992) argues that information technology is a medium for human action and as such it possesses structuring capabilities. Thomas (1994) underscores that it is purposive structuring that alters organizational structures by means of technology. Technology affects structure, but structure and interests embedded in it also affect technology. Therefore, the two different sourcing strategies for learning management systems may have different effects on how academic work is structured and what organizational structures are created. Furthermore, the analysis that this research question provokes allows contending whether academic capitalism is the organizing principle in this purposive structuring.

The third and last question is: To what extent, if at all, are administrators considering different ways of organizing learning management systems and consciously managing the organization's intellectual capital? Here, norms and facilities built into the information technology during its design are examined alongside whether or not the development of an in-house learning management system is influenced by a highly competitive commercial product. Orlikowski (2000) asserts that two aspects of technology are always conflated: the technology as artifact and the use of technology. The technological artifact has inherent material and cultural properties which influence how differently people interact with and experience the technology in their recurrent use of it. The design, use, and interpretation of technology are constrained by the material and cultural characteristics of the artifact and by the institutional context.

This research question also helps shed light upon the fate of tacit and explicit knowledge drawn by individuals in the organization during ongoing interactions with the technology, particularly in the instructional production and delivery of courses mediated by learning management systems. Responses to this question will provide information about what organizational knowledge is created by faculty and non-faculty members in technology mediated production and delivery of courses. Additionally, responses will determine whether this organizational knowledge is considered a strategic resource, how this knowledge is shared, and how it is productively utilized.

Overall Approach

The nature of this study required a qualitative exploratory case study approach. This approach helped preserve the sense-making, concepts, and themes that were conveyed by the participants. Reasons for choosing a qualitative method of inquiry for this study were: (a) exploring an area about which little is known; (b) studying individuals in their natural setting; (c) understanding the insights, experiences, meanings, and perspectives held by the participants in the study; and (d) exploring the organizational functions of a higher education institution (Creswell, 1998; Miller & Salkind, 2002; Strauss & Corbin, 1998).

The qualitative research strategy was based on a multiple-case studies design. A case study is an in-depth exploration of a "bounded system" or case, bounded by time and place. Furthermore, a case study can focus on developing a description or an understanding of individuals, organizations, a process, a program, an event, or an activity (Creswell, 1998; Miller & Salkind, 2002). Case studies have been used extensively in the field of education (Brandt, 2002; Cousin, 2005; Ghesquière, Maes & Vandenberghe, 2004; Luk-Fong, 2005; Marshall, 1985; McShane, 2004; Staples, Pugach, & Himes, 2005; Valenzuela, Copeland & Blalock, 2005).

Based on the aforesaid, a multiple-case studies design was considered best suited for research which involves a traditional, multi-campus university system engaged in extensively using learning management systems in its teaching and learning process.

Site Selection

The design of this qualitative research involved multiple-case studies. The nature of the research required both a holistic and an embedded approach (Yin, 1994). Holistic because the case study examined the nature of an organizational change in its entirety; and embedded because it involved analyzing organizational changes at the system level and at two campuses of a private higher education institution.

Creswell (1998) and Miller and Salkind (2002) indicate that in a qualitative case study approach the context of the case should be described in detail. The context involves situating the case within its setting as well as within its larger, overall environment. This research study was conducted at the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM, by its Spanish acronym), also known as the "Tecnológico de Monterrey" or simply, the "Tec."

The Tecnológico de Monterrey is a private, nonprofit university system composed of 33 campuses located in 28 different cities throughout México. It is a comprehensive, teaching-oriented higher education institution that offers high school, undergraduate, master, and doctoral programs. The Tecnológico was founded in 1943 by a group of businessmen who were concerned about a perceived lack of highly skilled professionals in México.

The Tecnológico is a highly-selective and high-tuition university system. It is the largest private higher education institution in the country with a student body of 92,875 and a faculty staff of 8,448. Sixty percent of its students are undergraduates, 12% graduates, and 28% are in high school (Tecnológico de Monterrey, 2007).

The Tecnológico de Monterrey is one of only three Mexican universities accredited by the Southern Association of Colleges and Schools. It is also recognized by the U.S. Department of Education and is a member of the College Board.

The university system has large study abroad and student exchange programs with hundreds of higher education institutions worldwide. In fall of 2006, 6,508 ITESM students spent at least one semester abroad and 4,524 international students were received and enrolled at different ITESM campuses. In addition, 1,210 international scholars were welcomed as visiting professors at the various campuses. The Tecnológico has 20 branches and liaison offices in the U.S., Canada, Latin America, Europe, and Asia (Tecnológico de Monterrey, 2007).

The Tecnológico created its Virtual University in 1989 to offer distance education. Today, the Virtual University offers primarily on-line graduate programs, on-line continuing education, and corporate programs for the Spanish-speaking community in North and South America. The Virtual University had an enrollment of 15,241 graduate students and 90,509 participants in continuing education in fall of 2006 (Tecnológico de Monterrey, 2007). The Virtual University is an integral component of the Tecnológico de Monterrey.

In 2002, the Tecnológico created the Universidad TecMilenio in an effort to increase access to higher education for thousands of middle-income students seeking high quality, private education at a low cost. By fall of 2006, the Universidad TecMilenio had 31 campuses in México and enrollment of 17,158 students in its high school, undergraduate and graduate programs (Tecnológico de Monterrey, 2007). The

Universidad TecMilenio is sponsored by the Tecnológico de Monterrey, but it is a separate, legally constituted entity with its own facilities, organizational structure, and academics programs.

Public higher education in México is dominant and comprehensive, whereas private higher education is peripheral and more focused in orientation (Levy, 1986; Geiger, 1988). Nevertheless, the private higher education sector has continued growing at a greater pace than the public sector. According to the data available at the websites of the National Institute of Statistics, Geography and Informatics (INEGI, by its Spanish acronym) and the Secretary of Public Education (SEP, by its Spanish acronym), total higher education enrollment in México grew 6.5 times over the thirty year period of 1970-2000 while the total population grew at a rate of 1.2 times. However, only 23% of the age-group population (2,047,895) had access to higher education in the year 2000. Public and private higher education institutions have played a major role in improving access. From 1970 to 2002, public institution enrollment multiplied 5.4 times, whereas private institution enrollment multiplied 18.6 times. Despite great efforts in the public sector, private institutions now have a bigger share of the higher education market. By 2002, they were enrolling 33% (742,227) of the student population compared to 14% (37,862) in 1970. In the fall of 2002, the total undergraduate and graduate population at the Tecnológico was 63,943. This figure represented almost 9% of total enrollment in the private sector of higher education in México (Tecnológico de Monterrey, 2003).

The aforesaid supports the relevance and importance of private institutions and, in particular, the Tecnológico de Monterrey university system in higher education within México and internationally.

In 1995, the Tecnológico established six strategies to face the challenges of improving education in México, creating jobs, and competing on an international level. The strategies were: (a) redesign the teaching-learning process; (b) focus the activities of research and extension; (c) develop its Virtual University; (d) internationalize the Institute; (e) maintain the continuous improvement process; and (f) promote the growth of the Institute (Tecnológico de Monterrey, 1998a). The outcome of the first strategy was the Tecnológico's Educational Model which included the incorporation of learning management systems.

The educational model was implemented throughout the entire system and across the curriculum. This organizational change involved more than 8,400 faculty members and a substantial investment in information technology infrastructure, human resources, and training. By fall of 2006, 66.4% of course sections offered in all academic programs at the Tecnológico were taught following the requirements of its educational model and using learning management systems. Two learning management systems are currently in use: Blackboard, an outsourced commercial product; and WebTec, an in-house development. Both learning management systems are used for instructional production and delivery of on-campus, face-to-face courses.

The Tecnológico de Monterrey qualifies as an excellent site to conduct this research. It is a large, traditional higher education institution engaged in the extensive use of learning management systems in its teaching and learning process across all campuses and across the curriculum. Furthermore, one outsourced learning management system and another system developed in-house are concurrently used in the production and delivery of on-campus, face-to-face courses.

Sub-sites Selection

The Tecnológico has a System Rectory and its 33 campuses are organized by geographic regions or zones. There are six regions: North, South, Central, Western, Mexico City's Metropolitan Zone, and Monterrey's Metropolitan Zone. In addition, the Virtual University represents another distinctly separate zone. Each campus has a President and each zone has a Rector who reports to the System Rector; additionally the System Rectory comprises four Vice-rectories.

Two campuses and two Vice-rectories were chosen as sub-sites to conduct this study. The two Vice-rectories were: the Vice-rectory for Academic Affairs and the Vice-rectory for Information Technology. The former was in charge of developing and implementing the Tecnológico's educational model, constantly monitoring and improving it. This Vice-rectory is also charged with providing training in the educational model. The Vice-rectory for Information Technology is involved in the choice of information technology and manages the information technology infrastructure and the learning management systems that support the educational model.

The two campuses were: Guadalajara, in the Western Zone; and Querétaro, in the Central Zone. For the purpose of this study, it was important to obtain the perceptions, understandings, and experiences from individuals at different rectory zones. The implementation of the educational model began simultaneously at all campuses; therefore, no campus had an advantage in that regard. It was also important to choose campuses that were representative of their rectory zone, had a large student population, a sufficient number of faculty members, and demonstrated the same level of engagement in the implementation of the educational model. Both Guadalajara and Querétaro campuses met these criteria.

According to the education model criteria in each of the zone rectories, there was not a significant variance in the percentage of all course sections offered during the fall of 2006 at the high school and undergraduate levels. The percentages by region reported in 2007 by the Tecnológico de Monterrey were: North, 69.6%; South, 63.9%; Central, 63.8%; Western, 70.3%; Mexico City's Metropolitan Zone, 58.8%; and Monterrey's Metropolitan Zone, 69.6% (Tecnológico de Monterrey, 2007).

Grouping the 33 campuses in terms of their student population size, the percentages of all course sections taught according to the Tecnológico's educational model in fall of 2006 were: 65% for campuses above 4,500 students (6 campuses); 71% for campuses with a student body between 1,200 and 3,500 (17 campuses); and 68% for the 10 campuses with less than 1,000 students (Tecnológico de Monterrey, 2007). Both, the Guadalajara and Querétaro campuses belong to the first group.

The Guadalajara Campus is located in the city of Guadalajara, in the state of Jalisco. In fall of 2006, it had a student body of 6,281 and a faculty staff of 553 professors (152 fulltime and 401 part-time). At this campus, 68.4% of all course sections were offered in the educational model across all academic programs. The Querétaro campus is located in the city of Santiago de Querétaro, in the state of Querétaro. Its student population was 4,908 and its faculty staff was 415 (148 fulltime and 267 part-time) in fall of 2006. In this same year, 69.70% of all course sections offered in all academic programs were taught following the requirements of the Tecnológico's educational model (Tecnológico de Monterrey, 2007).

Sample Population

The sample of participants in this study included men and women who held a particular position at the time of the research. They were fulltime faculty, department heads, information technology staff, academic administrators, or administrators. A total of 33 individuals were interviewed: 13 faculty members and/or department heads, 5 members of the information technology staff, 10 academic administrators, and 5 administrators.

Within the administrators' group, five high level administrators participated: two campus presidents, two vice-rectors, and one former vice-rector. The latter was involved in the early implementation stages of the educational model.

Ten individuals made up the sample for the academic administrators' group. Of those ten, five were from the offices for academic development: one at the system level, two from the zone rectories, and two from the campus level. Three other members were from the Querétaro Redesign Support Center and two from the Guadalajara Redesign Support Center.

For the information technology staff group, three members were interviewed from the Vice-rectory for Information Technology as were two members from Campus

Guadalajara. At the Querétaro campus, members from the information technology staff had no relation with the educational model. Staff members from the Redesign Support Center at Querétaro provided the required support in information technology. In total, 5 members from information technology were interviewed.

For the purpose of this study, only faculty members who teach mainly at the undergraduate level were interviewed. Thirteen faculty members participated in the sample: six department heads and seven fulltime faculty members. Four of those department heads and four of the faculty members were from Guadalajara; two department heads and three faculty members were from Querétaro. At each campus, half of the department heads and faculty members were from the engineering academic division, and the other half were from the business administration academic division. These are the only two academic divisions in each campus. All faculty members were fulltime professors at the undergraduate level, who had extensively used learning management system in their teaching practice. No part-time faculty members participated in the sample.

It is important to note that at the Tecnológico, the category of “fulltime” professorship denotes holding an employment contract involving full time and no termination date. Based on their progression to a higher stage of development, fulltime professors are further classified as: instructor, assistant, associate, or full professor. Part-time professors are individuals who are hired every academic semester to teach few courses.

The sample was deliberately selected to fully display multiple perspectives from different actors who met the criteria and were from key groups. This purposive sampling allowed for triangulating perspectives of multiple key informants for quality assurance (Creswell, 1998; Taylor & Bogdan, 1998). Participants in the sample were members of key groups involved in either the decision making regarding the choice of learning management systems; the design, development and deployment of instructional information technology; or as users of learning management systems in the teaching and learning process.

Researcher's Positionality

This researcher has worked for the Tecnológico for more than 23 years, holding different administrative positions. According to Mehra (2001), this condition makes the researcher an insider. Being an insider can usually be of benefit to the researcher because of the ease in identifying key informants, the ability to gain access to participants and documents that may not be granted to outsiders, the familiarity with the institution and its culture, and because insiders are trusted with relevant information (Brayboy & Deyhle, 2000).

This researcher has an extensive background in the administration and organization of the Tecnológico as well as in computer science. Therefore, due to the strong familiarity with the context of the study, the researcher understands the complexity of the system, the culture of the institution, and can speak the language in terms of issues that may arise of a technical or social nature. Because the researcher was on a leave of absence while conducting field work, he had the status of non-active employment but with complete membership. This status allowed the researcher to readily identified characteristics of key participants and to have access to important documents.

During the research period, this researcher was studying in a doctoral program in higher education in the U. S. and held concepts that were not part of the Tecnológico's culture. Care was taken to avoid providing cues to the respondent and to prevent from posing a potential threat to the participants. For example, the institutions' dress code is very formal; therefore, the researcher dressed casually with the knowledge that this would relax participants' alertness. As part of the interviewing protocol, interviewees were relieved to know that the collected information would be used only for completing a doctoral dissertation. Participants are well aware that higher authorities seldom, if ever, read a doctoral dissertation. In addition, the issues involved in the research questions did not represent a threat to them. Therefore, suspicion was not a problem, but preventing participants from reciting the official discourse was a major concern.

In spite of this researcher's insider condition, he has never worked at the selected sub-sites. This fact may reduce the possibility of affecting the study's validity due to interviewees compromising the value of data and withholding or slanting information. On the contrary, the researcher's knowledge and familiarity with the case under study became an asset for the quality and success of this study. Another asset was the researcher's knowledge of the institution and its culture. This aspect helped the researcher recognize when people were simply providing the "official version." The strengths and advantages of being an insider resulted in a privileged position and overcame the drawbacks associated with this researcher's positionality.

Data Collection

A case study is a comprehensive research strategy for empirical inquiry that relies on multiple data sources to investigate a contemporary phenomenon within its real-life context (Denzin & Lincoln, 2000a; Yin, 1994). Multiple types of data collection in case study research are used to provide an in-depth, detailed picture of the case. Informational data sources may include: direct observations, interviews, participant observations, audio-visual material, documents, reports, contracts, archival records, physical artifacts, and even quantitative data (Creswell, 1998; Denzin & Lincoln, 2000a; Ian, 2000; Miller & Salkind, 2002; Strauss & Corbin, 1998; Taylor & Bogdan, 1998; Yin, 1994). Research conducted by several scholars confirms that collecting data from multiple types of sources is a common practice for case studies in the field of education (Ainley, Banks, & Fleming, 2002; Fisher & Atkinson-Grosjean, 2002; Foskett, 2005; Garn, 2001; Johns, 2002).

In this study, data collection was primarily based on two sources of information: interviews and documents. For qualitative research, in-depth interviewing is a flexible and dynamic mode of inquiry directed towards understanding the perspectives and experiences of participants and the meaning they make of those experiences in their own words (Taylor & Bogdan, 1998; Seidman, 1991). Through in-depth, face-to-face interviews, data was collected during the months of May and June 2006 with key actors at the system level and at two campuses: Guadalajara and Querétaro. Interviews were semi-structured in order to allow the researcher to probe for clarification on relevant issues. By probing, the researcher does not replace the interviewee's words by filling in the gaps. In order to ascertain exactly what the participant means, probing requires the researcher to constantly ask the interviewee for details and specific descriptions of his/her experience and perspective; to rephrase what the participant said and ask for confirmation; and ask the interviewee to provide examples of what s/he means (Taylor & Bogdan, 1998).

All interviews were conducted by this researcher. The average length of an interview session was approximately an hour and twenty minutes; however, each session was allotted two hours to provide sufficient time for the interviewee to fully express his/her ideas. Interviews were tape-recorded and later transcribed by this researcher into a digital computer document file. In addition, the researcher took field notes that helped to inform regarding relevant issues not captured in the recordings. Interview sessions provided social interaction through conversation focused upon questioning and listening (by the researcher) and answering (by the respondent) that allowed constructing a situated narrative about the study topics (Denzin & Lincoln, 2000b; Rubin, H. J. & Rubin, I. S., 1995).

The interview protocol was carefully designed to provide no clues to the interviewee and to avoid questions that could induce a bias in the respondent. The questions were open-ended, allowing the interviewee to express freely and amply. Each participant was encouraged to explore the different veins of ideas that emerged and were of importance to the participant. Interviews, as a type of data source in qualitative case studies, have extensively been used by researchers in the field of education (Hellawell &

Hancock, 2001; Hodson, Saunders, & Stubbs, 2002; Smith, 2005; Vonderwell, 2003; Ylijoki, 2003).

In addition to in-depth interviewing, a vast number of institutional documents were collected. Among the institutional documents gathered were: (a) publications describing the educational model and its implementation; (b) publications describing the mission, principles, statutory statements, and operation; (c) brochures; (d) reports on academic indicators; (e) annual reports that provide an account of its internal workings; (f) faculty hiring contracts; and (e) institutional websites. Websites are a distinctive data source for documents. These readily available public records provide an efficient, direct account of an organization's public discourse which is particularly useful in describing institutional characteristics, activities, and processes. The use of websites as a data source for documents is not unusual in higher education research; Rhoades and Rhoads (2002), made use of them to study the identities, ideologies, and strategies of graduate employee unions.

Institutional reports and operational related documents provide a rational view of the Tecnológico's formal organization, while institutional brochures and policies "must be interpreted not as describing the operation of the institutions, but in terms of presenting a preferred image of institutions and managing the impressions of external publics upon whom they depend for their existence" (Taylor & Bogdan, 1998, p. 130).

Documents are unobtrusive primary data sources that provide direct information about events, decisions, activities, and processes (Taylor & Bogdan, 1998; Whitt, 1992).

The information contained in documents is direct and is not influenced by the interviewing process and its context.

Yin (1994) argues that “a major strength of case study data collection is the opportunity to use different sources of evidence” (p. 91). Combining different sources of data in a case study is called *triangulation* (Creswell, 1998, 2002; Taylor & Bogdan, 1998; Yin, 1994). Fundamentally, triangulation aims to overcome the weaknesses of one data collection method with the strengths of another (Denzin, 2001). By triangulating different data sources, the researcher can corroborate and validate the data collected. Furthermore, triangulation allows for converging lines of enquiry (Creswell, 1998; Yin, 1994).

Triangulation was achieved in this research by the replication logic of a multiple-case study design (Yin, 1994) and by combining in-depth interviews with documents. The latter were very useful for corroborating the information provided by interviewees and for providing reliable dates, facts, and figures.

Ethical Considerations

Creswell (1998, 2002) emphasizes the many ethical issues facing a qualitative researcher when collecting data in the field, analyzing the information, and writing the qualitative report. These issues are concerned with protecting participant’s rights and respecting the sites.

In order to conduct this study, this researcher agreed to comply with all the requirements of the University of Arizona Human Subjects Protection Program. To comply with the requirements, this researcher completed training and demonstrated protection of a human subject. The researcher later submitted a detailed description of the research project and obtained the approval from the program office noted above. The project description included: (a) background and rationale for the study; (b) its purpose and objectives; (c) methods to be employed; (d) significance of the study; (e) description of the population to be recruited and rationale for their participation; (f) recruiting and consenting procedures; (g) methodology and data collection procedures; (h) procedures for securing confidentiality of participant's identifying information; and (i) the benefits, costs and risks for individuals participating in the study.

An authorization was obtained from the proper authorities at each of the sites to conduct interviews with faculty and staff members. Campus authorities acknowledged that individual participation was voluntarily, the identity of interviewees was not to be revealed in any document, and confidentiality was to be maintained. They provided a list of potential participants who met the recruiting criteria and each individual was contacted by this researcher through e-mail. This fact may represent a sample bias since campus authorities could only have chosen participants who positively represented the Tecnológico and its educational model and not the critics in the subject. But it may also represent an extraordinary opportunity to explore whether or not instructional production is perceived as intellectual capital even among participants who are very much invested in the educational model.

All participants were informed of the nature and purpose of the study, the selection criteria, procedures, risks, benefits, costs and compensations, and issues of confidentially. Those who agreed to be interviewed also read and signed an informed consent form before beginning the interview session. The consent form was written in both Spanish and English. In addition, participants were assured at all times that their participation was voluntarily and that they could withdraw from the study at any time.

Moreover, participants were assured that the research was only for personal and academic purposes and the results would only be used to complete the researcher's doctoral degree requirements. Participants were given the freedom to choose the time and place for the interviewing session. They all decided to stay on their respective campuses and meet either in their office or in a faculty meeting room.

Interviewees acknowledged that the information collected was going to be stored in a safe place for a period of time and that it would be destroyed at a later date. This researcher and his advisor were the only persons who had access to the information. Anonymity was maintained throughout the analysis of the information and in writing this report.

Data Analysis

The analysis of collected data involved several steps. First, each interview was transcribed into a digital computer document file, such as MicroSoft Word. Second, all transcribed interviews were grouped and organized by position within the organization (faculty, department head, information technology staff, academic administrator, and administrator) and by site (Guadalajara, Querétaro, and System level). Then, each file was converted to plain-text format and loaded up to the Atlas/ti qualitative data analysis software. Documents were organized by topic and year of publication.

Transcribed interviews and institutional documents were then cross-analyzed to identify significant associations. Each transcription group was read thoroughly to reveal a general sense of the information provided by the participants and understand their overall meaning. Documents describing the development, implementation, and progress in the Tecnológico's educational model were also read to find pertinent associations with transcriptions. Thereafter, all data collected was analyzed in detail through a coding process. Categorical aggregations of relevant issues were assembled by seeking multiple occurrences and their relevancy to the research questions, and by establishing patterns of categories. The relevant issues found were then interpreted by combining them in meaningful ways within the context of the theoretical framework and research questions and also by finding new correlations that could help make naturalistic generalizations.

Coding is an analytical process which fundamentally involves: (a) a data reduction process whereby the material is organized in smaller pieces; (b) the identification of similar ideas, concepts, or themes; and (c) linking and grouping these ideas or concepts into categories as a way of refining, expanding, discarding, and developing interpretations of the data (Creswell, 2002; Marshall & Rossman, 1999; Richards, 2005; Taylor & Bogdan, 1998; Rubin, H. J. & Rubin, I. S., 1995; Strauss & Corbin, 1998). Coding is an inductive, reflexive, and iterative process guided by the research questions and the theoretical framework.

In this research, the coding process was enhanced by the use of the Atlas/ti qualitative software program. Basically, two approaches were taken. Open coding (Strauss & Corbin, 1998) was carried out to discover participant perceptions about the role of information technology in higher education. Whole sentences or paragraphs in each group of transcribed interviews were analyzed for developing relevant categories; thus, four overarching themes emerged from the data. Thereafter, three propositions were tested in the narratives of participants and in the documents: (a) information technology as tool for efficiency; (b) information technology as a symbol of modernity; and (c) information technology as a strategic resource for developing intellectual capital. In each case, analytical questions were pondered consistently. Examples of such questions are: How do participants refer to information technology? What is the main idea in this sentence or paragraph? What is this participant trying to say in regard to the purpose of information technology? By doing so, new concepts became evident; thus, new codes were created and fragments of text were assigned to their corresponding code.

Analysis regarding (a) structures of signification, domination and legitimation in the organization; (b) information technology produced; (c) information technology mediating faculty work; and (d) the relationships of the latter three with academic capitalism began with some specific codes; thereafter, new codes were developed as each interview was read and new concepts appeared. The aforementioned also occurred in a similar way with regard to the analysis of strategic management of intellectual capital and its relationship with academic capitalism. In both cases, research questions and the theoretical framework guided the analytical process. Sentences or paragraphs were assigned to codes in the coding process. In several cases, the same segment of text related to two or more codes because of interlacing theories; therefore, they were linked to as many codes as necessary. In these cases, the interconnection among theories was straightforward.

After all groups of transcribed interviews were thoroughly read and coded through the lens of a particular research question and the theories associated with it, all selected segments of text in the Atlas/ti database were filtered and arranged by each participant's position in the organization and by each code. A printed report was made for each group. These reports facilitated making a detailed description of the case and its context, categorical aggregations, establishing patterns of categories, and developing naturalistic generalizations.

Although learning to use Atlas/ti was time-consuming, the software helped to manage a large volume of information (more than 600 pages of transcription), quickly located useful quotations and multiple perspectives on a category, created families of codes, aggregated or disaggregated codes, and filtered and ordered selected text to create different reports. Qualitative software programs provide tools to help analyze data, but they do not conduct the analysis for the researcher (Weitzman, 2000). According to Weitzman, Atlas/ti can be categorized as a "code-based" theory building program that provides search and retrieve functions, allows representing relations among codes, builds higher-order categories, formulates and tests theoretical propositions about data, and links segments of text together.

Limitations of the Study

The purposive sampling strategy utilized in this case study did not include either part-time faculty members or students. These two groups of actors may provide different perspectives, understandings, and experiences that could strengthen or challenge the findings in this study and increase the likelihood for generalization.

The particular characteristics of a multiple-case studies design, the complexity of the setting in which this study was conducted, as well as the magnitude of the organizational change to which these cases referred may hamper the generalization of findings in relation to other higher education institutions. In spite of the aforementioned limitation, this study could at least become a reference point for further research on the same topics.

Moreover, there is currently a lack of comprehensive studies related to the impact of information technology on the organization of higher education, faculty work, and intellectual capital developed in instructional production and delivery. While this lack represents a limitation, it provides this study with the opportunity to offer empirical evidence in these regards.

It is important to consider the fact that the Tecnológico's top administration regulates institutional general academic policies and norms, specifically regarding faculty member's autonomy and control over instructional production and delivery (Tecnológico de Monterrey, 1998a, 2000b, 2004, 2006b). The aforementioned may be significantly different in other higher education institutions in México and abroad. Differences in human agency may influence technology's structuring process of organization in a variety of ways but particularly in such a large scale organizational change as described in this case.

Conclusions

The nature of this research called for a qualitative exploratory case study approach. The qualitative research strategy was based on a multiple-case studies design. This case study involved the analysis of an organizational change in its whole, but also involved the analysis of two campuses of a private higher education institution.

Data collection in this case study was primarily based on two sources of information: in-depth interviews with key informants and multiple institutional documents. Analysis of the data collected was guided by the research questions and the theoretical framework and enhanced by use of the Atlas/ti qualitative software. The techniques and procedures for data gathering and analysis were described in detail as well as ethical considerations, the researcher's positionality, and limitations of the study.

CHAPTER IV: FINDINGS

Introduction

This study addresses three issues related to the organization and administration of higher education institutions at the Tecnológico de Monterrey university system. These three issues are: (a) how traditional higher education institutions organize around the extensive use of information technology in the teaching and learning process; (b) how administrators and faculty interpret and make meaning of the purpose of learning management systems in higher education; and (c) how these institutions treat the intellectual capital generated in the utilization of learning management systems for instructional production and delivery.

The data gathered at the interviews and from the institutional documents collected were analyzed utilizing Orlikowski (1992) and Thomas' (1994) theories of technology and organization, Slaughter and Rhoades' (2004) theory of academic capitalism, and theories and models for the strategic management of intellectual capital (Bontis, 1999; Choo & Bontis, 2002; Davenport & Prusak, 1998; Sullivan, 1998).

The findings are organized into three sections. The first section addresses the perceptions of administrators and faculty members about the purpose of using learning management systems at the Tecnológico. The second section describes the different organizational structures that were created to support the incorporation of information technology for instructional production and the ways that information technology is enacted by its designers, users, and decision makers. The findings in this section are presented using Orlikowski's (1992) structurational model of technology as a framework.

The findings in regard to the intellectual capital that is created as a consequence of information technology mediating organization and instructional work are covered in the last section. These findings are presented using Choo and Bontis' (2002) framework for strategic management of intellectual capital.

Administrators and Faculty Members' Perceptions about the Purpose of Information Technology at the Tecnológico de Monterrey

When examining the impact of technology on an organization and vice versa, it is valuable to understand the perception of the organization's employees regarding the purpose for adopting and implementing a particular technology. In her structurational model of technology, Orlikowski (1992) argues that understanding the purpose of technology enables shared meanings that inform the users and influence their interaction with the technology. Hence, it is important to analyze the people's view behind the adoption and implementation of technology, its strategic purpose, and its likely value to the organization (Orlikowski & Gash, 1994). From the power-process perspective of technology (Thomas, 1994), analyzing the purpose of incorporating a particular technology in the organization is also of importance for its adoption and assimilation. The aforementioned can be achieved by understanding the desired objectives or results that the proponents seek by means of its use.

By using open coding in the analysis, four themes emerged from the data which was generated by a series of qualitative interviews conducted with participants from different key groups in the organization. The main areas of discourse evident in the data were that participants viewed the purpose behind the incorporation of information technology from four different perspectives: (a) as a constituting essence of the organization, (b) as a crucial agent for implementing the teaching and learning model, (c) as an academic resource for both students and instructors, and (d) as an opportunity for students to develop skills primarily used in occupational settings. In addition to these four themes, two propositions were considered during the interviews: a) information technology as an efficiency tool, and b) information technology as a strategic resource for the creation of intellectual capital.

Each of the four emerging themes and the two propositions are addressed from the viewpoints of different participants in key groups. An effort has been made to distinguish each participant's position within the organization in order to allow comparisons and appraisals of individuals' responses at the System level and at each of the campuses.

During the interviews, the participants used the term "redesigned course" in reference to a course that had been produced following the didactic guidelines of the Tecnológico's Educational Model (TEM) and had been uploaded to a Learning Management System (LMS).

Information Technology as an Element of the Tecnológico's Genetic Code

When interviewed, many individuals referred to incorporating information technology into the teaching and learning process as a kind of natural consequence of the Tecnológico's evolution, as a trait that has been passed down since the inception of their university system. This distinguishable characteristic was so relevant for the participants that this researcher deemed it appropriate to introduce the term "Tecnológico's genetic code" as a symbolic analogy of such a constituting essence of the organization.

As an example of the aforementioned relevance, a top administrator at the system level underscored that the Tecnológico de Monterrey was a technology oriented university which has always been distinguished by its innovation and use of information technology. The interviewee provided an account of some of the university's accomplishments regarding the utilization of information technology in education:

> We were the first university in Mexico to open the [undergraduate] program in computer science, the first university to introduce basic computing topics in all its undergraduate programs. We were the first Internet connection 20 years ago, we were pioneers in VPN, we were the first [computer] network that was formed in Mexico, ours.

In support of the latter, the institutional publication "Innovación Educativa en el Sistema ITESM" (Educational Innovation in the ITESM System) provides a record of the most noticeable innovations that the Tecnológico carried out in the field of education in its first 45 years of existence (Tecnológico de Monterrey, 1988). In this book, information technology is presented as one of the six broad aspects which this university system decided to incorporate into the process of transforming education in Mexico.

To another top administrator at the System level, the Tecnológico de Monterrey has always been a very innovative university that has incorporated the elements of software, hardware, and new methods to educate. The interviewee stated: "To me the Tec has always used technology in education. We have always used computers or have always used different means from the traditional ones to educate."

In the university's mission for the 1995-2005 period, the number one strategy was the re-engineering of the teaching-learning process and clearly stated that "learning should be supported by state-of-the-art technology" (Tecnológico de Monterrey, 1998a, p. 17). With that in mind, a top academic administrator at the System level recalled during an interview that "the [IT] platform began as a *must* … [thus] everybody rushed to use [information] technology platforms to support the teaching and learning process."

The respondent remarked that the learning management system “was not the educational model but indeed the Tecnológico’s Educational Model was supported by the [IT] platform.” When the implementation of the model began, people were confused with the idea that the educational model meant the digitization of the course materials, in spite of the explanatory account. Everybody received the strong signal that they should upload their courses to the learning management system in order for a course to be categorized as "redesigned". The interviewee added: “Back then, the [IT] platform was seen as an essential element or indispensable, or almost indispensable for the educational model.”

Evidence in support of the aforementioned statement was found in the institutional description of how information technology was intended to reinforce the educational model:

> The use of computers as a working tool by professors and students is a requisite for all the courses that apply the educational model…. a system comprising diverse interactive technologies, integrated and interconnected, that make documenting and managing the didactic process more compact and agile. This software system of integrated tools constitutes an [information] technology platform.” (Martín Pérez, 2002, p. 90)

Furthermore, in the same documented description, it was asserted that “the use of new technologies has been generalized to all on-campus, face-to-face courses that are offered at the Tec and has become one of the essential features of the educational model” (p. 85).

The messages conveyed to faculty members in the early stages of the educational change were confusing. A mid-level information technology manager at the system level recalled that “We said one thing and asked for another. We said that a redesigned course did not need to be on a technology platform, but if you did not have it on a platform it was not considered as redesigned."

This view of information technology as a *sine qua non* pervaded the entire organization and provoked many to define the new educational model through isolated aspects which in turn became the origin of a series of misconceptions. Some of those misconceptions were caused by the technological imperative in the educational model, as evidenced in the informational booklet titled "10 mitos sobre el rediseño de los cursos" (10 myths about the redesign of courses). The booklet attempted to clarify how information technology served the didactic processes instead of the opposite and also that information technology would broaden the scope for human interaction instead of leading to virtual education (Tecnólogico de Monterrey, 1998b).

In 2002, the rector of the Tecnológico de Monterrey System reiterated the university's call for the use of information technology in its core function during one of his official statements to the community: "It is also our purpose that the Tec becomes one of the institutions worldwide which makes a better and more efficient use of information technology as an aid to the educational task and, therefore, to the teaching and learning process" (Martín Pérez, 2002, p. 12).

A decade after implementing the educational model and incorporating learning management systems as one of its essential elements, an academic administrator at the system level declared that the Tecnológico de Monterrey has been congruent with its advocacy for the use of information technology and asserted: "The Tec has always been the referent in the use of [information] technology in education… what it is true is that the Tec is the institution of reference for university innovations."

Another indication that information technology is part of the university system's essence is found in the recently developed Mission 2015 where the principles which define the institution's identity and culture were re-stated. Of the 17 principles, the second states: "The Tecnológico de Monterrey bases its development in the innovation, the creativity, the use of technology, and the entrepreneurial spirit of those who form it" (Tecnológico de Monterrey, 2005a, Principio 2, para. 1).

The perception that information technology is a trait in the Tec's genetic code is also found in the narratives of the individual participants at both campuses. For example, a top administrator at the Queretaro campus agreed that the institution has always incorporated information technology in many areas and functions and remarked: "I think that the Tec has always had a certain abuse of technology [use], I think we have that in our blood for being engineers, many [computer] systems' engineers and converted chemical engineers."

Two mid-level academic administrators at both campuses concurred in the view that the quest for innovation and use of information technology are part of the institutional culture. Expressions such as "we always want to be innovating and always are looking for alternatives" and "the Tec has based always on that, in that we always are inventing, inventing, inventing, evolving, looking for different ways" are examples of that perspective.

In a similar fashion, faculty members at both campuses echoed the administrators' words. As an example, a faculty member at the Querétaro campus stated "I remember that the Tecnológico has always started with this type of things: using the Internet in a massive way, the wireless networks, the use of [IT] platforms; it is as if Tec has always been innovating and at the vanguard."

When questioned about their point of view, the Information and Technology staff at the System and campus levels concurred in that the Tecnológico has always been the vanguard in the use of information technology to innovate the teaching and learning process. One interviewee commented: "Something that is a distinct characteristic of the Tec is its constant innovation; that means that people know us by our innovations in information technology."

From the data generated by the interviews and the documents that were analyzed, it can be inferred that information technology and educational innovation are perceived as two intertwined concepts and as integral to the Tecnologico's essence and, therefore, help shape people's perception about the adoption and assimilation of information technology in higher education.

Information Technology as Instrumental to the Implementation of the Redesign Strategy

According to a top administrator at the System level, the fundamental change in the educational model was not the use of information technology; the fundamental change was to educate citizens engaged in the development of their community instead of merely specialists in a profession. Nevertheless, the respondent affirmed that it would not have been possible to massively implement redesigned courses manually. Learning management systems provided the support needed to carry out the educational model simultaneously at all 33 campuses. The same idea was also expressed by an academic administrator at the System level: “These new technologies, more than a resource, have demonstrated to be a working environment which favors the putting into practice of the characteristics of the educational model.” (Martín Pérez, 2002, p. 85)

Along the same line of discourse, another top level administrator reflected on the strategy for the re-engineering of the teaching and learning process stipulated in the 2005 mission statement. The interviewee indicated that the educational model turned out to be a teaching and learning technology itself, consisting of two parts: the “soft part” which included the array of didactic techniques and the “hard part” represented by the information technologies that supported the didactic methodology. Learning management systems were the means to make the educational model explicit to the student; thus, the hard part was the vehicle to carry out the soft part. For example, learning management systems made it possible for the learning activities designed by the instructor of a course to “explicitly be in a place where all the students could see them.”

According to another top level academic administrator at the system level, the learning management systems aided in accelerating the incorporation of faculty into the educational model by way of adopting redesigned courses. This meant that fulltime professors could adopt a course once they had already redesigned one on their own and part-time professors could choose to adopt instead of redesign a course. This was explained in an institutional document where the option for transferring a redesigned course was described:

> The course to be adopted must be approved and made public in a database, available for use by other professors who teach the same course in the same or another campus. In general, professors who adopt and adapt a course are those who work at the Tec part of their time. (Martín Pérez, 2002, p. 157)

An academic administrator at the system level who was highly involved in the development of the Tecnologico's educational model asserted that learning management systems served as a crucial means to carry out the re-engineering strategy, a means "which facilitates the implementation of the educational model, that provides [virtual] spaces which without them the educational model could not be accomplished."

At the campus level, the perception that learning management systems were instrumental to the implementation of the educational model was also voiced in the interviews. A mid-level academic administrator at the Queretaro campus held the view that the educational model was independent of the learning management systems. The interviewee asserted that the educational model proposes that the student should be the center of the teaching and learning process and "the platform is a substratum that supports that in some way." According to this respondent, the role of learning management systems was never clarified, although they were introduced as an essential tool to carry out the reengineering strategy of the educational process. The interviewee reflected out loud: "What is the function that the platform has or where does it come from? Well, it comes in part from the mission and on the other as part of the redesign model, but it was never clarified what role that platform should have."

The participants from the Academic Development office at the Queretaro campus also shared the view that learning management systems are an organizational resource utilized to accomplish the educational model and, therefore, the fulfillment of the mission. One interviewee stated: “The introduction of [information] technology in the educational model is a strategy to implement the model itself -which is student centered- to provide the quality in the classroom that is required, the companionship, the facilitation, and at the same time to be able to introduce new teaching strategies like Project Oriented Learning, for example.” Another interviewee stated that the implementation of the educational model would not be viable without the use of learning management systems:

> I said to myself: “If the educational model is asking of you -in the Mission 2005 we had- to be a facilitator, a guide, collaborative learning and more;” then, like I could not have the chance to do it in a traditional way of working and by starting using technology tools -besides them being a novelty- I had much more time to dedicate myself to be truly a guide, a facilitator, and start fulfilling the Mission.

A faculty member from the Guadalajara campus was very eloquent in depicting the role of learning management systems when implementing the educational model throughout the university system. The professor recalled the words of the rector of the system from one of their conversations:

> “Very well, I understand this is very important, just tell me how do I do it massively;” [those were] his exact words; then the [information] technology platform allows that massive implementation and I will put the meaning of massive not only in negative terms, but in terms of doing it for a large number of students scattered in the whole country. I understand it is a complex problem, then, if you ask me, personally I say that deep down I think this is what it was.

Learning management systems proved to be a good means for this massive implementation by way of adopting redesigned courses as shown by the figures in the institution’s annual reports: 4,433 class sections offered a redesigned course by August 1998; 2,843 of those sections were taught by the authors of the redesigned course and 1,950 class sections were taught by professors who adopted a redesigned course

(Tecnológico de Monterrey, 1999a). In the following year, those figures almost doubled: 8,681 class sections were taught using redesigned courses; 4,861 were taught by the authors of the redesigned courses and 3,820 were taught by adopters. (Tecnológico de Monterrey, 2000a)

The re-engineering of the teaching and learning process was “the most important strategy that the Tecnológico de Monterrey [had] to fulfill its mission” (Tecnológico de Monterrey, 2002, p. 11). Therefore, all the redesigned courses were required “with no exceptions, to fulfill the three fundamental aspects implied in the reengineering: the application of the selected didactic techniques for learning, the use of technological platforms as a support, and the design of learning activities directed toward the development of students’ values, skills, and attitudes” (p. 11).

Between 1998 and 2001, the percentage of class sections taught using redesigned courses more than doubled; it increased from 34% (4,433) to 69% (16,646). By 2004, the percentage was 74% or 17,747 class sections (Tecnológico de Monterrey, 1999a, 2002, 2005b). The aforementioned figures illustrate the significant role of learning management systems in the implementation of the educational model at the Tecnológico de Monterrey System.

Information Technology as a Mediating Resource for Teaching and Learning

Academic administrators at the system level argued that learning management systems have an impact on the teaching and learning process in many different ways. For example, one of them asserted that learning management systems “allow the concurrence of learning processes" and favor the interaction among students outside of the classroom, whether they are from the same or from different campus.

Another of the respondents argued that learning management systems impact the way that the learning process is organized. According to this participant, the student has a more proactive role in the management of his/her learning process. Learning management systems are an appropriate virtual space for the professor to organize and structure learning activities and inform the student what to do when they are in the learning process but it is the student who manages the learning process. For this respondent, information technology not only "makes possible a different way to manage the teaching and learning process" but also "it has an aiding role, enriches and complements what it is done in the classroom to use and optimize classroom time."

The information technology staff at the system level also commented on the mediating role of learning management systems in the educational process. A top level IT administrator expressed that through learning management systems the student is stimulated to actively participate in his/her own learning. Students can also have access to more information sources around the world and learning management systems allow the instructor and student to better manage the course content as well as the collaboration groups.

Other IT staff responded that information technology facilitates the process of teaching and learning in three ways: (1) it allows access to a vast amount of information and knowledge and (2) the ability to manage it at the time and place where it is needed, and (3) it allows an "extended classroom" and thereby extends the learning process.

Another IT staff member responded that one purpose for the use of learning management systems is "the standardization of course contents that students are going to learn, of the goals and the specific objectives." Another purpose mentioned was "to provide a virtual space where students can access information and collaborative learning activities, where students and instructors can meet and leave evidence of their work."

For another IT staff member, learning management systems were also an aid in "the administration of the educational process and becomes an instrument that can be used by professors to enrich their teaching mechanisms." The respondent added: "If you do not have an educational model in place, then the platform is useless."

The usefulness of information technology in the educational process at the Tecnológico de Monterrey is stated in an institutional brochure utilized in the university's domestic and international public relations. In this brochure it is stated that:

> The educational model includes numerous processes which are enhanced by the use of information technologies and telecommunications. The students use the computer to do their homework, fulfill their learning objectives and interact with their classmates and professor, which favors the students' active participation, encourages responsibility, facilitates internationalization and forms authentic learning communities (Tecnológico de Monterrey, 2006a, p. 15).

At the campus level, the perception of information technology as a mediating resource for teaching and learning was also shared. For example, a top administrator at the Queretaro campus commented "I would say that [the purpose of learning management systems] is to open new spaces for learning" and further elaborated "I believe that the technology platform opens times and spaces for exchanging with students as well as with peers, with other faculty members from the same discipline or related disciplines, that we would not have otherwise."

For this interviewee, information technology allows students to go beyond the boundary limits of the individual professor “so the knowledge that students have would not depend solely on the knowledge that the professor has, but it goes farther beyond.” Information technology also makes it possible to have a “permanent conversation” with students, therefore, giving the professor the ability to address student concerns and different levels of learning outside of the regular classroom meeting times.

The respondent also commented that learning management systems were of secondary importance for that campus, but instead the behavioral change of professors and students was fundamental in the educational model. In this model, the paradigm is that learning is centered on the student and the professor “becomes a designer of learning spaces.”

From the point of view of a mid-level academic administrator at the Queretaro campus, learning management systems are a resource which enriches the work of the professor, enhances student’s learning, and aids the teaching process. Learning management systems are not only a space for delivering content, but also a working virtual space where students can interact and perform learning activities. The participant expressed: “From my perspective, the purpose of using an [information] technology platform is to have a platform for the construction of solutions to cases, projects, problems, through the collaboration of students even when the class is face-to-face.”

At the Guadalajara campus, a top level administrator considered a threefold purpose of information technology: (a) a pedagogical one, (b) the enhancement of learning, and (c) the development of the academic community. In the participant’s own words: “One of them, I have no doubt, [is that] it helps to constructivism [pedagogy], that means that the student learns or that the student has additional resources besides the instructor.” The second purpose was that students at the present time are used to multimedia material which is more appealing to them and information technology helps a lot in the production of that kind of material. The third purpose was to motivate faculty and to keep them up-to-date.

The Academic Development staff from campus Queretaro referred to learning management systems as a resource that facilitates the work and interaction of participants in the teaching and learning process, that aids the professor to organize the class and material, and that “allows improvement of the quality of the interactions that take place in the classroom… the discussion, the reflective process, the debate and the construction of new knowledge inside the classroom.” Working with learning management systems required traditional professors to change their schemes, their paradigms about the teaching and learning process, which in turn demanded a structural organization of the course. However, learning management systems also represented a resource at hand that facilitated the process of organizing and structuring the course, one that provided the possibility to prepare a richer class with more attractive resources. Learning management systems were also a means to optimize class time and allowed the professor “to take the class to another type of learning…. Having all the materials, all the plan of what it was going to happen, all homework ready there, then obviously saves you more time to fully dedicate yourself to your class, for interaction.”

For staff members from the Academic Development office at the Guadalajara campus, learning management systems were a "tool that aids the process of learning so it can be more significant and more efficient." The purpose of using learning management systems is to facilitate and improve the communication among the students and between the professor and students, optimizing class time. Learning management systems were also viewed as a very good tool for academic administration to monitor the teaching and learning process, but learning management systems by themselves did not guarantee learning.

> The platform is an excellent tool, I think we have not been able to fully exploit it for learning, we have been able to exploit it for communication and for having there a series of elements that we are interested in having…. The tool was always put as a tool for learning, there is where I tell you that initially we did not use it for learning, it was more for control [of the teaching and learning process] and it keeps being much of a tool for control because we are an organization very much of engineers. (Staff member from the Redesign Support Center at Guadalajara)

Faculty members at the Querétaro campus spoke of learning management systems as a dynamic tool that permits structure and course content organization. One of them specified that "in some way, the [IT] platforms make you, or motivate you, or give you elements so you can structure the class [session] in a more efficient manner… the platform eases the way, it facilitates it, it takes you more easily to be more structured in your session plans." Another faculty member added that the redesign process of structuring and organizing a course leads professors "to reflect on what they do, how they do it and why they do it" in a very visible and tangible way; it makes them concretize knowledge and link it to daily life. "It would be like the reorientation of learning in a continuum… that always give you that flexibility to rethink, reflect and change." The interviewees argued that learning management systems provide more dynamic structures to that end.

To them, learning management systems is a place where professors can transfer the knowledge available for a course and the necessary information for students so they can be responsible for their own learning. They also considered learning management systems to be a tool that allows them "to generate a process of interaction with students… a way to interact through a space" that can be a bond between professor and student and that would allow a more intense flux of interactions appropriate to the teaching and learning process.

The group of faculty members from the Guadalajara campus revealed ideas similar to the faculty members from the Queretaro campus. To the former group, learning management systems were an important complement in the teaching and learning process, a tool that enriched their teaching practice from the conceptual course design to their actual classroom performance. Learning management systems provided a virtual space where they can organize all the information, materials, and learning activities. That virtual space allowed them to extend the classroom since students can access the course anywhere and at any time. As one professor explained, "[It] is a space where I can organize my information, where I know that my course is, where I know that my students can [have] access to information that before I would have given them by other means."

Another professor supported that view, stating "I know that all the material that I need for my class is there and it is not only one activity." Furthermore, this virtual space also aids in optimizing class time, as the professor remarked "[It] has allowed me to better achieve the objectives of the course in the sense that I do not waste so much time… [it] expedites the process of the class session and that saves me time, allowing me to better or more calmly get to the interpretation of the results."

Learning management systems also represent an extension of the classroom since they allow creating and facilitating the interaction among participants in the process of teaching and learning. As one of the professors stated, "To me, it has helped me to generate a dialog external to the classroom, an extra-classroom learning community was formed." In support of this notion, another one of the interviewees underscored:

> It is yet another resource, to me is a resource that should facilitate certain processes, there are some that are hindered… but I think that the fundament is that it facilitates the interaction with students, promotes the class not only to bind to what happens in the classroom, but that you have the opportunity to interact with them virtually.

A decade after the implementation of its educational model, the Tecnológico summarized and presented its experience in using information technology to mediate instruction in on- campus, face-to-face courses, in the recently published institutional document "El modelo educativo del Tecnológico de Monterrey" (The Tecnológico de Monterrey's educational model). Through learning management systems, professors convey information about the objectives and plan of the course, the learning activities, resources and working materials, and guidelines and links to electronic resources. Professors use learning management systems as a virtual space for interaction among students beyond the classroom and between the student and professor. Furthermore, students use learning management systems to carry out collaborative learning activities designed by the professor and participate in virtual learning communities created by the professor and supported by learning management systems (Tecnológico de Monterrey, 2006b).

The examples provided above by participants describe in summary, the mediating role of learning management systems in instructional production and delivery. These findings offer evidence on people's perception of information technology as a mediating resource for teaching and learning.

Information Technology as a Portfolio of Job Related Skills

In the Tecnológico's 2005 mission statement, the student's profile was described in terms of the values, attitudes, and skills s/he was expected to posses upon graduating from the institution. In that profile, one of the various skills considered important by the institution was "the efficient use of telecommunications and information technology" (Tecnológico de Monterrey, 1998a, p. 16).

Martín Pérez (2002) argues that student skills were developed by their interaction with information technology in the educational model which "prepared them to comprehend the world and for a professional life provided with a global and universal mentality" (p. 98).

At the Queretaro campus, a top level academic administrator agreed with that perception and further commented that by interacting with information technology students acquire "a competitive advantage when they graduate," skills which are "a plus that students receive." When asked about the contribution of the university to higher education in Mexico with respect to incorporating information technology into the teaching and learning process, the respondent replied:

> Therefore, I believe that an important contribution has been through its graduates who once they become part of a company or organization they already have an attitude, a way to interact with technology, which also has an impact in the organization.
>
> Our alumni are not afraid of information systems or any type of information technology. It is something they have cohabited with everyday therefore it is not a problem to them.

By using learning management systems, the Tecnológico expects that its students develop a set of skills and abilities needed after graduating. As a top level academic administrator at the system level asserted, "we want to develop certain capacities … the management of [information] technology … [that they] be able to learn in distance-learning settings… [that they] become independent from the instructor, collaborate at a distance, also to process information that students can now access online."

The group of mid-level academic administrators at the system and campus levels referred to the pervasiveness of information technology and expressed that "the use of [IT] platforms places [the student] in an environment in which s/he will live and work." From a global perspective, people need to work with their peers in remote locations and with companies which are in a different context. Students who use information technology and learning management systems "develop instrumental skills so when they go to a company they already master them and they facilitate to work in virtual settings, therefore, they feel secure they can do it, they are able to get organized in a team with other colleagues who are in a different context."

For the Academic Development staff members at the Queretaro campus, students not only develop skills for the appropriate use of information technology by using learning management systems, but also by the use of other information technology tools promoted through learning management systems. The other tools to which they were referring are word processors, spreadsheets, Power Point presentations, electronic libraries, specialized software, simulators, the WorldWideWeb, and virtual laboratories.

The information technology staff members at the Guadalajara campus and at the system level also perceived that students acquired a competitive advantage by developing information technology skills. Information technology is being utilized everywhere and in every company. Employees with transnational corporations work collaboratively at remote distances and therefore, students are exposed to that kind of environment.

Faculty members from the Querétaro campus also expressed that students acquire a set of skills which are important to employers. One of the respondents argued:

> Look, I think that the trend worldwide is the intensive use of information technology. The student graduates, goes to work to a company, and most probably the company will have its own systems and the student will have to manage some, well, some software; will have to manage various software.

For a similar reason, another interviewee from this group stated “with the use of [IT] platforms, we are training our students. We are giving them a very, very important skill for the time when they get to practice their profession, the skill of being able to communicate efficiently… in order to make more dynamic and more valuable decisions.”

A faculty member from the Guadalajara campus talked about the need to include the development of information technology skills in the educational model in order to provide a more integral education to students. The participant explained “We have to recognize that we live in the information era, the era of the technological transformation… we have to give the student a more integral education in the cognitive aspect, attitudinal, the aspects of values and vanguard technology. This last area, I think, is represented by the use of the [information] technology platform."

The accounts given by the participants exemplify their perspective about information technology as an opportunity for students to develop skills primarily to be used in occupational settings.

Information Technology as a Tool for Efficiency

The theory of academic capitalism proposes that higher education institutions' interest in using information technology is to deliver educational material and courses in order to minimize the cost of labor, increase their operation efficiency, and expand their portfolio of services (Slaughter & Rhoades, 2004).

Data generated from interviews and documents collected provided no evidence of an institutional interest in incrementing the Tecnonlógico's efficiency of its operation or in efficiency as an outcome related to the utilization of information technology in the institution's educational model. During the various interviews, faculty members and academic administrators agreed in that classes are still being held in classrooms and that students and professors continue to attend every class session. They also asserted that faculty's teaching load was not modified; it neither decreased nor increased due to the use of learning management systems. When asked about a possible impact on class size, faculty members and academic administrators declared that there was no impact at all in the number of students per class section as a result of the use of learning management systems in the educational model.

In order to validate data generated from the interviews, institutional reports and statistics were gathered and reviewed. The figures indicate that, at the system level, the average class size in undergraduate programs actually decreased by almost 27%. Before implementation of the educational model, the system's average number of students per class section from 1993 to 1996 was 26. In fall semester of 1998, a year after implementation of the educational model, the average class size was 24. By the year 2000, the average was 18; and by 2005, it was 19. The average class section size at both the Queretaro and the Guadalajara campuses did not suffer a great variation. In Guadalajara, the average size of a class section remained at 23 from 2000 to 2005, and in Queretaro the average decreased from 26 in 2000, to 22 in 2005 (Tecnológico de Monterrey, 1996, 1999b, 2001, 2006c).

When asked about the impact of learning management systems on faculty composition in the educational model, the interviewees indicated they have not seen any impact whatsoever. The information contained in the institution's statistical reports showed no significant variation in faculty composition from 1996 to 2004 at the system level for undergraduate programs. The percentage of fulltime professors in 1996 was 36.6% and the percentage of part-time faculty was 63.4%. In 1998, the figures were 37.7% fulltime and 62.3% part-time. Faculty composition in the year 2000 was 36.7% fulltime and 63.3% part-time and, by 2004, faculty composition did not change significantly as the percentage of fulltime professors was 37.4% and the percentage of part-time faculty was 62.6% (Tecnológico de Monterrey, 1999b, 2001, 2005c).

Faculty members and academic administrators alike recognized that the re-engineering of the teaching and learning process represented a huge investment in material and human resources, such as information technology infrastructure, software licensing and software development, training in the pedagogy and learning management systems, and the production of redesigned courses. From an economic perspective, the idea of producing only one or a few digitized courses to be replicated and used in all class-sections across the university system could justify such an investment in the re-engineering of the teaching and learning process. However, in this study, the analysis of data gathered from the interviews revealed that reutilizing the digitized course content by way of adopting redesigned courses was not perceived as an interest in making the operation more efficient, as the theory of academic capitalism suggests (Slaughter & Rhoades, 2004).

During the interviews, a mid-level academic administrator at the Guadalajara campus asserted that the objective of producing a course in learning management systems was not the adoption of those courses per se. According to this participant, the goal was the involvement of all faculty members in the educational model. The idea was that professors would highly engage in the educational model and that they could redesign their own courses as a way to better understand the model, as expressed by the respondent:

> In fact, the adoption of courses was a second step. I mean, the first one was to redesign because redesigning meant that the professor would go deep into the guts of the course, change it, accommodate it, but sometimes for time reasons or many other things that is not possible, then the other option was to adopt a course, but in order to adopt a course they must also undergo training [in the model]…. Adopting was a good solution; first, for part-time professors and then for some

> campuses. There are small campuses where there are not so many professors and they cannot reduce their teaching load, [therefore] they cannot redesign, but they do can undergo training and then adopt [redesigned courses].

There were some ideas about adopting the best redesigned courses made by faculty members who were experts in their academic fields, as a top level administrator at the Guadalajara campus remarked "… there was never an institutional line that, for example, the institution would select the best professors in the country or more recognized or with more advanced [academic] degrees and bind the rest to adopt their courses." The respondent added that in fact, every campus and faculty member was free to choose either to redesign courses that could be transferred to other faculty members or to adopt any courses already redesigned.

According to a top level information technology manager, the intent for fulltime faculty members was to develop designer professors not adopters and that resulted in having several redesigned versions of the same course which was categorized by this respondent as inefficient. When challenged about the adoption of courses as a strategy, the interviewee remarked "What I do not believe is that the purpose was to do it that way. It was rather a consequence of the speed we were going; we could not go without adopting." The interviewee further indicated that some small campuses with few fulltime professors or with financial constraints decided to adopt redesigned courses as their strategy and further concluded that this might have meant a more efficient operation for those campuses but in detriment to academic creativity and capacity building.

A top level academic administrator at the system level agreed that there were a few small campuses which elected to adopt already redesigned courses in order to implement the educational model due to the high costs related to redesigning, but this was not as a result of any institutional policy.

Faculty members played an important role in conditioning the adoption of courses, as commented by the same respondent:

> It was obviously impossible to say that by institutional policy, a course X selected as “three X” or “five X” or “five stars” would have been adopted by an experienced professor without him or her intending to make some change to it. No, right? It would have been ideal, yes, but all the creativity and the experience of well-rounded individuals is eliminated.

At the campus level, faculty members and academic department heads concurred that the purpose behind the adoption of learning management systems was not the adoption of redesigned courses, but it was rather a consequence of their utilization. As an example, a department head at the Guadalajara campus stated “I think it was a consequence, but that was not the end.” Another department head at the Querétaro campus underscored that “I think that was not the end, but it was definitely an advantage. It was an advantage that has been achieved. I do not know if they were looking for it or if it just emerged. Another advantage, as I was saying, was to replicate faculty members’ materials, especially the good materials.”

The Academic Development staff members at the Guadalajara campus also concurred that the aim was not the adoption of courses but that all faculty members underwent training in the educational model. Initially, the only way to acquire those competencies was through the process of redesigning a course; afterward, another method was introduced which required the professor to undergo training in the process of adopting an already redesigned course. Faculty members were able to choose either method when they began their training in the educational model. One respondent expressed:

> At the beginning, I do not think that we thought much about that [adopting]; otherwise, we would have done the organization of another project -in a different way. Since the beginning, anyone could, as a campus, anyone could bring in its redesign. There could be 30 courses of Algebra I; therefore, I rather think that that was not the end. If that would have been the end, it would have been more structured. They would have said: If John Doe is producing an Algebra I course, then, everybody else must adopt it. I rather think that it [the purpose] was to introduce technology and later we saw that technology can aid in the standardization we want with regard to quality.

The idea of achieving quality and standardization behind the adoption of redesigned courses was also mentioned by a top level academic administrator at the Queretaro campus: “I think that in many cases it also has been useful to standardize the contents, skills and aptitudes that we want to develop at the different campuses by way of adopting courses which are already re-designed, which are in the [IT] platform.”

Faculty members at the Guadalajara campus also mentioned that they thought of standardization at the beginning as quality assurance and of adoption as a way to achieve that standardization. One person expressed: “I believe that one first thought was standardization. I believe that in 1996-97 we dreamed of standardization.” Another faculty member asserted that standardization “represents quality assurance.” Finally, another faculty member added: “Yes, I think that at the beginning we thought that we were going to be able to standardize. I think that it is very difficult to standardize the educational process.”

The purpose behind the adoption of redesigned courses is summarized in the statement made by a top level academic administrator at the system level. The interviewee declared that the purpose was “to facilitate, to sooner provide professors with a very good course, accelerate their incorporation to the educational model, give them the best, but might be the [academic] culture or tradition; it [adoption] happened very little.”

Information Technology as a Strategic Resource to Create Intellectual Capital

The theory of academic capitalism (Slaughter & Rhoades, 2004) argues that higher education institutions engage in market-like behaviors and proposes that the incorporation of learning management systems is part of the branding strategy in these institutions. Findings in the previous section support this perspective. Standardization and quality assurance are central features of neo-liberalism and of capitalist regimes. Therefore, participants’ perceptions about the role of learning management systems in standardization and quality assurance in their education model forms part of the Tecnológico’s brand and a way to legitimize themselves to their constituents.

In order to find out whether learning management systems were perceived as a symbol of modernity in a branding strategy or as an opportunity to create intellectual capital, printed promotional material was collected and analyzed. Interviewees were then questioned about the sourcing strategies for learning management systems and their rationale for their strategic choice between both learning management systems.

In this particular study, none of the interviewees mentioned learning management systems as an element of a branding strategy. However, the analysis of the collected promotional material demonstrated that information technology appeared in them, but (a) in lesser proportion compared to other elements and (b) its use was very different between the Queretaro and the Guadalajara campuses.

At the system level, the only promotional material found was an advertisement in a teenage magazine with an information technology orientation. The ad featured the slogan "Technology is easier to understand when you are educated with it." At the Queretaro campus, the only mention of information technology was found in the brochures that described each undergraduate program and only briefly mentioned in relation to the facilities available to all students. In contrast, the Guadalajara campus developed a series of three booklets that were more sophisticated in their content and presentation and were entitled "Así aprendemos en el Tec" (This is how we learn at the Tec). In particular, the third volume in the series (which is 45 pages long) provided a very complete description of the educational model, among other things, included information on the "impact of information and communication technologies in education" (Tecnológico de Monterrey, 2006d, p. 7) and also made clear that "the Educational Model utilizes a technology platform through which you [students] are able to asynchronously interact with peers and faculty while easily organizing homework and learning activities" (p. 9). The latter was the only documented evidence found where learning management systems as a service were being promoted and identified with the institution's educational model.

Slaughter and Rhoades (2004) also argue that in the academic capitalist knowledge/learning regime higher education institutions apply managerial models in vogue in the business industry. Therefore, universities and colleges engage in business-like arrangements like outsourcing information technology infrastructure and services. In the interviews conducted at the Tecnológico de Monterrey, it was evident that this institution resorted first to the outsourcing approach for its learning management systems and only later developed an in-house application. It was also clear that the outsourced service consisted only of software product licensing; there was no technological infrastructure, hosting services, content production, instructional design services, or pedagogical support involved in the outsourcing agreement. A top level administrator at the system level asserted that the Tecnológico was "licensing only the learning management software" from Blackboard.

In addition to outsourcing learning management systems, the Tecnológico simultaneously embarked upon development and implementation of its own learning management system called "WebTec." In spite of having two distinct learning management systems in place, one a commercially available product and the other an in-house development, there existed a remarkable difference in their utilization within their education model. In the spring semester of 2005, there were 13,098 class sections using Blackboard versus 2,406 class sections using WebTec. This means that 84.5% of the class sections were Blackboard based and only 15.5% were WebTec based. Figures for the in-house learning management system are slightly better when comparing the number of students per section who had access to a redesigned course: 81.7% (83,183) of the students per class section had access to a course on Blackboard and 18.3% (18,666) of the students per class section had access to a course on WebTec (Tecnológico de Monterrey, n.d.a). Nevertheless, the utilization of the in-house learning management system does not reach even 20%. The evident disparity in utilization certainly provokes questions about the choice of information technology since its massive utilization is of utmost importance to the educational model.

Participants were asked two questions: (1) What were the reasons for having two learning management systems in place?; and (2) What were the factors which influenced choosing one system over the other or utilizing both?

Participants in the key-groups had different perspectives. Mid-level academic administrators at both campuses had a consensual opinion about the purpose of having two learning management systems in place: they agreed that it was to offer choices and to look for the best one. They also agreed that WebTec is best suited for the educational model. When asked about the choice they made in their rectory zones, they provided different rationales. An academic administrator from the central zone (Querétaro campus) indicated that their decision for using Blackboard was based on the robust qualities of the software product. In contrast, the academic administrator from the western zone (Guadalajara campus) indicated that their decision was based on the features of WebTec which addressed the needs of the educational model; therefore, this learning management system was greatly promoted at all the campuses in that zone.

The group of interviewees from the Academic Development Department at the Queretaro campus agreed that the Tecnológico wanted two learning management systems that provided faculty members with options to explore and analyze the benefits and drawbacks of each. However, one of the respondents further elaborated in a contradictory statement:

> I think it has to do with possibilities, not with absolute imposition, but with possibilities so the professor can choose one or the other depending on which one

> he or she feels more comfortable with…. I believe that internally there are these two platforms also in the constant search for someone to support them. I mean it also has to do with the interests that all the [class] groups there get supported, with having enough capacity, with being able to provide it to you. Then, I think it has a lot to do with that. The VITI [Vice-rectory for Information Technology and Innovation] for example, have not asked us, neither the faculty, nor the administrators, but they are in the search of better possibilities, that the [computer] network would not go down, making sure that they are giving you that possibility, that works…. Therefore, it has a little to do with that, with the safest technical possibility that can be given to the professor.

Mixed ideas about the choice of a learning management system were evident in this group of interviewees from the Queretaro campus. Another respondent commented "In this campus, we only have Blackboard right now and it was decided because changing the signal from one [platform] to two was going to cause a lot of confusion. Therefore, we restricted ourselves to introduce the one that could be of better aid to faculty work."

At the Guadalajara campus, two participants from the Academic Development Department commented that having two learning management systems was in order to have a variety, so professors could choose the one they like the best and the organization could evaluate which one works better for the needs of each area. They both emphasized the idea of not being tied to only one. A third interviewee mentioned that the reason for having two learning management systems was evidently practical since the organization needs to outsource one while WebTec becomes robust enough to support its massive use. According to the three respondents, WebTec is being used at the campuses in the western zone because it meets the needs of the educational model and of the faculty members.

Faculty members interviewed at the Queretaro campus declared they were aware of the existence of WebTec, but had never used it. However, they were very familiar with

Learning Space and Blackboard. They were unaware of the reasons why there were two learning management systems in place at the system level. One of the department heads supposed that WebTec was developed specifically for the needs of the institution and commented "I really do not know why WebTec was developed, but I consider it was a way to find a more appropriate environment for the people at the Monterrey Tec, to make something more exclusive."

These faculty members were not aware of the reasons why their campus chose to utilize Blackboard when they had to transfer their already redesigned courses from Learning Space and continue working in the redesign of other courses. Nevertheless, they held firm in the idea that the development of WebTec is not as advanced as Blackboard. One of them expressed:

> I felt like WebTec was like a backup, so in the long run we could all have our own platform, in the Tec itself, where the research, updating, and modernization of the platform were done inside and we would not always be subject to an external company from which we would be buying or leasing the utilization of the platform.

Another of the interviewees argued:

> I think that WebTec is not yet completely consolidated, I mean, they do not trust 100% in WebTec yet and they are not very convinced that it is much better that Blackboard. Then, it is like being tested in some campuses, but they do not dare to generalize it to the whole system.

In contrast to the Queretaro campus, the department heads and fulltime professors at the Guadalajara campus had experience with Learning Space, Blackboard and WebTec and were more aware of the features in each of them. They described WebTec as a learning management system of their own and declared that it was being developed with the Tecnológico's educational model in mind; therefore, WebTec was seen as a more appropriate tool for the needs of the organization. Nevertheless, they thought that the purpose of having two learning management systems was for diversification; some professors were more convinced to use one and some to use the other. “To compare them and see the differences,” remarked one of the department heads, “I have always thought, I have made evident that [WebTec] has the advantage that is a platform developed by people at the Tec and that implies it is going to be something under continual improvement and above all adapted to our needs.”

One of the faculty members was convinced that the choice of a learning management system should depend more on aspects related to the construction of knowledge and less on academic administration processes that facilitate the supervision of administrative authorities. The professor remarked “[The choice] is more an epistemic subject than an administration subject and we did it backwards in the past… we have not spent enough time in the analysis. We have neither spent the time nor has it been of importance to us.”

A different point of view, a more rational-political perspective was expressed by top level administrators at the system and campus level. For example, a top level academic administrator from the Guadalajara campus recalled that the rectory of the western zone had an early and active involvement incorporating learning management systems into the curriculum. They tried WebCT when it was still an academic project at the University of British Columbia. When the first decision was made, the system chose to use Lotus Notes’ Learning Space across the board because they could provide support for the massive use of its software product. When Lotus Notes lost interest in the educational sector and announced that they would no longer support Learning Space, the university began to develop its own learning management system (WebTec) and also looked for an external software product available on the market. The interviewee remarked that "it was not something deliberate to have two, it rather went evolving."

The same rational-political perspective in the decision making of a learning management system was also expressed by a top level administrator at the system level. Blackboard was recognized as a "generic" learning management system and WebTec was designed with the educational model in mind. When asked about the purpose of having two learning management systems, the interviewee responded "Because we do not know if Blackboard [will do] like Learning Space, who went out of the academic world and left us hanging from the brush… therefore, we had to make a change in technology before we had considered it."

According to the respondent, after they switched to Blackboard, it took the institution almost a year to stabilize the operation of Blackboard since their learning management system was not originally designed to support thousands of users concurrently accessing one central server. The company kept on working on the software architecture in conjunction with the Tecnológico to make it operational and efficient. The respondent underscored the difference in resources available to a company like Blackboard versus the Tecnológico's resources for developing and supporting its in-house product. "WebTec does not have the discipline of programming that Blackboard has since there are 200 engineers at Blackboard developing it and we have a small team of 7 to 10 people." Therefore, the Tecnológico has not been able to make WebTec robust enough to support its massive use. The IT staff at the institution has been able to stabilize the operation of WebTec for the current number of users, but has not been able to upgrade it. In addition, the operation of WebTec requires more human resources than the operation of Blackboard.

Knowing the growth of Blackboard as a company and the expansion of its clientele worldwide, the respondent indicated that the Tecnológico “began to search other [IT] platforms which are commonly recognized as open-source like Sakai [or] Moodle; just in case we have to cancel Blackboard, we will go with another one.”

A second top level administrator at the system level also recalled that the decision to have two learning management systems in place was not intentional. Five or six years before the 2005 mission statement, the Virtual University of the Tecnológico de Monterrey and some campuses in the western zone rectory were already using different content management systems. However, it became impossible to provide appropriate technical support to such a variety of software products and it was decided to limit the choices in order to provide adequate service to professors and students. Learning Space was primarily chosen based on the technological support they could provide to the thousands of courses to be managed in the software system and the thousands of concurrent users accessing those courses. While the information technology infrastructure and processes were being centralized at the Tecnológico, Lotus Notes decided to end its development and support of their educational applications. At that point, Blackboard and WebTec appeared on the scene. With regard to the origin of WebTec, the respondent commented “The *creatives,* who also have gained a place in the space, the visible creatives started to work in a platform [WebTec].” The WebTec initiative grew stronger due to the fact that the system was trying to avoid future vendor lock-in and WebTec included features that the other two learning management systems did not provide. According to the interviewee, WebTec was seen as an internal possibility to guarantee continuity of the implementation of the educational model:

> [WebTec] started to solve the problems of virtuality, the management of distance interaction, especially in terms of the academic administration of this distance process…Because the tests that were performed created great expectation, it was said: Well, let us uphold this project because the importance of this project -which is a project being developed at home- was the possibility to avoid these type of changes [of vendors’ interests].

The respondent added that WebTec started to include more of the features the educational model required for on-campus, face-to-face courses, but its utilization was kept limited because “[WebTec] is not yet a robust platform; then it is limited to only one zone in the country…. and to a project which is a computer project at the level of various campuses who accepted to work on that.”

A top level administrator at the Queretaro campus provided a more political perspective. The interviewee argued that: “I have never had an invitation to a meeting to know the differences between them or to have the opportunity to choose, or to know what would be the benefits of one over the other” and further remarked that the decision for the choice had been at the rector and vice-rector’s level, not at the campus level. “One rectory zone decided to go one way and the other another way … I don’t know what is the point for having two, or the advantage. I believe it is a disadvantage at a certain point because it is not possible to exchange between the ones who are in one platform and those in the other.”

The respondent further elaborated that the choice has little or nothing to do with considering learning management systems as a strategic resource. “If [the educational model] is on a [IT] platform or is not on a platform, if it is Blackboard or Lotus Notes, or Webtec, or any other thing, I believe that is not fundamental, but the fundamental has been the change in our behavior as professors, the change in students’ behavior.”

The emergence of a political reason in the discourse of top level administrators about the choice of information technology is congruent with Thomas’ power process perspective of technology (1994) which analyzes the motives of those engaged in the choice of technology and proposes that technological change can be triggered by internal political action.

In the interviews, the participants provided no clear evidence that information technology was being regarded as a strategic resource to create intellectual capital. Nor was there found a clear recognition of the WebTec learning management system as part of the intellectual capital the institution has created. Furthermore, the comments made by a top level academic administrator at the system level discourage any notion of the latter. In the case of WebTec, the interviewee remarked that its development has continued over time, but it has been an isolated effort since it has not had a large amount of resources devoted to it compared to the resources available at large software companies. Its utilization in the educational model has been limited to a small number of campuses. Nevertheless, the development team has continued adding more features to WebTec which conform to the educational model and to the needs of the faculty members who use it, “in spite of the voices of those who question its payoff.”

Organizational Structuration Around Information Technology and Instructional Production

In order to analyze how the Tecnológico de Monterrey organized itself around the extensive use of information technology in the teaching and learning process, Orlikowski's (1992) structurational model of technology was used as a frame of reference to construct a sound description of the organizational changes at the Tecnológico.

Orlikowski's model comprises three interrelated components that recursively affect the condition of each other. These elements are: (a) the information technology that mediates academic work in the teaching and learning process, (b) the individuals in the organization who design, use, or decide about the information technology, and (c) the institutional properties. The type of effect that these three elements exert in their relationships are regarded by Orlikowski as: (a) information technology as a product of human action, (b) information technology as a medium of human action, (c) institutional conditions of interaction with information technology, and (d) institutional consequences of interaction with information technology.

Information technology is a complex concept. For Orlikowski (1992), information technology conflates the physical artifact itself in addition to the working practices of human agents and their working context for the design, use, and decision making about the physical artifact. The physical artifact by itself is an inert object. It is only through human action and the context in which that human action takes place that effect information technology. In their interaction with technology, human activity is mediated by the characteristics of the information technology.

Orlikowski (1992) argues that the institutional conditions and consequences in her structurational model of technology are constituted by Giddens' (1984) structures of signification, domination, and legitimation. These structures make up the overarching institutional social context that affects (i.e. institutional conditions) human agents and is affected (i.e. institutional consequences) by the human agents in the organization. In reality, institutional conditions and institutional consequences are not binary concepts but derive from the selfsame concept of institutional properties. The latter is divided into those two instances for analytical purposes due to the dualistic nature of the relationship between any two given elements in the structurational model of technology and to the relationships' continuum among those elements, through time and space.

According to Giddens (1984), communication among individuals in an organization is mediated by their interpretive schemes which represent organizational structures of signification. Structures of domination are constituted by the set of organizational rules and the authoritative and allocative resources which mediate human capacity for action. The norms and conventions governing an individual's appropriate working behavior constitute the organization's structures of legitimation.

During the analysis of the information gathered, there were several structures and social practices that could be identified as a result of the development and implementation of the educational model and the incorporation of learning management systems into the teaching and learning process at the Tecnológico de Monterrey. For the sake of this study, a considerable effort was made in distinguishing the organizational structures and social practices that pertain solely to the utilization of learning management systems in the educational model and, thus, to the structurational model of technology. After presenting the organizational structures found, they will later be analyzed from the perspective of the theory of academic capitalism in order to identify their relationship, if any, to an academic capitalist knowledge/learning regime.

Institutional Conditions of Interaction with Technology

Organizational structures influence the ways in which people interact with technology. These structures act upon the different actors in the organization and shape the way they understand and use technology in their recurrent practice. The structures of signification, domination and legitimation set in place by the Tecnológico de Monterrey to support their educational model and the way these structures conditioned academic work were analyzed in this study.

Structures of Signification. The Tecnológico de Monterrey reviews its mission every 10 years. This revision includes a consultation process among all sectors of the Tecnológico's community. In the revision process of 1995, the institution identified four challenges in which the university system could play a significant role in México: (a) the creation of more jobs, (b) international competitiveness, (c) democratization, and (d) the improvement of education. In order to fulfill its mission for the 1995-2005 period, the Tecnológico established the reengineering of the teaching and learning process as its first and most important strategy. The teaching and learning process was envisioned by the Tecnológico as one focused on student-centered learning and supported by state-of-the-art information technology (Tecnológico de Monterrey, 1998a).

To convey the need for a new educational model and institutional change, the Tecnológico considered the challenges of the new times: globalization and international competitiveness, the emergence of the information society, and the demands of the business sector (Tecnológico de Monterrey, 1998c).

The Tecnológico's Educational Model conflated a student-centered didactic methodology and the use of information technology as an essential support for the didactic processes. For the university system, their educational model represented a change that "transforms the teaching job in many aspects and exceeds the old paradigm of only just the delivery of knowledge" (Martín Pérez, 2002, p. 13) and, hence, it required the Tecnológico faculty members to redesign their own teaching practice (Tecnológico de Monterrey, 1999c).

The Tecnológico's 2005 mission statement and its educational model provided a shared vision and thus, enabled shared meanings to all members of the organization; therefore, it constituted the pivotal structure of signification for the incorporation and use of information technology in the teaching and learning process.

Structures of Domination. From the data gathered at the interviews and the documents collected, several structures of domination were identified as conditioning the use of learning management systems in the educational model. At the system level, the Tecnológico created two preeminent organizational entities: the Vice-rectory for Technology Innovation and Internationalization, and the Department for Educational Research and Development. These two entities in turn brought other structures of domination into existence.

The Tecnológico's Vice-rectory for Academic Affairs conducted a systematic consultation process within its community and conducted research on methods of teaching and learning to establish the bases for the Tecnológico's Educational Model. Then, in 1997, the Vice-rectory created the Department for Educational Research and Development to further develop and support the re-engineering of the teaching and learning process (Tecnológico de Monterrey, n.d.b). Among this department's several functions, those significantly more related to the use of information technology in the educational model were:

> To develop schemes for the didactic use of information technologies that help the professor generate learning spaces and activities.
>
> To create, publish, and manage the databases of registered and updated courses developed by the professors and approved as transferable. (Martín Pérez, 2002, p. 164)

Of utmost importance, the Department for Educational Research and Development developed and implemented the Program for the Development of Teaching Skills. This required program trains all faculty members in the process of converting traditionally designed courses into redesigned courses that incorporate the educational model; additional training is provided for faculty members to adopt and teach an already redesigned course. The design and content of the training program served to transform the teaching practice and change academic work. Considering these two factors, the training program in the educational model constituted yet another organizational structure of domination.

Other structures of domination relating to the redesigning methodology and involving authoritative resources were encountered. For example, several individuals in the organization, some from the Department for Educational Research and Development and some from the regional rectories, formed a group who had the authority to either approve or reject a redesigned course as fully complete. Once a course was approved at the system level, it was listed in a catalog of redesigned courses that could be transferred to any campus in the university system. This structural arrangement not only was a structure of domination but also constituted a new network of actors who, along with the redesigning professor, were involved in the revision phase of the production process of a redesigned course. Involved in this network were staff members from the redesign support centers (which will be further discussed later), academic administrators at each campus, the director for academic affairs in each rectory zone, in addition to academic administrators at the Vice-rectory for Academic Affairs.

The second organizational entity of notable significance created at the system level was the Vice-rectory for Technology Innovation and Internationalization. This Vice-rectory was created in 1997 in order to support the reengineering strategy (Tecnológico de Monterrey, 1998d). The priority of this Vice-rectory was to provide support for implementing learning management systems in the educational model. The Vice-rectory is another example of an organizational structure of domination since it developed the rules and had the authoritative and allocative resources to control and regulate the information technology required for the educational model. Among the Vice-rectory's main functions were:

> (a) To search for the best technology options available in the market;
> (b) To provide training to professors for the efficient use of the technology options in supporting the implementation of the educational model;
> (c) To develop tools more appropriate to the needs of the professors;

> (d) To create the required technology infrastructure: [network] connections, [computer] networks, high performance [network] servers, and other elements. (Martín Pérez, 2002, pp. 165-166)

Through this Vice-rectory, the outsourcing arrangement of learning management systems was given formal status as another structure of domination. At first, the outsourced technology was Lotus Notes' Learning Space; then, after the business company decided to leave the educational market, the next learning management system was outsourced from Blackboard.

In parallel, the Tecnológico decided to develop its own, in-house learning management system called WebTec. WebTec was not developed by the Vice-rectory for Technology Innovation and Internationalization but by a group of academics and IT staff from the Center for the Integration of Solutions at one of the campuses. WebTec was originally designed as an application for online education; however, due to the Tecnológico's strategic decision, it was later modified by the same team of developers to accommodate the educational model.

The software resources offered by both learning management systems as well as the features embedded in both WebTec and Blackboard conditioned the academic work of faculty members and students and their interaction with these technologies; therefore, they both constitute structures of domination.

The Tecnológico had to develop the information and communication technology infrastructure demanded by the massive and intensive use of learning management systems at the various campuses. Student and faculty computing services provided locally at each campus were just not enough. Working with redesigned courses that were uploaded on learning management systems greatly increased the requirement for remote access to the local area networks and to Internet. Faculty members were provided with laptops or desktop computers connected to the local area network and newly admitted students were strongly encouraged to have a computer at home. A top level administrator at the Querétaro campus commented that:

> Having the [IT] platform forces the student to have a laptop or a PC at home, otherwise, s/he is out of the game… perhaps 15 years ago, the computer lab was enough for them to do their homework… but now I think there is not a single student who does not need a computer to keep up-to-date in his/her classes, to do research, homework, to know what s/he has to turn in next class, to be in touch with his/her classmates and carry out collaborative work.

At the implementation stage of the educational model, the Tecnológico "certified" computer vendors whose products met the computing and communicating capacities required and offered competitive prices to students. The Tecnológico did not engage in the commercialization of computers, but promoted their acquisition by informally certifying vendors, allowed them to set up stands on campus to market their computing equipment, and even became a guarantor to the student regarding the vendor. The latter was accomplished during the first two years of the implementation phase of the educational model. A mid-level administrator at the Guadalajara campus recalled that:

> At the beginning, when this started, we even were guarantors for the students, guarantors in order for the cost to go down a little and we let [vendors] to set selling points…. What we do at the start of a semester is to set up stands for companies who offer computing equipment; we try to find the ones with the best prices in the market.

With the promotion efforts, the respondent ventured to say that around 80% of the students have their own laptop at the present time.

At the system level and at the various campuses, a number of software applications were designed by academic administrators and developed by IT staff to aid in the redesigning process. These applications are examples of allocative resources provided to faculty members in their process of organizing and uploading their courses on learning management systems. These software applications are considered to be structures of domination since the design rules embedded in these resources oriented and bound the work of faculty members to the redesigning process.

By the same token, the redesigned courses approved as transferable can also be considered structures of domination from the perspective of the professors who adopted them and conformed their teaching practice accordingly to comply with the adopted course. These courses were referred to as “Five Star,” “Model,” “IMET” (Introduction to the Tecnológico’s Educational Model), “META” (Advanced MET), and “ANS” (Approved at the System Level).

As for the software applications, there were easy step-by-step instructions and templates for the design of a course that at the same time facilitated but also confined the redesigning work of faculty members. For example, the software tool called “e-Academic Assistant” was developed to provide a working interactive environment to direct faculty member decisions in the redesigning process. The software applications included the mandatory structure and elements of a redesigned course, the fundamental didactic elements of the educational model, and options for a particular didactic technique. It also provided access to all the electronic resources available to enhance a course. The content generated in the e-Academic Assistant is independent of the particular learning management system where the redesigned course was uploaded.

In reference to the e-Academic Assistant, a member of the information technology staff explained: "It is a design environment using plain text and also has graphic design templates to keep professors away from designing them and to standardize a little the appearance of the courses." The e-Academic Assistant was jointly designed and developed in 2005 by the Department for Educational Research and Development and the WebTec developers with the objective of "making more time and effort efficient and of more quality the faculty members' design of the courses" (Tecnológico de Monterrey, 2006e, p. 17).

During the analysis of the interviews, intellectual property aspects were explored from the perspective of constituting instances of organizational structures of domination that condition the production of redesigned courses and treat them as institutional resources. The data gathered by the interviews showed that an intellectual property policy was set in place and enforced in which two things were clearly distinguished: the explicit recognition of the fact that a professor had produced a redesigned course and the institution's exclusive legal right to reproduce, publish, sell, or distribute the redesigned course.

Academic administrators and faculty members alike agreed that this policy was implemented to establish and distinguish the formal acknowledgement of a professor's authorship as well as the Tecnológico's copyrights over the redesigned courses. A mid-level academic administrator at one of the campuses mentioned that "it is very clear that the professor has the authorship, but the Tec has the [property] rights." Another mid-level academic administrator recalled that "since the beginning, professors were asked to sign an agreement for the cession of [property] rights to the Tec and keeping their rights for authorship." Another interviewee commented, "All redesigned courses on a platform were the Tec's property. Back then, we all signed a letter stating that this was Tec's property, the product you generated."

In effect, the internal documents gathered showed that fulltime employees signed an agreement to establish both the authorship and the copyrights. Also, those two aspects were included in the working contract for part-time faculty. In both documents, it is stated that the Tecnológico holds "the copyrights of the employee's partial or complete working products" and that it also holds "exclusive rights to use, reproduce, modify, transfer or commercialize these work products." It is also stated that employee authorship is granted and must be recognized "by the explicit mention of their names in the registration of the work products in which they had participated."

Redesigned courses were registered as copyrighted material with the Mexican National Institute for Intellectual Property and the aforementioned authorship's acknowledgement and copyrights were stated at the time of registration as shown in the internal document "Agreement for the registration of a product of work."

The registration of digitized educational material in the format of a redesigned course on learning management systems was an unfamiliar procedure in Mexico as a top level academic administrator mentioned. The legal procedures did not contemplate digitized educational materials; rather, they were focused on books, written documents, and videos. The interviewee further expressed that:

> The strategy to register courses was not the right one; what we should have registered were *learning activities* [italics added]; in fact, we should not even have registered the courses because much of the [courses] content was based on textbooks, or ideas, or content already developed by other faculty members from other [academic] institutions.
>
> The only thing that was registered was an index, not the whole course…. What it was really possible to register were learning activities and we were able to realize that, but by the time we detected that, we already had been working in the educational model for six years.

For this respondent, the rationale for registering redesigned courses as copyrighted material and for implementing the policy on intellectual property was to prevent employees from "registering a [redesigned] course as their own and then they [would] ask the organization [for] a royalty for using it." Another top level administrator expressed that the reason was "to avoid that [a course] could end in the hands of a third party and then they could use it and could play a legal chicanery against the Tec, hence, it was in fact to protect [the course] not so much to commercialize it." A mid-level academic administrator at one of the campuses added, "if I [as a faculty member] leave the Tec, I cannot commercialize it, I cannot go to another place to sell my course…. It is not that they [the professors] will get rich and will make us rich, but it is rather for the course not to be distorted."

A member of the information technology staff commented that by holding the property rights of redesigned courses, the Tecnológico is able to update them and keep using them even when the author or authors are no longer with the institution. This point of view was shared by faculty members. As an example, one of them mentioned:

> In a way, it is to facilitate that any professor at the Tec can use any redesigned course. Because if each professor is the owner of his or her course, then each time that other professor wants to adopt [that course], then s/he has to pay copyrights to the professor who redesigned it and that would be say a restriction, it would be a rock in the road.

In regard to the intellectual property aspects concerning both the Blackboard and WebTec learning management systems, two mid-level administrators at the Vice-rectory for Information Innovation and Internationalization asserted that the outsourcing arrangement with Blackboard restricts only the licensing of the learning management system software and they only have copyrights over their software and not over the redesigned courses that are uploaded and managed in their software product. One of the interviewees commented, “No, none [copyrights] over what is developed on Blackboard, no. They have [property] rights over their [IT] platform, over the [programming] code of the platform itself, but not over the [redesigned] courses, no.”

Mid-level administrators at this Vice-rectory as well as top level academic administrators and the developer’s team leader of WebTec asserted that the WebTec copyrights were protected. The WebTec trademark was registered before the Mexican National Institute for Intellectual Property and with the Ministry of Education’s Copyright Office. On one hand, the secrecy of the software design and development is protected. On the other hand, the copyrights belong to the Tecnológico de Monterrey, as one of the interviewees further explained: “It is also like a double protection. One, against the possibility of plagiarism or information leak happening, and another to make internally clear to all the development team who is the owner of the rights.”

At the campus level, analysis of the information gathered also found that other organizational structures of domination were created. For example, redesign support centers were created in many campuses to coordinate training in the educational model and provide pedagogical and technological assistance to faculty members in their redesigning process. Each campus organized and staffed these centers differently with managed professionals, graduate and undergraduate students, and faculty members. One of the interviewees mentioned that "there were entities, the redesign support centers, which provided precisely the support to faculty members, giving them additional training on technology issues." A top level administrator at the Querétaro campus recalled:

> We had two changes: one was the creation of the Department for Academic Development and one of its elements is the [IT] platform; but there are also all the training courses, the academic conferences. It is much broader [the scope] than only the platform…. Organizationally, we did not grow with a very strong structure in that area. There was a specialist in the use of the platform, another in instructional design which indeed is different to design your class on a platform than design it on a sheet of paper…. They were faculty members from our campus…. Later, we had a massive training on the use of the platform. This was done by undergraduate students for faculty members and later by faculty members to other faculty members. We had a lot of peer learning.

The pedagogical support and the technological support were organized differently in each campus. "There was never an institutional definition; the decision was rather left to each campus" was the comment of one of the interviewees. Many of the redesigned support centers were part of the departments for Academic Development; some of them provided only the pedagogical support and the Information Technology Services Department provided the technological support. Some campuses decided to staff their redesign support centers with managed professionals to provide both the pedagogical fundamentals and the technological services. However, the educational model demanded faculty members highly trained in a particular didactic technique to provide pedagogical assistance in the instructional design for that particular didactic technique.

The organization and the infrastructure provided by these support centers were also different at each campus. In some campuses, an assistant for each service (pedagogical and technological) was assigned to the professor and they would hold their meetings at the professor's office. In other campuses, they had a redesigning area equipped with computers, tables, and blackboards. Faculty members attended these facilities to request help; in addition, they could informally share their experiences with peers and ask them for advice. Regarding the training program in the educational model, each faculty member developed a redesigned course on his/her own with the support of pedagogical and technological assistants while in the program.

The technological assistant's job at the redesign support center was very basic, as an information technology staff member recalled. They assisted faculty members by showing them how to do basic tasks, such as uploading text to their course, setting up hyperlinks, uploading images and various objects, generating quizzes, opening files, and so on.

A faculty member at the Querétaro campus underscored that academic content development for a redesigned course depended entirely on the professor's decision. This was revised and approved by the professor's academic department, but there was another department which "audited" the redesigned courses. The faculty member expressed that "any course redesigned by a professor has to be revised somehow by this department to get their approval from the platform's point of view." Professors produced their course following a set of pedagogical as well as technological criteria that were revised by that department, as another faculty member remarked:

> There is a didactic advisor who is supposed to coordinate that all courses being uploaded to a platform have the adequate didactic and pedagogical structure in accordance to certain requirements; that they have objectives, educational intentions; that they have a perfectly delimited activities' section, well organized, where the student clearly knows what activities to do in order for a topic to be covered appropriately and be covered entirely.

At the Guadalajara campus, the redesign support center was created at the beginning of the educational model implementation. A mid-level academic administrator recalled that "in that redesign support center, there were pedagogy specialists, there were graphic designers, there were computer technicians for the management of the [IT] platforms." Most of the pedagogy specialists were fulltime faculty members who were trained and "certified" in one of the didactic techniques defined in the educational model. They acted like mentors for a group of professors in the pedagogy fundamentals of the educational model and the incorporation of a particular didactic technique.

Some faculty members worked together as a team to redesign a single course they both were teaching. Each team member brought in their own particular expertise and the redesigned course was enriched as a result. This arrangement was especially beneficial for part-time faculty who teamed up with a fulltime faculty member since the latter was very well versed in the use of learning management systems and the educational model and the part-time professor did not have much time for redesigning. In reference to this case, a faculty member at the Guadalajara campus recalled that "there was a part-time professor who had less time but lots of practical knowledge [in the academic discipline] together with a fulltime professor who had more time and more knowledge about the platform; therefore, the project was enhanced."

The Guadalajara campus and other campuses in the western rectory zone later developed a new form for the production of a redesigned course; they formed a "production cell." A top level administrator described the concept: "In that production cell, there were experts in writing, communication, web pages, [graphics] design, the content expert, the expert in the didactic technique; and, there were some outstanding courses. Then, it is not a small thing what we have there."

One of the interviewees underscored, "We had to create a working link between intra-campus teams in order to produce courses." The different individuals who worked at the redesign support centers or the production cells constituted not only a new network of actors in the production of a redesigned course, but also a structure of domination since their interaction with a professor and the technology influenced the professor's academic work.

A production cell was dedicated solely to the production of high quality redesigned courses called META (Advanced Educational Model). One of the faculty members commented, "in the META model courses,… a group of experts where an instructional designer, the designer from the technical point of view, and even the didactical [designer] could be involved and that, from my learning point of view, had the advantage that the document as a finished work was very rich because there were people for enhancing it. It was, let's say, formed very soundly from the content's point of view and well structured from the methodological point of view." One of the staff members from the redesign support center at the Guadalajara campus described how the production cell operated:

> The first step to produce the course was the generation of the content. The professor also played the role of content expert who was the one to provide the information for the course to us; in addition to the work of the professor, the work of the instructional designer was included who was a person [professor] trained in a particular didactic technique to be included in order for the course activities generated to have at least 30% of the didactic technique. Once we had the content created, then it was passed on to the editing area where writing and style were enhanced and digitized and, at the same time, a graphic design of the course was created including iconographic elements, colors, menu distribution, etc… once the multimedia interface was created, all the content was inserted. Once the final product was out, then it was linked to a technology platform, for example WebTec; all the resources created were put in WebTec and the course was delivered to the professor.

The Tecnológico's Western rectory zone established only three production cells, each one in a different campus. They only produced 36 META undergraduate courses which were intended to be highly appropriate for transferring. Academic department heads decided which courses would be developed as META courses and their decision was based on the appropriateness for applying a particular didactic technique on a particular subject area and the number of students who could be impacted by this type of redesigned course.

Other organizational changes at the campus level took place at the Information Technology Services and Administrative Services departments. Financial and human resources were deployed to support the use of learning management systems and thus these departments constituted structures of domination. The educational model implied a huge investment in infrastructure, staffing, and training; therefore, it became a budgetary priority in the minds of financial administrators. A mid-level academic administrator commented in this regard:

> I think that academic development as well as the information technology side change as a function of this [the educational model] and the administrative department as such does not change; it changes the way it works: what is first now, what is mission-critical that I have to attend. Then I start looking at my budget as a function of the development of my faculty, of their training, of the acquisition of resources, and the administrative department has a different perspective… [now] I first asked myself: the academe, what [information] technology is going to be used in the course that it is going to be taught and in addition, that it [the technology] is working appropriately for anyone to use it.

Information Technology Services departments accrued new functions and responsibilities and were reinforced with additional staff and resources. Before the implementation of the educational model, their main function was merely to provide basic computing services to students and specialized computing services to the administrative departments; afterwards, their functions became critical to the teaching and learning process. They had to provide a lot of support to faculty members and to the redesign support centers as well as to students who had to access the redesigned courses. They were also committed to adapt classrooms and different working areas for students and faculty members to be able to use information technology and have access to the learning management systems via Internet.

At the beginning of the implementation of the educational model, working with Learning Space demanded that each campus have a local network server and the required IT staff to operate it. As an interviewee remarked, “We were about 3 or 4 people who managed the platform because we were growing the number of courses exponentially, semester after semester.” The respondent further added:

> The operation was completely distributed, each campus had its own local administration with its own servers, its own administration team, its own free working scheme, and they only reported to the Vice-rectory some specific aspects they were asked for [in order] to gather statistics that were presented to the rectory of the system. That was it, but everything was decentralized.

Information technology services were aligned to the educational model and staff members were forced to change their service focus. A staff member at the Guadalajara campus expressed, “We in computing services had to look now at the educational model… our job is to facilitate [the use of technology] to the users.” The educational model impacted their mind-set about the utilization of instructional information technology in higher education. As an example, in the mid-level 90’s, there was no Internet dial-up access services commercially available in México. Therefore, each campus acquired the communications equipment required to provide the dial-up service called “Tec at home” at no charge to students and faculty. A mid-level administrator at the Guadalajara campus recalled, “Many years ago, we provided Internet [access] at home. There were no companies commercializing that service… with the educational model of '97-'98, we already offered dial-up services from home.”

The provision of incentives to faculty members was another structure of domination that each campus set in place. Different kinds of incentives were established in each campus; for example, the Queretaro campus offered a monetary incentive to part-time faculty members who fully completed a redesigned course as well as public recognition for having completed the training program in the educational model. Fulltime professors received a public recognition after successfully completing their training program, but no monetary incentive was given. An academic department head at Querétaro explained:

> Incentive exists only for part-time professors; a part-time professor who redesigns a course gets paid ... is given a monetary incentive for the redesign once it has been accepted. Fulltime faculty do not [receive a monetary incentive], because we consider that their job is to be in the academe, constantly improving their course, and we consider that the redesign of a course, uploading it to the platform, is nothing else but improving their course. Hence, we consider that is included in their salary.

Another academic department head at the same campus added: “What happens is that the fulltime professor can do this redesign within his/her normal working hours and the part-time professor has to set apart his/her free time or working time to do it, which it is not being paid.”

The fulltime faculty members interviewed at the Querétaro campus concurred with the opinion of the academic department heads, as one of them expressed: “I think it is part of our own duties as docents to incorporate the technological and didactical innovations that the institution is requiring for its educational model, that which is the Tecnologico’s Mission.”

In the case of course adoption, no monetary incentive at all was given either to the faculty member who adopted a course or to the author of the redesigned course being transferred.

At the Guadalajara campus, a fulltime faculty member’s teaching load was reduced during the duration of the training program and through completion of the redesigned course; s/he received monetary incentives for each redesigned course that was approved. In addition, fulltime faculty members received a salary increase after the completion of their training program in the educational model. Part-time faculty received a monetary incentive for each redesigned course that was approved and, in addition, their salary rank was upgraded. Both fulltime and part-time faculty also received public recognition after successfully completing their training program in the educational model. As in the case of Queretaro, no monetary incentive was given at the Guadalajara campus either to the professor who adopted a course or to the author of the transferred course.

As a note to situate the reader, fulltime faculty members at the Tecnológico receive a 12-month salary during the academic year. Most of the training in the educational model was done during the summers, but the process of redesigning a course required a professor to work on it during at least one academic semester.

Other structures of domination that had an impact in a fulltime faculty member's academic career at both campuses were the classification of faculty members and the sabbatical period attainment. Both were conditioned by the participation in and completion of either specific parts or the whole training program in the educational model. At the Tecnológico, fulltime faculty members are categorized in four different academic ranks (Tecnológico de Monterrey, 2000b) and each rank has monetary and other kind of incentives and features associated to it. Each rectory zone at the university system is able to make adjustments to the systems's general classification regulation without changing the core. According to a mid-level academic administrator at the Guadalajara campus, "The faculty's classification regulation was changed to include the Program for the Development of Teaching Skills as a classification requisite" and also "to obtain a sabbatical [period], but all that was related to the educational model." The internal documents collected at the Guadalajara and the Querétaro campuses showed clearly that, in fact, the participation in and completion of parts or the whole training program were a requisite for faculty to advance in their classification.

Structures of Legitimation. Faculty members' interactions with learning management systems within the educational model were found to be guided by the normative aspects of different organizational structures of legitimation. For example, the Tecnológico's Educational Model as a structure of legitimation included three main normative components which sanctioned an individual's actions and conduct: (a) the use of a particular pedagogy methodology, (b) the use of learning management systems, and (c) the redesign of faculty members' teaching practices.

With regard to the use of learning management systems, a top level academic administrator expressed:

> At the Tec, the [IT] platform was implemented under a strong signal of being indispensable, a "you must" and, like everything in life, when they see it as a kind of imposition, professors began to or were, some of them, a few, opposed to it. Some of them used it in order to fulfill the requisite: "for them [the authorities] to check out that I am using it, that my course is on a platform;" and there were some who were appealed by it and took great advantage of it.

The reengineering of the teaching and learning process was based on behavioral change of faculty members who were compelled to transit from a teaching-centered practice to a student-centered one. In order to achieve the aforementioned, all faculty members were expected to undergo training in the educational model and teach only redesigned courses. The central idea of the training program was the development of faculty members in order to achieve the educational change: "The development of faculty does not seek, *a priori*, to renounce to those educational traditions which are effective for certain goals, but rather to depart from the previous experience of the professor and enhance it with pertinent elements" (Martín Pérez, 2002, p. 150).

The Program for the Development of Teaching Skills is a project-oriented training program in the sense that, at the end of the program, the professor either has completed the redesign of a course or has adopted an already redesigned course. Once the training program has been successfully completed, the professor was "certified" in the educational model. Becoming a certified professor in the educational model was considered the appropriate conduct for faculty members and thus constituted a modality of a structure of legitimation. As expressed by a top level academic administrator: "…it was very well seen, almost indispensable in your career as professor that you got certified in the redesign and redesigning leads to the use of an [IT] platform."

With regard to the two options proposed in the training program, a mid-level academic administrator at the Guadalajara campus declared that "the criterion was that [the professor] must teach a redesigned course, either redesigned by him/her… or adopt one already redesigned and approved at the system level. They had both choices, but the course they were to teach had to be a redesigned course." However, fulltime faculty members were expected to redesign at least one of their courses.

An academic department head at the Guadalajara campus remarked that "it is not a mandatory requisite, but it is rather a goal. We are looking for all faculty members to teach redesigned courses precisely to take advantage of the amount of available resources." Another academic department head at the Querétaro campus added: "normally we asked them… it is not properly established in writing like a law, but we do expect every faculty member… to teach redesigned courses on a technology platform." Finally, a faculty member at the Querétaro campus commented that "there is a strong pressure for everybody to have redesigned courses but, up to what I can see, it is not a tacit requirement…. it has been left to the professor to decide if s/he redesigns his/her own course or searches among the redesigned courses to adopt one and from there on to start teaching the class already on a technology platform."

The process of adopting a redesigned course was seen more appropriate for part-time faculty members who did not have the time to undertake the redesigning of a course and for faculty members who already had redesigned a course. Martín Pérez (2002) points out that "in general, professors who adopt and adapt a course are those who work part-time at the Tec; these professors are trained in the fundamentals [of the educational model]" (p. 157).

The definition of a set of criteria that an appropriately redesigned course had to meet constituted another structure of legitimation. The set of criteria was considered to be too large and was causing faculty members to divert their attention from the educational model's ideology. A mid-level academic administrator recalled that "it was asked to meet a very large number of criteria so they can check them out and fulfill certain indicators; in that sense, we forgot that the designs were for the students and we ended up doing designs for the criteria." Another mid-level administrator added that "in the face of a scheme of indicators, the fulfillment of those indicators became more the objective itself rather than an instrument for quality."

Many of the faculty members interviewed at both campuses mentioned subsets of the redesigning criteria as the following compilation shows: (a) “There was a massive training in the management of the platform, in how the courses should be redesigned, in what was the basic structure of a redesign, what elements it should contain, how they should be conformed;” (b) “that they have objectives, educational intentions, that they have an activities section;” (c) “the duration of the class, the values and attitudes that should be included in the activities… the didactic technique;” (d) “the introduction, objectives, schedule of activities, exams, the materials, all those aspects of design and structure;” (e) even “the font of the characters.” A faculty member at the Querétaro campus added:

> Simple rules like the use of colors for example; I cannot use a blue color for a title or a folder… the blue color is for the links [hyperlinks]… besides, in a redesigned course, I have to fulfill a series of requirements: there has to be the objectives of the course and there has to be the intentions of the course, and there has to be the analytical program of the course, and there has to be a link to the Tec’s official program; there has to be a link to the electronic library; a series of requirements for a course to be approved at the system level.

Besides the establishment of the set of criteria for redesigning, several other regulatory processes were developed and represented more structures of legitimation. For example, the process of approving a redesigned course as transferable for adoption consisted of several phases and involved different actors at the campus, rectory, and system levels. The redesigned course had to be approved first by the redesign support center of the academic development department on each campus; it then passed to revision and approval of each rectory’s director of academic affairs; finally, it passed to the Vice-rectory for Academic Affairs.

The Vice-rectory for Internationalization and Technology Innovation developed various processes for the administration of the redesigned courses database. These processes included such tasks as petitions to upload a course to the database and update the catalog of transferable courses, make the courses available to the professors who adopted them, and so on. The Vice-rectory also issued a policy for handling copyrighted materials included in the content of a redesigned course. In this regard, a staff member in the redesign support center at the Guadalajara campus commented that “there were manuals where copyright [issues] were specified; what could be put in those courses, what could be considered as violating copyrights; for example, if there were a book and that book included a CD, we could not put all the materials in the CD without the author's authorization.”

The Tecnológico established that 80% of the class sections offered in any given campus should apply the educational model and thus, a redesigned course. The figure was based on the assumption that there would be some endogenous factors affecting the attainment of 100% of the class sections. As one top level administrator mentioned:

> We always thought that 15-20% was very difficult to achieve due to professors who were not willing to do it, part-time faculty and faculty members’ rotation; therefore, we always thought that there will be a percentage that was not going to be like that, but we basically achieved the goal of 80%.

The 80% goal became a benchmark and served as a standard by which campus performance was measured and judged and, hence, constituted a structure of legitimation. During an interview, a mid-level academic administrator made this observation: “How is a campus measured? One had an idea based on the amount of redesigned courses. Courses must be redesigned and approved in order to reach the benchmark. That has been recognized as one of the problems we had in the redesigning endeavor." Another mid-level academic administrator expressed that "each director for academic affairs organized his/her own way to do it [revision for approval]. I did revise each one of the courses, indeed. There were some cases where people only sampled and due to the pressure of the benchmark .. well, it caused the process to be fast-tracked."

Responses to the benchmarking structure of legitimation were different at the two campuses which were studied. At the Queretaro campus a top level administrator expressed that "there has never been a mandatory course of action, we manage ourselves with great leeway. This is why we did not do too well in reaching the goal, but we prefer the freedom over the benchmark." In contrast, a top level administrator at the Guadalajara campus asserted that "particularly in the western region, we worked in an eminently structured way. We were the region in the whole country which undisputedly worked better in that regard [achieving the goal] and we are picking up with that."

The structures of signification, domination and legitimation which conditioned the interaction of individuals with technology at the Tecnológico de Monterrey were analyzed in this sub-section from the perspective of institutional properties that act upon human agents. They will be analyzed next from a human agency perspective.

Institutional Consequences of Interaction with Technology

Users of technology have an active role in either perpetuating or in modifying the organizational status quo. Human agents act upon the existing structures of signification, domination, and legitimation by accepting them and thus reinforcing them or by opposing them and thus opening a threshold for their transformation.

In any organization, a change in technology or a change in the way people use technology may undermine and reshape organizational structures. In the case of the Tecnológico de Monterrey, it was found that a change in technology took place after the educational model was implemented. It was also found that with time some of the previously existing structures were modified as a result of faculty member's recurrent interaction with information technology in the educational model. Furthermore, new organizational structures were created as a consequence of that interaction. These findings are presented below.

Structures of Domination. According to Martínez Pérez (2002) and to some of the interviewees, the Vice-rectory for Internationalization and Technology Innovation became the Vice-rectory for Information Technology in 2001. The change was not only in the name, but most importantly in the functions and resources as will be discussed later on.

At about the same point in time, Lotus Notes' Learning Space abandoned the educational market and the Tecnológico switched their outsourcing vendor to Blackboard. The change in technology had a profound impact on the existing structure of domination constituted by learning management systems and the information and communication technologies. For example, the change in technology affected all campuses since it now required the software system to be centralized in network servers in only one location in contrast to Learning Space which was previously hosted in local network servers at each campus.

With the departure of Learning Space from the educational market and in addition to switching the outsourced vendor, the Tecnológico also decided to continue the development of WebTec from its original design as a software tool for online education to include the necessary features that would support the educational model and on-campus courses. The operation of WebTec needed to be hosted in one central server, a requirement similar to Blackboard.

In light of the change in technology, the Vice-rectory for Information Technology fully centralized the operation of both learning management systems by hosting them in central network servers managed by their own staff. A top level administrator remarked that Blackboard and WebTec were centralized applications and recalled, "Then, what happened? We brought here all the services that were provided by the campuses." A mid-level administrator at this Vice-rectory commented: "Everything is centralized. The operation of all the [IT] platforms is done here; that means for both [IT] platforms considered institutional which are Blackboard and WebTec and we started all that more or less around 2001."

The Vice-rectory for Information Technology also centralized the relationships between the Tecnológico and software and hardware providers by concentrating all acquisition applications and thus the Tecnológico's bargaining power with vendors. A top level administrator remarked that "In this part of licensing, we do have very good control… all acquisitions pass through this office, all of them…. We have a table of negotiations with Dell, HP, and IBM…. We strategically decided to license from

Microsoft, then the official suite for all our work is Microsoft, Power Point, Excel, etc. For database, it is only Oracle."

As an outcome of such negotiations, the Microsoft Office software application and other applications are provided to students at no charge. "The Microsoft Campus Agreement includes Office Professional 2003, Office Professional XP, Windows XP Upgrade Client, Front Page 2003, Visual Studio 2005; and the Norton agreement is for the Norton Antivirus 10 Corporate Edition" (J. Elorza, personal communication, April 19, 2007).

Due to the high demand for remote access to the local networks, the campuses could no longer provide reliable dial-up services. Therefore, the Vice-rectory for Information Technology requested this service from telephone companies and carried on a process to "certify" the quality and reliability of this service. A top level administrator stated:

> We had to certify carriers and we told our students: I recommend this carrier. Well, the student can do whatever he wants. I certify Telmex, Axtel and Alestra and we are working with them and sending them traffic; they have to provide very good services. Then they set up a lot of [services] for redundancy and other sort of technical things. We now must be Telmex's fifth [largest] user in the country.

In regard to the relationship with Blackboard, the respondent indicated that the Vice-rectory for Information Technology is their only point of contact and that they periodically attend events sponsored by Blackboard. The interviewee added: "We belong to a group of users in which each year we go to see what is new." A staff member of Information Technology Services at the Guadalajara campus underscored that:

> The people from the Vice-rectory for Information Technology, it is them who have direct contact with Blackboard. They are the ones who attend courses

> directly from Blackboard and, once they have the knowledge, they deliver it to the rectories and the campuses. We go to meetings with the people from the Vice-rectory where they show us the functionalities, the new tools, how things are done. That we do but we do not have direct contact with Blackboard.

Originally, the operation of WebTec was kept apart from the Vice-rectory for Information Technology. Due to the centralization of the operation of learning management systems and the massive use of WebTec, its operation was integrated into the Vice-rectory. A top level academic administrator stated that "WebTec was a platform not being supported by the Vice-rectory for Information Technology from the technical point of view. Now, finally, the Vice-rectory is responsible to provide maintenance for it." A staff member from the WebTec team underscored that "there is a completely technical area [at the Vice-rectory] with the expertise we need for centrally administering WebTec… and to support the massiveness of concurrent users and of [IT] platforms."

The centralization of the operation of learning management systems at the Vice-rectory for Information Technology had a significant impact at the campus level, as a top level administrator at the Queretaro campus explained. "It was an important structural change in which we stopped managing many things on campus and at the [regional] rectory as well. It is being managed centrally which has its pros and its cons because when it fails, it fails for everybody and when it works, it works for everybody."

At the Guadalajara campus, an account of the impact in the change of technology was provided by an IT staff member:

> Before the centralization we had here in Guadalajara,… each campus had its own [IT] platform which was Learning Space. When everything is centralized at the system level, our support is basically for course space generation, for technical problems that may be encountered in their use, for resolving locally [any technical problem] to students and professors, aiding the Vice-rectory in the operation, that

> the courses are running, that is our job, and provide all the local network infrastructure…. We have technical support kiosks close to the classroom buildings to help quickly resolve any connectivity problems, printing problems, problems when trying to access the platform…. We have less work now. We do not have to manage [learning management systems] servers anymore. We do not have to manage databases. We do not have to manage any infrastructure related to [learning management systems] servers.

The aforementioned was not the only impact the centralization had at the campus level. The Information Technology staff at each campus was downsized and, since the local operation switched from highly complex to a parochial one, highly qualified staff was substituted with technicians. A staff member in the Vice-rectory for Information Technology underscored that these technicians "do not do much, they only keep the computers running," and asserted, "we do it all." A staff member from Information Services at the Guadalajara campus recalled that:

> When we started working with platforms, we were four people in the department exclusively for the technology platforms and we provided support for approximately 200 group sections, more or less… now, currently, after 8 years, there is a person in charge only of the coordination of platforms (let us call it that way); one person and I as "support" (let us call it this way) and we provide support to around 1,100 group sections.

The Vice-rectory for Information Technology set up a centralized "Help Desk" to resolve any technical problems that campuses may have with any learning management system. To the eyes of a campus user, the Help Desk was like a single service window for "WebTec and Blackboard, where all the 'tickets' are resolved, the more common [problems]." The latter was mentioned by a top level administrator at the Vice-rectory.

After seven years of implementation of the educational change and as a consequence of the capacity built and experience gained in the interaction with information technology in the educational model, the once largely staffed redesign support centers began to disappear at each campus. A top level administrator at the Guadalajara campus explained: “It was an [organizational] change at the beginning when we had to do a massive conversion in all the Tec; but, now it seems that we are back to where we were.” A mid-level academic administrator at the same campus added that “There was a point in time in which some rectories decided to dismantle the redesign support centers and pass all the workload on to the [academic] department heads…. There still are people behind them who provide the support [to faculty], but a redesign support center no longer exists formally.”

The majority of the pedagogy assistants in the support centers were fulltime faculty members who were certified in the educational model and in a specific didactic technique. The workload for these professors was reduced in order for them to assist and mentor their peers. When the centers were divested, they simply returned to their fulltime teaching position as their sole activity. The number of technology assistants and other assistants was considerably reduced. When asked about the fate of the redesign support centers, a mid-level academic administrator at the Queretaro campus explained:

> They evolved. The tendency was to incorporate them into the academic divisions but, in my opinion, it did not work well. They became extinct. At the end, they got back in a more incipient way to academic development [departments] on campus. Why? Because Academic Development is in charge of training faculty, among other things.

Regardless of the way it was done, in reality, the redesign support centers as a structure of domination were no longer needed and part of their functions were passed on to academia. An information technology staff member candidly expressed, “I think that, with the number of people already certified, the idea of having a special structure for that [redesign support] was put on the back burner."

By way of rendering these functions to the academe, another structure of domination was modified: the authority to approve a redesigned course. The redesigned courses are now revised locally by faculty members from the same discipline as that to which the courses belong. When a course is approved, it is passed on to the Rectory's Director for Academic Affairs. A top level administrator commented in this regard: "Redesign courses are now revised by the academy. The professor sends it to three or four peers for them to revise it, to enrich it, to provide ideas… then it is a more enjoyable, a more enriching job, it is less solitary."

Academic department heads at both the Guadalajara and the Querétaro campuses agreed in that the revision and approval of redesigned courses were transferred from the redesign support centers to them. An academic department head at the Querétaro campus explained that:

> Once [the professor] has the redesign ready, we get together as a group…we are a small department; we get together, the entire department, and we revise the redesign, we revise the course. I see the activities, the objectives, content, levels, everything. Once we approve it, we pass it on [to the rectory's director for academic affairs].

Another academic department head at the Guadalajara campus underscored: "Even though I am not the author, I as a department head participate in the process of revision for the course to have the requirements to get approved…. It is the job of academia."

As shown above, the redesign support centers as structures of domination were dramatically changed. At the Western region, the structure and function of their production cells were also modified as a mid-level administrator at the Guadalajara campus explained: “They are not producing [redesigned courses]. Right now, they are correcting them, basically.” And further added that their production cells were downsized to only three people: one computer systems engineer and two graphic designers.

Structures of Legitimation. After having centralized the operation of the learning management systems a “model of operation” had to be defined which included a set of processes that affected the work of IT staff, faculty members and department heads. Course planning for each semester became a critical activity since redesigned courses needed to be uploaded to the server, approved courses had to be put in the catalog of transferable courses, students and faculty accounts had to be created, and so on; therefore, everybody had to comply with this model of operation.

A lot of the burden was put on the academic department heads and the local IT staff. A mid-level academic administrator at the Guadalajara campus commented, “Since two years ago, each [academic] department head has to control and administer the educational model and keep control of which faculty members are already trained.”

A top level administrator at the Guadalajara campus expressed, “For example, a very important process is course planning. It has to be very well structured with much anticipation because all the courses need to be set up in an information system that has a lot of requisites.”

Because the functions of the extinct redesign support centers were devolved to the academic department heads, their work obviously changed. All department heads interviewed concurred that their job had changed by the accretion of revising and supervising tasks to their work. These tasks included the supervision of faculty members' training in the educational model, supervision of the status of a course in the redesigning process, identification of a particular didactic technique to be included in the redesign of a course, identification of transferable courses in their discipline, the revision and approval of redesigned courses, and taking the actions needed to fulfill the benchmarks established by the system. At the Querétaro campus, an academic department head dwelled on the subject:

> Before, you concentrated on hiring the professor and doing a follow-up on everything to go well in his/her courses. Now, I would say that I have invested a bit more of my time in monitoring all my professors, how are their courses, not only that they are being taught, but also what is their condition, if they are redesigned at the basic level, if they are redesigned with a didactic technique… we were asked to decide what type of didactic technique must be applied in each course… with that in mind, we focused our efforts on the training of part-time faculty…. Something I did not do before was being concerned about the classification of the course… I have to see if the course is redesigned, in which type of classification it falls into and if I am meeting the 40-40-20 indicator…. That is the way my job as department head has changed, in looking at the classification of the courses and being more concerned with the development of teaching skills of my professors.

Another academic department head at the Querétaro campus explained how their work has changed and the behavior that is expected from them:

> Well, running after them so they would redesign… obviously is an additional job to be checking on the professors who are in the training program that they are redesigning, that they maintain their redesigned courses, that they meet the redesigning requirements as well as the training requirements, I mean, yes, it is a little more work to supervise, motivate and monitor.

At the Guadalajara campus, the findings were similar. An experienced academic department head commented that he noticed changes in the work of department heads. The respondent remarked:

> Their role in supervising, they not only go to the classroom, but also to the platforms where there is information on how the courses are delivered… and they have to make decisions looking for the development of the faculty who are under their responsibility, to develop them, to train them in the use of the platforms…. We have to search in the Tecnológico de Monterrey's database of redesigned courses, which ones would be the appropriate courses to adopt on campus, also the [inaudible] in the sense of knowing how the communication with students is happening, if the resources available are being utilized or if the professor or the student are having problems, if the course is being maintained because this is another important aspect, not only producing a course and leaving it there, it has to be maintained.

Another academic department head at Guadalajara expressed that it is their responsibility to verify which courses are already redesigned and match them with the profile of fulltime or part-time faculty members in order for them to teach a redesigned course. The respondent further added: "The work of the department head increases, not only by looking for a minimum, basic, quality assurance now with the redesign, the techniques and all, and the follow up that you really do…. Is the professor really using the didactic technique? Is the professor really using the technology? And you monitor each one of the faculty members."

Other structures of legitimation that were modified because of the interaction with technology were human resources processes. At some campuses, the process of hiring part-time faculty members was contingent on their fit within the educational model; therefore, personnel from the Department for Academic Development had a preponderant role in pre-screening applicants, training them, and serving as filters for the academic departments. A top level administrator at the Guadalajara campus commented that the hiring and training processes were changed in order for applicants to be hired with lots of anticipation even before there was an opening. They were trained before service started so they could really grasp the ideology of the educational model. At the Queretaro campus, a top level administrator explained:

> The Department for Academic Development conducts all the pre-screening process for professors and the training. The idea has been to have a stock of potential professors already trained in the educational model, with all the qualifications, so the [academic] department heads or the academy decide who is hired and who is not.

In this regard, an academic department head at the Guadalajara campus asserted that the processes of recruiting and selecting part-time faculty members had changed and underscored: “In particular, I prefer to observe the people I am recruiting, what experience they have in the use of [information] technology… I also try to see how flexible would his/her attitude be towards using this type of resources.”

A structure of legitimation that had to be modified as a direct outcome of faculty members’ agency was the normative rules for a course adoption. Faculty members resisted the structure of legitimation originally constituted by the policy for adopting without changing a redesigned course; they transformed it by way of adapting an adopted course to suit their teaching practice and needs. Faculty members were opposed to adopting courses as they were in an “all or nothing” fashion; therefore, many courses were piling up without anybody adopting them. A mid-level academic administrator at the Querétaro campus exclaimed:

> Finally, Marcos Méndez [fictitious name] accepted that the courses could be modified because originally it was: “You take the course and deliver it as it is, and

> that's it." Recently, the answer is: "You do not have to deliver the whole adopted course; you can take the elements that are of interest and use them;" that means to disaggregate the course.

Faculty members were allowed to adapt the course which most of the time resulted in creating a new, redesigned course for the same subject. This was a catch-22 situation, as explained by a top level administrator:

> What was allowed to avoid undermining the personality, the style, the experience of each one of the professors? It was allowed to adapt courses and in those cases, even you could choose the author, at the end of the semester you had the same course but with certain changes and those changes could now be registered with your authorship or you were added to the authorship…. Then, many professors adopted a course, but they did not like it 100% and they modified it. But those modifications had to be reported because it increased the number of redesigned courses.

The set of criteria used in redesigning a course was also modified because faculty members complained about their inadequacy not only in the redesigning process but also because they constrained the possibility of course adoption. In the latter case, the redesigning criteria made the courses too specific to the authors' and campus' conditions.

In light of the aforementioned, the set of criteria for redesigning was changed over time. The characteristics that a redesigned course should possess in order to be transferable and re-utilized were reviewed and changed. Moreover, some faculty members and academic administrators became interested in the possibility of producing "modules" or "objects" instead of whole courses, as a mid-level administrator expressed:

> The purpose is to allow the design and production of a course using modules already developed, as it occurs in object oriented programming which is where the name comes from. Then, instead of having to redesign the entire course, I design an object very well or I search in a library of objects and select those which I find as adequate to include in my course and this is going to simplify the transfer process much more.

The interviewees who were aware of the project to develop “learning objects” at the Tecnológico indicated that a group of faculty members and academic administrators were in the process of defining the criteria for designing these learning objects. They had researched the literature available on learning objects and were aware of the SCORM (Sharable Content Object Reference Model) international standard, but they needed to set the criteria for a learning object to include the educational model’s pedagogy and philosophy. This set of criteria or norms will constitute a new structure of legitimation since it will also include the criteria for a learning object to be digitized and repurposed through the use of technology. A mid-level administrator at the Guadalajara campus mentioned that a starting definition was made: “A declaration was made about what an object was to implicate; well, that it is an electronic entity that has to include a learning objective, learning activities, and learning assessment.” An academic department head at the same campus explained that the concept of learning objects is linked to the design of the new curricula based on students’ competencies and remarked:

> We have to define the competencies that we want the students to achieve…. To achieve those competencies, we are going to develop learning objects and those learning objects are going to be associated to a competency. What they try is to achieve that competency. This learning object is going to be associated to a topic or subtopic; it is going to be associated to a competency; it is going to be associated to a rubric.”

A new network of actors emerged as a result of the work conducted in defining the set of criteria, those critical elements a learning object must contain, and for developing prototypes of learning objects. A mid-level academic administrator mentioned: “We set out on the task of knowing who was interested in doing something related to this topic of learning objects. We were able to integrate all of them into a research group. We are working with them." Another respondent added, "Up to this moment, there are about 80 professors…. working on the development of various objects for one single course."

Another structure of legitimation that was modified was the normative rules concerning how learning management systems should be utilized in the teaching and learning process. In regard to the different ways learning managements system were being used, a faculty member at the Querétaro campus expressed:

> There are people who simply met the requirement and keep their traditional class… because it has always worked that way. Having their course on platform is purely ornamental. There are people who are highly involved in the process and definitely have made substantial changes in their way of teaching, in their way of conducting the teaching-learning process, in achieving the facilitation of learning through the use of the platform.

The Tecnológico realized that professors had developed different sets of knowledge and skills about the use of learning management systems and that they were actually being used in a variety of modes, not only as the institution intended the technology to be used. A top level academic administrator remarked:

> One of the areas in which I had to dig to the bottom and strategically define was the use of the [IT] platforms…. We have sent strong signals: (a) It is valid to use other [IT] platforms; and (b) the professor together with his/her department head, the academia, the campus director, can decide the platform's level of usage. That means we are making it flexible; we are no longer sending the message: Use it even if it is an artificial use.

"We have four levels of usage," mentioned a mid-level academic administrator before describing them. The first level implies only the delivery of the course based on the characteristics of the educational model. The second level adds the communication feature to the delivery of the course; learning management systems serve as a medium to manage the communication between students and professor and among students. The third level comprises the delivery and communication and, in addition, the virtual collaboration of students and the professor. The fourth and last level refers to the use of a 100% online course taught by an expert in the discipline. This type of online course is part of a program called “Campus Support Program” (PACSI by its Spanish acronym), originally intended to support those small campuses which did not have an expert in a particular discipline. Those courses were not fully online; they were distance courses with a local assistant professor.

The new 2015 institutional mission called for a redefinition of the Tecnológico’s Educational Model. The results of that re-examination were published in 2006 in the institutional document “El modelo educativo del Tecnológico de Monterrey” (The Tecnológico de Monterrey’s educational model). In one of its chapters, the use of information and communication technologies as an aid for the teaching and learning process was covered and the different usage levels of learning management systems were defined:

> For the transmission of information. Through the platforms, professors provide full information about the course to their students, in order for them to pursue their learning….
>
> For interaction. Professors provide virtual space in the platform to students for their interaction among themselves and between them and their professors….
>
> For collaboration. Professors create space in the platform to carry out [learning] activities of group members with whom they constitute a virtual learning community….
>
> For the delivery of courses fully online. In these courses, the benefits of the use of [information] technology platforms are reinforced…. (Tecnológico de Monterrey, 2006b, p. 40).

As a matter of interest, the above findings offer the first evidence of information technology users' agency in transforming organizational structures in a conspicuous way.

Structures of Signification. During the interviews, several participants remarked that the term "redesign" is no longer in use. One of the interviewees underscored, "What we are saying is: It is either [a course] based on the educational model or it is not." In effect, terms like "re-engineering the teaching and learning process" and statements like "the efficient use of information and communication technologies" and "learning activities must be supported by state-of-the-art technology" are no longer found in the new 2015 institutional mission. Instead, the term "educational model" is used more conspicuously. For example, the strategies listed in the new mission are still headed by the one related to the teaching and learning process but is now stated as: "To ensure academic quality and to enrich the educational model" (Tecnológico de Monterrey, 2005d, p. 11).

Over time, a more epistemological discussion about the educational change was posed at the Tecnológico by faculty members and academic administrators. An academic department head commented on the discussion of the myths about redesigning:

> It was a way of counter-arguing the perception held about redesigning by the first professors who undertook the endeavor because they were reluctant, they did not want to work under this scheme and they saw many negative things. Well, those myths about redesigning stayed for a time, but little by little it changed and it became something more philosophical what the Tecnológico´s Educational Model was. That I saw it more positive, to state the proposal broadly instead of defending it, what is the justification? Why we want to do it? I was here during that time of give-and-take with faculty members.

In the 2005 re-examination of the educational model, the use of information and communication technology as a support for the teaching and learning model is still considered a “distinct characteristic” of the Tecnológico as expressed by the Rector of the system; however, he added, “the *appropriate* [italics added] application of these resources is more valued with time by alumni, their parents and employers” (Tecnológico de Monterrey, 2006b, p. 3). By reading the institutional redefinition of the educational model further, it can be inferred that the appropriate use of learning management systems intersects with the four modalities of use declared in the same document. These usage modes reflect the meaning that faculty members have ascribed to learning management systems through their recurrent teaching practices.

The educational model has indeed meant a redesign of the teaching practice and has created a new culture among faculty members and administrators. A top level administrator expressed: “The fundamental change has been in our behavior as professors, in our students’ behavior…. each day is more like a conversation for learning together, [the change] is more than adopting a platform or not, using the technology in a certain way or not, much more.” Another mid-level academic administrator remarked, “I see a different professor… in his/her way of thinking, in his/her way of elaborating knowledge, in his/her way of teaching…”

By looking at the aforementioned findings, it may seem that the structures of signification introduced by the educational model strongly influenced the collective belief of the organization’s distinctiveness and brought about the Tecnológico’s organizational saga (Clark, 1972) for the last decade.

The Tecnológico’s institutional conditions and the institutional consequences of interaction with information technology were identified and described in the last two sections. Next, the analysis performed on Orlikowski's (1992) constructs of information technology as a medium of human action and information technology as a product of human action is presented.

Information Technology as a Medium of Human Action

The incorporation of learning management systems into the teaching and learning process at the Tecnológico de Monterrey has conditioned the work practices of those individuals who use them. Learning management systems did not determine those work practices, but they either facilitated them or constrained them depending on how the technology was utilized by the different individuals.

For example, previous to the redesigning process, faculty members at the Tecnológico had different empirical knowledge and habits for preparing and organizing their daily classes. Some of them used to write down notes on how to cover a topic in class and some of them had it all in their heads. Some of them felt more compelled to prepare the whole semester plan in advance and some did it on a daily basis. By using learning management systems and by following the requirements of the educational model, the professor's didactical knowledge and knowledge about a subject could be made explicit permanently to students and other faculty members. A faculty member at the Querétaro campus expressed the aforementioned in a very eloquent manner:

> The use of [IT] platforms emerged more or less at the same time as the idea that the student is primarily responsible for his/her own learning, that the traditional class of the professor in the classroom with a marker on a whiteboard, that the traditional class was overcome, that the student has to be more responsible for his/her own learning, not so much the professor. Then, there existed the need to transfer much of what there was in the professor's notes and in the professor's head to some place so the student could have access to all that information and it was [then] possible for the student to study on his/her own….

> There was an enormous amount of information in the [IT] platform independent of the type of platform, whether it was Learning Space or Blackboard or WebTec, that does not matter absolutely… but there was an enormous amount of information in the platform.
>
> Therefore, the student could, in theory, study before the class session; the student could, in theory, miss a class session and study later on his/her own; the student could for example solve optional exercises that needed not necessarily to be turned in to the professor. Thus, this allowed for more self-study and for the student to be more responsible for his/her learning.

During the interviews, faculty members, academic department heads and academic administrators concurred that learning management systems mediated different faculty member practices, such as course planning and course structuring, teacher-student and student-student interaction, academic exchange, interaction amongst faculty members, and faculty training.

According to a mid-level academic administrator at the Querétaro campus, a professor has to revise the curriculum in the redesigning process and disaggregate it into activities that include diverse didactic elements: the objective, directions, guidelines, deadlines, and resources. These have to be designed in such a way that students are able to take upon themselves the responsibility for their own learning. A staff member of the Department for Academic Development at the Querétaro campus explained that professors who redesign a course organize and structure their course very carefully and design all the learning activities with the educational model in mind so they can reflect "what the student is going to do and the way s/he is going to transform knowledge." As an example, for each activity, faculty members have to plan:

> What is the objective? What is the specific description? What are the instructions that the student must follow to transform his/her knowledge into action and that this action be reflected either in the classroom or a research or a project?... that is called design of learning environments… [which is] a combination of many things

> based on didactic and technology that they [faculty members] may not have done before.

In the redesigning process, faculty members learned the order and structure that a course must have in learning management systems. This forced them to be more organized, as an academic department head expressed: “Another positive aspect related to platforms is the structuring of a course… we are required to further plan the activities of a course and they are available for [students] to see them and they themselves can better manage their work in the course.” The respondent further added: “What has changed due to the utilization of platforms is the planning process of a course. It has allowed us to work on a course with certain anticipation before standing in front of the group to teach the class. There are a series of elements that have to be ready previously.”

A faculty member at the Guadalajara campus recalled that before the incorporation of learning management systems “You designed your class. You knew you had an analytical program [syllabus], but you designed your class on a daily basis. Then, they suddenly tell you that you have to write down what you are going to do every minute in the whole semester. You went like: Wait a minute!” This task required a lot of effort on the part of faculty members, but the respondent remarked: “Now, I tell you, it was good because I know I get to my class and have everything prepared, yesterday’s [class], the day before yesterday’s, and the day from tomorrow’s [class].”

At the Querétaro campus a faculty member simply put it, “to me as a professor, it has helped me to have a more adequate structure or organization of the course.” Another professor at the same campus agreed and added:

> The platform has allowed us to structure the development of our classes in a better way. That does not mean that before, with pencil, paper and blackboard, we could not do it. What happens is that maybe we did not have a more structured way that allowed us to give a more programmatic sequence to the daily activities in class. It has allowed us to be more structured.

To a mid-level academic administrator at the system level, by following the planning and structure of a course in the redesigning process, “You are helping the professors to think in an adequate manner for the fulfillment of the objective because in the platform you are requiring them to make those [didactic] decisions…. and to manage the learning process with technology.” A mid-level administrator at the Vice-rectory for Information Technology expressed that “You have to plan the course the way you planned it before…, but now we introduced more components in a conscious way. You want them to collaborate and to participate in a group and to reflect; then you have to sit down and plan it.”

Once the course was completely redesigned, faculty members were in charge of updating and maintaining their own courses each semester. The redesigning process represented a lot of time and effort on the part of faculty members, but they indicated that afterwards they could do other things differently. For example, a faculty member at the Querétaro campus underscored:

> The fact that we have everything there in the platform, that we have it all organized, to us the professors it facilitates a lot of the process of switching from one semester to another. You only go there, do the modifications, change dates, change any activity that did not work well; that you think that it is convenient to change, then you go and change it. You give maintenance to the platform and you upload it again and then you have all your material organized for your whole course; that allows you to have time for other kind of things: enhance an exercise, etc.

Another faculty member at the same campus explained how his work practices have changed by the incorporation of learning management systems into the teaching and learning process:

> This has changed my way of working a lot because now I have all my courses on the platform. I am doing a bunch of things that I did not do before. For example, I give optional self-evaluating homework for the students to solve if they want to… good students do solve them and this is self-study. I give optional readings for the students to read; I give true-and-false type exams, completely optional for the students to prepare themselves; I give a series of activities that are really optional that I did not give before and they are optional…. everything is on Blackboard. If it is a reading, I just put the reference and the students download it from the electronic library which I did not use much before.

The negative side of technology allowing the professor to do more things than before is that those activities are time consuming and could cause a professor to divest his/her attention from other tasks. In this regard, another faculty member at the Querétaro campus expressed:

> You have to invest more time because it is not the same to pick up homework on paper, review them and return them. But, as the platform offers more many things, you can do asynchronous discussion tables, or that students upload their homework there; the professor is more likely to invest more time to the design and a bit more time for revising and feedback because everything is being recorded in the platform and the students are already used to that…. I get in [the platform] when I have a chance even though it is at night and I see what they put there, I review what they are discussing… and then a team edits everything we uploaded onto the platform in order to have only one text of everything that was discussed about the topic; yes, it is a burden.

In the same line of argument, a faculty member at the Guadalajara campus expressed: “That follow-through, because of the type of activities that are there, if I put an activity for a forum on the platform, I have to keep checking the contributions. Everybody uploads their homework there and I have to open every file, every homework [assignment] from there.” Another faculty member at the same campus added: “With technology, if you get inspired too much, you end up suffocated. It ends up being more complicated because there are more things that come to your mind. You give [the students] more things and you have to keep revising them."

Faculty members at both campuses expressed that their work practices have changed in direct proportion to their degree of involvement in using learning management systems. A faculty member at the Querétaro campus responded that:

> The academic work is different in many aspects and that has much to do with the professor's degree of involvement… there are people who fulfill the requirement of having the material on platform… and that's it!... there are people who are very involved with the use of the platform, with the redesign of their course; therefore, they intensively use their material on platform and are always referring the student to that material and the student is constantly in the platform and interacting through the different elements included in the platform.

A faculty member at the Guadalajara campus also mentioned that the impact of technology as a medium of human action depended on the faculty member's degree of involvement in its utilization:

> How does it impact? Well, you have a lot of resources. If you are an enthusiastic person and you like incorporating novelties, you can even get a bit crazy with all of the options. If you are a person who gets scared or gets overwhelmed in the face of such amount of information, then I imagine that instead of being a tool that favors it can be something that feels even as complicating things; I would not dare to say that it limits things.

The use of learning management systems has also had an impact in the interaction between professor and students and among students, but the level of interaction depends on how each professor decided to redesign his/her course. For example, a faculty member at the Querétaro campus mentioned that some of his colleagues tried to use learning management systems to make students work in virtual groups. This worked fine for some of them and to others this did not work the way they wanted it to. In his own personal case, the respondent explained: “Personally, it is very hard for me to use the discussion forums. In fact, I do not use them. I use the platform mostly as a medium where the student can have access to all the resources in the course.” This professor added that a simple way of communicating with his students is by uploading information and course materials to learning management systems which are the only place where students can refer in order to look for them.

An academic department head at the same campus argued that learning management systems mediate communication between professors and students and encourages students to keep learning beyond the classroom and the boundaries of the syllabus:

> The platform as communication is originating something in the students, a minimum effort, but the platform itself, if you can put the appropriate links and the appropriate information, almost obligates the student to do more research… we are talking about self-learning; we are talking about going a little beyond what you are seeing in the course.

For a faculty member at the Guadalajara campus, much of the interaction he had previously with his students in the classroom in relation to the syllabus, information, and directions for homework and activities, was now provided in learning management systems that students have access to. Thus, this professor had more time in class for other types of interactions with students. The interviewee explained that:

> Now the same is done, but now everything is through the platform. All those directions are on the platform, they are organized there. The interaction between the professor and the student has changed a lot in that regard. Now, the majority of professors go to the classroom with the computer in their hands, with the laptop, and from there we make presentations… see the materials, see simulations, we see things that allow us, that are elements that help us enhance the class. From that point of view, it has definitely changed.

For other faculty members, learning management systems made it possible to extend their interaction with students beyond the classroom by mediating asynchronous communication for virtual collaboration. As another faculty member at the Guadalajara campus underscored: “The dialogue external to the classroom developed into an extra-classroom learning community, outside of the classroom; with collaborative projects and you as a professor could monitor team work… [the interaction] that is taken place among the students, [in a remote interaction] each one at their home.”

The use of learning management systems as a medium for interaction depends on how faculty members redesign their course and manage the teaching and learning process. Some faculty members utilized learning management systems as a content repository, but many used it to “provide feedback inside the platform and generate activities associated with collaborative groups,” as mentioned by a mid-level administrator of the Vice-rectory for Information Technology. An IT staff member commented that some professors use many features that allow the interaction with and among students like the discussion forums. When these features are incorporated, a critical activity that professors should do (according to a mid-level academic administrator) is the management of interaction in order to avoid duplicating the same things they do during face-to-face interaction in class as well as asynchronously on learning management systems. A staff member at the Vice-rectory for Information Technology commented in this regard:

> Faculty members understand what to do in class when using Problem Based Learning or a Case technique; but when you tell them to upload it to Blackboard or to WebTec, they wonder how they would do that. How this thing [IT platform] is going to help for this to take place? Because in the classroom he knows that he

> will put the students together to dialoguing and then he will give them a problem to solve it. Here, how do I do it?
>
> Therefore, many of the professors do not understand why they are given a virtual space for collaboration; they have to follow a different methodology than the one they were taught here [in the face-to-face methodology].

According to a top level administrator at the Querétaro campus, learning management systems are being used additionally as a medium for the interaction among academics to coordinate the work of faculty members within a discipline by having a virtual space where they can discuss and follow through on their actions. The interviewee expressed that the use of learning management systems "has facilitated the work of the academic; I think that by not having to meet in a meeting room, but instead having a conversation at different times over a topic of interest to various people in an academic field has helped a lot." A mid-level academic administrator at the system level remarked that learning management systems "are impacting organizationally the collegial work in the 'communities of practice'" that are being created to promote the interaction among faculty members for sharing their teaching experiences, their best practices, explore and reflect on new ideas, and keep up-to-date on the knowledge generated in their academic field. Communities of practice (Wenger, 1998; Wenger, McDermott & Snyder, 2002) as defined by the Tecnológico are virtual spaces "where professors develop collegial work, transfer knowledge, and enhance their own scholarly development" (Tecnológico de Monterrey, 2006e, p. 12). According to the interviewee, several communities of practice have been created for faculty members to work on a particular academic field or on a particular didactic technique in the educational model and faculty members' interaction is facilitated by learning management systems.

Another example of technology as a medium of human action is the Guadalajara campus pilot project SINERGIA which started in 2005 (Tecnológico de Monterrey, 2006e, p. 16). SINERGIA is a virtual space developed on WebTec for the collaborative design and sharing of learning objects. Various professors from the same academic field but at different campuses develop learning objects for a specific subject; they resort to this virtual space to collaborate and to upload their developments. Other faculty members from the same academic field are granted access to the virtual space's database of learning objects to use them in their redesigning process. An academic department head at the Guadalajara campus explained the concept:

> What we are trying to do is a more flexible model where different professors can contribute with activities, learning objects as they are called, in a way that through a platform they could work on a same course and create synergy among the various professors in order to have the best practices of one and another, in such a way that a course can be enhanced by the contributions of the various professors.

Learning management systems are also being utilized as a means of conveying training in the educational model to faculty members. "Many training courses are on Blackboard," expressed a faculty member at the Querétaro campus. Even the information about the courses being offered is on Blackboard, mentioned a mid-level academic administrator at the Guadalajara campus who underscored, "They send the information on any training course through Blackboard. You can get in to Blackboard to check the course catalog." As an example, another mid-level academic administrator at the Querétaro campus remarked that "there is an online course on the effective use of Blackboard."

The incorporation of learning management systems provided the opportunity for the re-utilization of redesigned courses thus altering the work practices especially of faculty members who were to teach a course for the first time. Instead of only being given a copy of the analytical program of the course and the books, a professor in these circumstances can be provided with a well structured course in learning management systems which contains educational materials already proved and an array of learning activities. Therefore, the professor does not have to start from ground zero to prepare his/her course. It will save him/her time that can be invested in developing new materials, do things differently, or use a different approach from the adopted course. In this regard, an academic department head at the Guadalajara campus expressed:

> The extreme case is a professor who is going to teach a course for the first time. S/he has the text book, the analytical program, and it could be very difficult for him/her to teach the first session. That material is not enough to teach a very good first session or the first sessions. One, as a professor, has to make a series of decisions: what do I start with, to what depth do I cover it, how am I going to connect this topic with the next, if I leave at this level how is it going to affect later; and having a redesigned course on a platform, with activities already established, planned, proved. It facilitates that decision making and in some way the professor can trust to a certain degree in the depth that is being handled in that redesign and can use the previously developed material in those decisions in which s/he has doubts.

Before the implementation of the educational model, it was like “here is the text book, here is the analytical program, here are the regulations and guidelines" and now it's "here is the course, here is the access key” recalls a faculty member at the Guadalajara campus. A top level administrator at the Querétaro campus commented that:

> [Faculty members’ work practices] have changed so much that we even suggest to the professor to adopt an already redesigned course from the various options of courses approved at the system level. Then you say to the professor: Here you have the course a, b, c; check them out to see which one you feel more

> comfortable with; the ideal is that you adopt it, that you do not invent "cold water," no, [but that] you enhance it, that you share it with other colleagues that already have redesigned courses.
>
> Then, from that fact I think that it is also a very strong change in paradigm because, if you want, you can start with your redesigned course since the first until the last session, with the exercises, the homework… that can be frustrating to some professors and therefore they incorporate much of their own…They change things, innovate a lot… but for some part-time professors, it is a blessing because they already have everything much more organized than they would on their own… it demands less time on their part than having an analytical program and a book to prepare their class.
>
> But this also allows that new professors do not go into the old model of preparing class, but rather to design learning spaces, that the class is more student-centered. Then, it has this double purpose.

The examples provided above show that learning management systems have not only been used as a medium of human action in and outside the classroom for professors and students but also as a medium which facilitates or constrains the academic work practices of faculty members, department heads, and academic administrators. These findings are similar to those of Masino and Zamarian (2003), Orlikowski (1992), and Sommer (2006). For example, in the higher education setting, Sommer found that information technology organizes the interaction for teaching and learning because it determines the structural conventions for defining conversation spaces, shaping the ordering and sequencing of the interaction, granting or denying access to spaces, controlling and managing the flow of information and interchange, and monitoring individual contributions and interactions.

Information Technology as a Product of Human Action

The structurational model of technology (Orlikowski, 1992) emphasizes that human agents bring information technology into existence both, physically and socially, by way of interacting with it in two modes: its design and its use. Therefore, both modes were examined in this study.

The Design Mode of Interaction. According to Orlikowski (1992), in the design mode of interaction, individuals create the information technology and in doing so they build into it certain meanings, resources, and norms that influence the interactions in which the users of the technology will engage. At the Tecnológico, the most conspicuous and important information technology results produced in the context of its educational model were the redesigned courses, the learning objects, the e-Academic Assistant, the WebTec learning management system, and the *Sapiens* project.

The majority of the redesigned courses were designed individually by each professor following a set of criteria established in the educational model. The resulting redesigned courses included learning resources developed by the professor according to the pedagogical methodology and technological resources featured within learning management systems. The pedagogical methodology consisted of at least the fundamentals of the educational model and, ideally, of a specific didactic technique. For its educational model, the Tecnológico specified four didactic techniques that were already being widely used in education; these were: Problem Based Learning (PBL), Project Oriented Learning (POL), Case Method, and Collaborative Learning (Martínez Pérez, 2002).

Redesigned courses were conceived as a semester-long unit of digitized educational material. The end result was an aggregated whole containing an overview of the course (syllabus, goals and objectives, grading policy, and general information), including the course content, assignments, activities, specific information and instructions, quizzes, and so on, for each class session. In their instructional production, faculty members built into the redesigned courses the meanings and norms drawn from the educational model and the resources required by the same educational model. In this regard, a faculty member at the Guadalajara campus underscored that "a redesigned course utilizes a platform as a tool; it has certain guidelines that we all know from the training program in the educational model, the activities, the duration of the class, the values, the attitudes that have to be included in the activities; in the last courses, we had to include a didactic technique."

A staff member at the Department for Academic Development at the Querétaro campus explained that many of the guidelines in the educational model were "standardizations basically, about the shape and the structure… that means, what statements and content I should have in each of the subjects, what structures I should have inside the activities, how should I lay out the information to the student."

There were also guidelines for designing the technology-user interaction in order to provide the student with a similar, intuitive way of navigating inside the redesigned courses. For example, a faculty member at the Querétaro campus remarked:

> To begin with, … the courses [should] have certain uniformity to be more student-friendly because, if each course is completely different from each other, it is harder for a student to access and use it. Therefore, I think that one of the objectives is to achieve certain uniformity and that the courses are more student-friendly… I also believe that the main objective of using platforms is to promote self-learning; hence, the course has to be designed in such a way that it promotes self-learning.

A faculty member at the Guadalajara campus added:

> [The student] has a familiar scheme in which s/he can move because all the courses are based in this scheme, guidelines; s/he knows that there is a virtual communication area, a bibliography area, a document or materials area, a personal communications area…. the structure is a scheme; but what goes inside is up to the professor and that is enriching, that there is uniformity in style but the freedom to be me.

The redesigning process required faculty members to build certain meanings, facilities and norms into the courses drawn from both the educational model and learning management systems; it also required the professor to provide his/her own unique teaching style and experience.

At a certain point in time after the implementation of the educational model, redesigned courses were considered as a long, monolithic, rigid unit of educational material. These characteristics did not facilitate its reutilization as transferable courses by potential adopting professors. They were not flexible enough to be easily modified and were not dynamic enough to be adjusted to different contexts. In consequence, academic administrators started to look for smaller and more flexible units of educational material that could be easily reutilized. Hence, the institution became interested in the concept of learning objects, as a top level academic administrator informed: “Right now, the Tecnológico is looking for the generation of smaller and more modular, more transferable elements of knowledge that could be the learning objects.” A mid-level academic administrator at the Guadalajara campus commented that the use of learning objects would make the educational model more flexible and remarked that “before, the educational model was very close-minded; it was either the whole course or nothing.”

Learning objects are regarded as a much smaller unit of digitized educational material that can range from a particular concept to the whole topic. Learning objects would allow the construction of courses in a modular and flexible manner. A mid-level academic administrator expressed that “We have advanced a lot in defining the characteristics that a resource like this should have in order for it to be reusable by the professor.” The respondent further added that they were in the process of defining the set of criteria for designing a learning object which would include the meanings, facilities and norms as kernels of the educational model, but also in order for the learning object “to be reutilized, it must have what it is known as teaching notes which are the professor’s didactic notes and that is what is going to help the other professor to manage it well.” A mid-level administrator declared that the design of a learning object requires “the clear identification of what has to be learned based on competencies, based on evidences and the criteria to assess those evidences.”

In regard to the in-house learning management system, the design and development of WebTec departed from its predecessor, an application for online education, but its final conceptual design started as a *tabula rasa*. As a mid-level information technology manager at the system level expressed:

> From the precursor system, there were the content area, the messaging area, grading and indicators, those were brought; but, before fully starting the development of WebTec, what we did was a conceptual model of the Monterrey Tec because we wanted the Tec, the application that we were to develop, to be useful for the Tec…a “suit made to fit.” This conceptual model considered that the Tec manages N levels of education that go from literacy programs to doctoral programs; that it manages N areas of knowledge… it considered the educational formats that include face-to-face, online, virtual and hybrid. It also considered the levels of education, types of education, the geographic dispersion, and the languages that needed to be handled. I think that was basically it.

The interviewee remarked that “the core of WebTec is the transactions that occur between the student and the professor.” Therefore, an internal messaging system was created because “up to then, the e-mail was the medium to register activities, but they were recorded in the computers of the professors and not in the network servers.” The respondent further added that the most distinctive characteristics of WebTec were its internal messaging system, its agenda, and its capacity to generate an electronic portfolio.

Another mid-level administrator at the Vice-rectory for Information Technology recognized that WebTec’s internal communication system was one of its advantages and underscored that:

> WebTec manages almost everything by internal communication in such a way that, if I give out an activity, it tells me when the student has done it… I can do a very close follow-up of the student’s activities; thus, for tutoring purposes, WebTec is a very good tool because I can go in and see what [the student] has done, when [it was done] and how many times, and we did not have this capability in Blackboard.

In regard to the salient feature of keeping a history of academic transactions by WebTec’s internal communication system, a top level administrator recognized that, by using this feature, “the professor has a way to go into the course and see if the student did the homework, see if s/he discussed and how much s/he discussed [a topic], and by having certain follow-up capacity… the system allows you do the monitoring in a much easier way than if you do it by hand in your classroom.” A faculty member at the Guadalajara campus agreed with the above and added that “the part of the student’s follow-up, the student tracking… it is more [achievable] in WebTec that in Blackboard.” Another faculty member at the same campus underscored that “the advantage that the platform offers is that an academic record is really being created; records that the student can check on his/her own, when s/he gets in to see what s/he has sent, what homework was sent, which were not sent, on what dates; and the professor can also do that.” Faculty members interviewed at the Guadalajara campus concurred in this regard: WebTec does facilitate the academic administration of the teaching-learning process. In contrast, a mid-level academic administrator admitted that this academic administration is more difficult to do in Blackboard.

A top level administrator remarked that WebTec was developed with the Tecnológico's educational model in mind and reported that "WebTec was thought to include having collaborative groups, having Problem Based Learning, Project Oriented Learning, and those sorts of things; therefore, it was designed to have a better follow-up scheme in accordance to the Tec's model." The respondent further added: "Since the beginning, WebTec had four areas: the design of the course, the delivery of the course, the academic administration, and the knowledge data base. However, it was better known for the delivery of the course." WebTec in addition to the e-Academic Assistant and a learning objects' knowledge management system integrates what it is now called Sapiens.

According to a mid-level administrator at the Guadalajara campus, Sapiens is an upgrade of WebTec: "Sapiens is the complete whole environment. Sapiens integrates what we knew before as WebTec. Sapiens is an environment that integrates the design platform, the delivery, the continuous improvement, the electronic portfolio and a series of additional products."

The development of the Sapiens project started in 2005 for the redesign of courses in the new academic programs for information and communication technologies that all campuses were going to offer (Tecnológico de Monterrey, 2006e). Sapiens allows faculty members to build a course using the learning objects contained in its database and also allows for keeping the academic administration of the learning process of each student. According to a mid-level administrator, “That means that you can go to the level of the individual, what is his/her portfolio of competences, and you can analyze the institutional activity and the best practices, through all this information.” In order to do that, the respondent explained: “you need a meta-data that does not generate more work. You are not going to cause learning to be inefficient just for building a platform of that kind, but contrariwise it must be something for the student to better use his/her time and effort and also for the professor.”

A staff member from the development team explained that Sapiens’ knowledge database is “an organized collection of learning objects easily accessible for professors to use them, and when a course has ended… for each of the objects, you can keep track of the evaluations, the evidences, the accesses and the comments made by the professor and by the student.” The knowledge database would allow someone to “identify the object, the author, the subject the object belongs to, the topic that is covered, the competencies that are covered, the learning objectives it has, key words, and for that we also follow the international standard stated by SCORM.”

The database of inter-related learning objects contained in Sapiens will be available for all faculty members to utilize them in the design of their courses for the new curricula. A mid-level academic administrator exclaimed:

> We hope that it can be a very valuable resource for faculty members to have at their disposal this capital or knowledge generated by faculty members; it is knowledge-transfer indeed. It is the knowledge that you have, that your experience does not remain hidden, that you put it at everyone else’s disposal…. We hope that it can be reutilized so professors can make progress faster; that did not happen before.

The instructional production and the educational technology tools described above are examples of information technology as a product of human action. These findings are consistent with those of Masino and Zamarian (2003), Orlikowski (1992) and Sommer (2006). These researchers have shown that in the design mode of interaction with information technology, human agents are influenced by the specific social context of the organization when building into the technology certain meanings, resources and norms.

The Use Mode of Interaction. In the use mode of interaction with technology, Orlikowski (1992) argues that the way human agents appropriate the aforementioned meanings, facilities and norms designed into the technology are influenced by the shared interpretive schemes prevalent in the organization. In the case of the Tecnológico de Monterrey, these interpretive schemes emerged from its educational model and had an effect on the mindset of the users of Blackboard and WebTec.

Among the interviewees, Blackboard was perceived as a very good, general purpose commercial learning management system that it is widely used in many universities. A top level administrator at the Vice-rectory for Information Technology stated that “Blackboard is a generic platform that was not made to look after the Tec’s model as WebTec was.” For a faculty member at the Guadalajara campus, “Blackboard was a very structured alternative that offered external support, that appeared to be more institutionalized, that was being used by other universities… WebTec is seen as the local offer, more internal, that you are making more adequate, that you are improving.”

Blackboard was also perceived as having more general features than the educational model called for. A mid-level academic administrator commented:

"Blackboard is something general that is made for everybody, for those who buy it; therefore, there are some things that could be of use, but we never use them. In other words, I can say that it has been underused." A mid-level administrator at the Vice-rectory for Information Technology agreed in that regard and added that "Blackboard is too big and has many things, but sometimes it is not very appropriate to the needs of the professors, very specific things, very simple things to do, and WebTec is really good at that." In addition to the aforementioned, faculty and IT staff members pondered that it was not possible to make changes to Blackboard due to fact that it was being outsourced as a service application.

In contrast, WebTec was perceived (by users and non-users) as an internal, smaller endeavor, but more appropriate to the educational model. A faculty member at the Querétaro campus believed that the idea behind the development of WebTec "was to look for an *ad hoc* platform to the structure of the Tec, to the ways and means of the Tec itself, while with Blackboard we had to adjust ourselves to the structure that Blackboard itself offered." To a mid-level academic administrator at the Guadalajara campus, "WebTec has been developed with the Tec in mind…. for our own needs…. all the features are used because it is made according to our needs; in other words, it does not have things that are not being used or that will never be used." For a mid-level administrator at the Vice-rectory for Information Technology, the idea behind the development of WebTec was:

> That it was going to be a platform conformed to the Tec; therefore, if I made a request and say: for collaborative [learning] I would like the discussion groups to be different than what they are now; and there I can develop that and if I ask

> Blackboard to do that, maybe they will listen, maybe not, and here there is no option. In other words, it is mine and I do it as I need it.

A faculty member at the Guadalajara campus agreed in that regard and further added to the benefits of WebTec for being an in-house development: “WebTec is a tool of our own that allows us to mount our own educational model unto a tool developed for this same purpose; that it is more flexible in the sense that, if the model should now require particular additional elements with our new mission, then it gives the freedom to generate them.”

According to the two mid-level administrators interviewed at the Vice-rectory for Information Technology, the software version of Blackboard that currently is being used at the Tecnológico comprises merely the delivery of the courses. “We have not been able to migrate to the latest version because it is complicated due to the size of the information that we have, you move a little here and 5 or 10% of the courses that may fail, that makes an impressive mess.” However, they added that of the latest versions of Blackboard “the additional application we are evaluating with them is their content [manager], their learning objects. Building Blocks are a scheme in which I can add functions to Blackboard by doing my own development.” The respondents were aware of the latest features of Blackboard and informed that they were pilot testing them: “Blackboard was going to launch or already had launched their own initiative in this respect [learning objects] and they called it ‘Blackboard Content System’ and in that concept it is also included the management of a knowledge database and we are evaluating it at this moment.”

In regard to the aforementioned, a top level academic administrator underscored that the work being done with learning objects was more advanced in Sapiens than in Blackboard. “Who is ahead in the use of a knowledge database is Sapiens because Sapiens is that. The content manager [Blackboard’s] has been here for a short semester barely and Sapiens has been here for a year.” Advocates of Sapiens explained that Blackboard’s Content Manager is a repository of learning objects more than anything and it does not have the more advanced features that Sapiens has. A mid-level academic administrator at the Guadalajara campus expressed:

> To build up a course, Sinergia generates a packet of HTML pages that you can incorporate to Blackboard [or Sapiens], but what you lose is the possibility of the follow-up to that object that is going to be in Sapiens… the improvements that you make to that object, the feedback that object could receive from faculty members, the outcomes of a student’s project, for example, if in an object you assign a POL project and the project has great results for the student and that end result forms part of his/her electronic portfolio, all that follow-up can be done through Sapiens and not in Blackboard.

From the information gathered at the interviews, it can be seen that the interest of academic administrators in furthering the utilizing of learning management systems and advancing the knowledge on their application in education has taken new paths. They all departed from the same shared meanings that emanated from the educational model, as a mid-level administrator remarked:

> Here is the situation: Blackboard had many less things for those ends than the ones that WebTec started with; they had the intention of adding all those other elements that we were just talking; but, to begin with, what it mattered was the model that we were working with; in other words, if you do not have an educational model behind that responds to that, then the [IT] platform is worthless.

Besides the shared meanings which influence the appropriation of technology in the mode of use, Orlikowski (1992) also mentions that human agents retain control of the interaction with technology by not utilizing it at all, but by utilizing it in different manners than it was originally intended or by modifying their engagement with the technology. From the data gathered at the interviewees, it was found at the Tecnológico that the various faculty members appropriated learning management systems differently and also engaged at different degrees in the use of redesigned courses. Faculty members had ultimate control over the design of their own courses, including deciding how far to use the facilities provided by learning management systems. In consequence, various levels of technology use emerged in faculty members' recurrent teaching practices. For example, a mid-level administrator at the Vice-rectory for Information Technology remarked that learning management systems allow faculty members to extend the teaching and learning process beyond the limits of the classroom, but pondered that "it obviously depends much on the design and the use that each professor makes [of technology]… we are not all as dexterous in the use of technology; we are not all as skillful in the design of an activity that allows to happen what I just mentioned."

Proficiency in the use of technology was an obvious factor that influenced the appropriation of technology as well as the cultural factor, as a faculty member at the Guadalajara campus stated:

> The risk that faced these technology platforms was that they could become a sort of syncretism. That is to say that if the academic authorities are demanding from me a line of action that has to deal with the use of an electronic platform, but if this is either complex or it moves me from my traditional chores, then I will tell my boss that I use it because, when I am in front of the student, we are the student and me, and I have the will to either make use of the platform or not make use of

> the platform; then, if the institution demands it from me… if the authority demands it from him/her, probably the professor will resort to his/her conventional methods of teaching…I think that happened.

At the end of the day, what happened was that faculty members retained control over the level of technology usage in their redesigned courses and in their classroom. A faculty member at the Querétaro campus commented: “Still to this date, you find or we can find professors for whom it has been difficult to adapt to the new technology. I personally can tell you that I use the platform. I get into the platform, but I consider that I still use it in a very basic manner despite of all the time that we already have with the platform.” A mid-level administrator at the Vice-rectory for Information Technology agreed with the latter and further added:

> Most of the use made today of the platforms is an information use. This means that professors have all their program there, all their materials and everything else, and…the student…checks, downloads homework and so on, from there, from the information... right now, there are few courses that take great advantage of the platform and, when I speak about great advantage, I specifically refer to making use of the rest of the tools that are there, say discussions, say sending and receiving homework, that is to say that the student can send…his/her homework and the professor can revise it there.… That does not happen in most cases; say the synchronous interactions where the professor can have a live chat with the students and can do a kind of demonstration; say online exams, and some other tools that appear inside the technology platform and do not get used in a natural way; rather, the professor chooses to use it or not and, in most cases, they are not being used today. The spaces where I put certain information at the disposal of the students are used more. That is the part that is used the most.

The adoption of redesigned courses was another mode of using the information technology produced by faculty members. The adopters of redesigned courses appropriated the interpretive schemes, facilities and norms built into the courses by their designers. However, it was found that the adopters’ interaction and engagement with the redesigned courses varied in degree. Faculty members who adopted a redesigned course concurred that the main incentive for adopting a course was having the opportunity to choose from a set of courses developed by experienced faculty members. All redesigned courses contained the academic plan for the complete semester and an array of well designed activities. To many faculty members, the most common disincentives for adopting were: (a) feeling the urge to adopt a course, (b) the stringent structure of the course (including its semester-long format), (c) the unavailability of resources or the lack of knowledge in using a resource required in some of the activities, and (d) the personal teaching approach of the author of the course. As an example, a mid-level academic administrator recalled that:

> What has happened a lot with the transferable courses is that they were imposed… the professor was told: "Look, this is it and you have to teach it the way it is,"… an imposed whole course does not fit to the level of the professor… or it can be that the professor does not adapt to the [author's] style, or does not adapt to his/her conditions.

In a similar fashion, a faculty member at the Guadalajara campus expressed that "the matter with adopting, I think it has the disadvantage that many people felt it was something very rigid, something imposed, something that I have to be using, that was designed by somebody else whom I do not even know, who maybe even contextualize it to his/her region and it is of no use to me." Another faculty member at the same campus indicated that when somebody redesigns an activity s/he knows the particularities of its application and "when you are a professor who adopts, then you read it and you may have the idea, but not the fine details."

In contrast to the aforementioned, there were faculty members who had a different opinion about the adoption of redesigned courses. A faculty member at the Guadalajara campus exclaimed that adopting a course was:

> "Oh! You know what? It has incredible things!," I used to hear of my peers who were adopting "These activities, they are very well designed!" or "The professor redesigned this activity to a great detail!"….
>
> Then the professor had that freedom. Then, yes, you adopted a course, but you did not have to robotize yourself to follow it by the book; yes, with the objectives; yes, with the times; yes, with the educational intentions, but not necessarily 100% with all the activities….
>
> Then we had the freedom to make decisions… if the objective is to meet these cognitive and attitudinal learning, I think this activity that I already do works better for me than this one that I did not understand too well or that I do not find adequate for my personality.

Another faculty member at the same campus believed that the faculty members' disposition was crucial in considering an already redesigned course as a favored resource and as an aid. The respondent stated:

> It is awesome because I have many alternatives and I am not by myself even if I am merely interacting with the platform. There, it resides the experience of someone or of many who dedicated themselves to do a design and who are sharing it with me… if I would not like anything from what it is there, I have the resources offered by publishing companies in addition. In other words, publishers do not give you only the textbook, they provide you with a whole kit of alternatives there.

By the same token, a faculty member at Guadalajara considered that the binding effect of adopting a redesigned course depended on the disposition of the adopter. "The problem is when this can become a maximum and not in a minimum… if the professor begins looking at it as a maximum, then it is burdensome; but if s/he begins looking at it as a minimum, as a starting point from which s/he can enrich it, then we have a wonderful detonator."

In regard to faculty members' disposition toward adopting a course, a faculty member at the Querétaro campus expressed:

> I have seen a problem that arises…there is a professional jealousy in the first place…maybe it is very human among professors. That jealousness stops me from trying to imitate another professor. Then, no matter how much they tell me "adopt this course," I want to be unique and that desire of being unique makes me say sometimes that the courses that I am bringing for transfer are very bad. That happens to me very often.

Similarly, another faculty member at the same campus also believed that it was hard for faculty members to adopt courses due to their proneness to reject subordinating themselves to other colleague's work. The respondent stated that:

> I consider that the professor is a rare specimen…we are very vain, a little arrogant. Maybe I am exaggerating and maybe I am talking about myself. We find it very hard to use materials developed by other people, at least that is may case. Therefore I say, "Well, if I adopt a course I will surely not like it. I am going to modify it a lot. I am going to spend much time modifying it and maybe the outcome will not be what I want, then I better start from zero."

Faculty members at the Guadalajara campus commented that other factors hindering the use of an adopted course are the differences in teaching approaches, the scope or depth in which some topics are covered but most importantly the lack of documentary indications that would enable the adopter to fully and clearly understand the meanings and facilities built into the redesigned course. One of the interviewees stated:

> Sometimes, one sees a specific part and one could not agree or could not concur with the same approach of the professor and somebody could say (sorry for the expression) "The crazy who redesign this course, who knows what s/he was thinking"… sometimes I think it has a lot to do with the documentation. Sometimes maybe a redesigned course does not have the documentation that allows the professor [the author] to convey to a professor [the adopter] what was the designer's idea.

Other examples of factors affecting the use of adopted courses were the unavailability of the resources required by the adopted course either because the library did not have a particular material or the computing lab did not have a specific software. Also, the adopter's lack of knowledge about how to use a particular material or specialized software and the excessive amount of student assignments required. A faculty member at the Guadalajara campus remembered a conversation with some of his colleagues; some were fulltime and some were part-time faculty members; all of them were using the same redesigned course. The interviewee recalled that "The comment from the part-time faculty member was: 'I would like to keep the pace implied in the redesigned course of Business Statistics, but the amount of assignments are impossible for me to grade… and give back in time with the feedback'…[but] for a fulltime professor, it is possible to do."

A faculty member who adopted a redesigned course admitted that he considered the amount of asynchronous collaborative activities demanded by the adopted course an exaggeration. The respondent stated: "It was based on collaborative [learning] and it was striking… all of the activities were in teams. You annoy the student, you break him/her down… you cannot do the same thing in class. Then, you are abusing a technique because you think that technology would allow you to do that."

The above findings are consistent with the structurational model of technology's human agency perspective (Boudreau & Robey, 2005; Masino & Zamarian, 2003; Orlikowski, 1992, 2000; Sommer, 2006) which shows that users of technology may not have much choice on what information technology to use and how to use it. However, they make their own decisions about how much to integrate technology into their working practices. In other words, human agents are able to enact information technology in different ways by controlling their engagement in its use.

Institutional Properties and their Relationship to Academic Capitalism

From the perspective of the theory of academic capitalism (Slaughter & Rhoades, 2004), the restructuring of higher education under the new knowledge/learning regime calls for: (a) a substantive organizational change and associated changes in internal resource allocations; (b) a substantive change in the division of academic labor with regard to research and teaching; (c) the establishment of new organizational forms; and (d) the organization of new administrative structures or the streamlining or redesign of old ones. Therefore, this research examined particularly the institutional properties (organizational forms, administrative structures, structural arrangements, norms and policies, and so on) related to instructional production and the use of learning management systems in the teaching and learning process. It also examined instructional information technology as a medium and as a product of faculty members' academic work and teaching practices.

The institutional properties found and the ways that information technology structures faculty members' work practices at the Tecnológico were analyzed from the perspective of the theory of academic capitalism. This process allowed for the categorization of institutional properties and the enactment of instructional information technology into: (a) organizational structures that increase the managerial capacity; (b) new network of actors; (c) market-like behaviors; (d) new circuits of knowledge; (e) intellectual property policies; (f) changes in faculty work; and (g) changes in the academic profession. Each category will be expanded below.

The Managerial Guild Increased. Slaughter and Rhoades (2004) indicate that higher education institutions who engage in instructional production expand their managerial capacity because: "A growing number of mid-level managers supervise the mass production of education through the use of information technologies such as Blackboard or WebCT" (p. 19).

In regard to the aforementioned, new structures of domination were created at the Tecnológico for the implementation of its educational model. These structures were the Vice-rectory for Information Technology; the Department for Educational Research and Development; the Center for the Integration of Solutions; the redesign support centers at each of campus; and, a few production cells at some campuses. Also, the already existing Department for Information Technology Services at each campus in the System was required to perform new functions which were aligned in support of the learning management systems.

The creation and expansion of these peripheral, non-academic units are examples of increasing managerial capacity; however, not all of these instances were permanent as Rhoades (2007) suggests happens in a Mode III organization of instructional production. As was previously shown, the redesign support centers and the production cells were divested, the members of the academy returned to their fulltime teaching positions and most of the center's functions were reassigned to academics. It was also shown that, with the centralization of the operation of learning management systems, the departments for

Information Technology Services at each campus were downsized and their operations became parochial.

Lastly, the Department for Administrative Services at each of the campuses made the necessary changes in the internal resource allocations according to the requirements of the educational model for technological infrastructure, human resources infrastructure, training and development.

New Network of Actors. The production of digitized educational material in learning management systems brought forth new non-conventional academic structures that forced the individual professor to work with other faculty members and non-faculty members, thus forming new networks of actors. Examples of the aforementioned were found in the network formed by academic and non-academic professionals working within the redesign support centers, in the network configured by those faculty and non-faculty members involved in the revision and approval of redesigned courses, in the network formed by the academic and non-academic professionals working at the production cells, and in the network of faculty members participating in the project SINERGIA.

Market-like Behaviors. Slaughter and Rhoades (2004) show that higher education institutions have incorporated market-like behaviors and, hence, promoted the academic capitalist knowledge-learning regime. As an example, they engage in business-like arrangements like outsourcing learning management systems as it happened at the Tecnológico, where the platform was first outsourced from Lotus Notes and later from Blackboard.

Other examples of market-like behaviors were the "certification" of computer vendors and the settlement of arrangements to help those vendors in the promotion of their computer products inside the campus premises. Another example was the "certification" of telephone carriers for the provision of dial-up services as a strategic effort in developing suppliers. Such an activity is typical in the business sector.

Another market-like behavior was the development of business negotiations with software and hardware commercial corporations to select winners in the marketplace as providers of technology at competitive prices for students and faculty members alike.

New Circuits of Knowledge. The outsourcing arrangement of learning management systems precipitated a new circuit of knowledge by connecting people at the Tecnológico to external individuals at Blackboard. This arrangement required the Tecnológico to cross the boundaries of the higher education sector into the business sector to interact openly in considering and treating knowledge as raw material that can be repurposed through technology.

It also implied that the Tecnológico served as a testing ground for Blackboard, as Slaughter and Rhoades (2004) warned would happen in the academic capitalist knowledge/learning regime:

> Corporations and universities form strategic alliances in which universities serve as test beds for new products, offering a milieu impossible to duplicate in a laboratory. Often students and faculty participate in modifying or improving the products, the benefits of which are captured by both the university and corporations in terms of use and by the corporation in terms of economic return (p. 19).

In regard to the aforementioned, a top level administrator at the Vice-rectory for Information Technology underscored that members from that Vice-rectory worked very hard with people at Blackboard to stabilize the operation of their learning management system under a massive utilization. The respondent expressed:

> I believe that where we made a contribution is that they had many millions of students in the world, but not all of them in the same server… what we developed together with them was the computer architecture part. This is to say we went inside to revise the operation and make it efficient so it could provide service to all [the concurrent users]… that was hard work and they did help us, they and us and Oracle.

Similarly, a mid-level administrator at the same Vice-rectory recalled that "Achieving the stabilization of a system of such magnitude cost us some time evidently, but the benefits are very visible." The interviewee further added:

> To support and stabilize the platform with those levels of growth, it cost us blood and I refer to blood because we made more than one professor suffer on the way, obviously, because when we made a leap from 250 to 1,250 [course sections], more or less… the platform got out of control at the start evidently; it failed down a little or a lot, it broke down, whatever.

Another mid-level administrator at the Vice-rectory for Information Technology remarked that they helped Blackboard to achieve the robustness required for the massive use of its learning management system at the Tecnológico and stated that:

> Blackboard is one of our more clear examples of effectiveness and optimization in terms of infrastructure. From that platform we provide service to a little more than 40 thousand concurrent users…. This is the most solid and robust application that we have up to this day. No other transactional information system of administrative character compares to what we have in Blackboard, neither the payroll, nor the administrative system, nor accounting, nor anything like that.

From these findings, it can be argued that the collaboration between the Tecnológico and the Blackboard Corporation was beneficial for both parties, but their collaborations represented a new circuit of knowledge.

Intellectual Property Policies. In the academic capitalist knowledge/learning regime, Slaughter and Rhoades (2004) argue that business corporations and higher education institutions “treat advanced knowledge as raw material that can be claimed through legal devices, owned, and marketed as a product or service” (p. 17).

The Tecnológico treated the redesigned courses as institutional resources and recognized their potential commercial value. Therefore, the institution established an intellectual property policy to protect and claim copyrights on redesigned courses and also to give an explicit recognition of each faculty member’s authorship.

The Tecnológico also claimed the copyrights of WebTec, its in-house learning management system, and registered its trademark with the Mexican National Institute for Intellectual Property and the Copyright Office of the Ministry of Education.

Changes in Faculty Work. The incorporation of learning management systems into the teaching and learning process at the Tecnológico called for the restructuring of faculty work. First of all, faculty members were required to teach only redesigned courses; therefore, they had to undergo more than 200 hours of training and become certified in the educational model.

Second, the redesigning of a course was guided by a set of criteria that faculty members had to follow in order for their courses to be approved and considered as transferable. A set of criteria was also established for the design of learning objects.

Third, many of the faculty members became certified in the use of a didactic technique and provided tutoring, as part of their workload, to other faculty members in the same or different disciplines.

Fourth, the organization of instructional production changed in such a way that the new modes of production required the individual professor to work with other faculty members and non-faculty members, thus, forming the new network of actors previously described.

Smith and Rhoades (2006) discuss three models of instructional production for e-learning classes: the craft model, the collegial model, and the virtual assembly line model. Even though the redesigned courses at the Tecnológico are on-campus, face-to-face courses, the models proposed by Smith and Rhoades were found adequate to describe the organization of instructional production at the Tecnológico. For example, in the vast majority of cases, the instructional production of redesigned courses resembled the craft model where the individual faculty member works largely on his/her own. There were only a few cases in which the redesigned courses were produced in a collegial mode or a virtual assembly line mode. Nevertheless, two important characteristics are worth mentioning: in the Tecnológico's craft-type model, on one hand, all faculty members underwent training in the educational model and followed the guidelines provided there; on the other hand, all faculty members had pedagogical and technological assistance at their disposal in the redesigned support centers. A staff member from the department for academic development at the Querétaro campus stated that "The professor has to produce his/her own course, his/her own materials. Sometimes s/he has teaching assistants who help him/her… I check their progress and help them in basic technical things like uploading documents, not in developing them."

The Tecnológico's Educational Model demands that faculty members perform multiple functions inside and outside the classroom, before, during and after the academic period. These requirements assured faculty members of a central role in the teaching and learning process. Faculty members had to attend and conduct every class "to orient, broaden, enrich, and clarify the knowledge that their students are building through their activities;" faculty members had to "plan, design and administer the teaching and learning process." They were also asked to:

> Create a working environment…. Facilitate the learning process by providing adequate conditions and keeping a personal and continuous relationship with each one of their students…. Continuously evaluate and provide feedback…. Act as a leader… to create a learning community in which the students generate synergy and help each other, and motivate them along the process…. Continuously conduct classroom research, making improvements and adjustments to the established plan in case it is required, and documenting the results (Martín Pérez, 2002, pp. 35-37; Tecnológico de Monterrey, 2006b, pp. 44-45).

A faculty member at the Guadalajara campus underscored that what has not changed in the educational model is the central role of the faculty member. "[Students] keep expecting that things be a function of what one as a professor is guiding, there is still an interaction in which the professor, in that sense, still is the center."

Fifth, faculty members' teaching practices were mediated by learning management systems. As previously shown, the redesigning process required a professor to prepare with great anticipation the entire course and to organize it in great detail. Learning management systems mediated the delivery of information and the interaction with students by "extending" the classroom beyond the class session. Also, learning management systems facilitated the academic administration of the course.

Sixth, learning management systems began to be used to mediate the interaction among faculty members through the communities of practice and SINERGIA.

Seventh, learning management systems were also used to deliver courses in a faculty member’s training in the educational model and also were considered a great medium for the adoption of courses for faculty members who were going to teach a class for the first time or were going to be introduced to the educational model like an in-service training.

Eighth, all faculty members were compelled to conform to the normative rules established for the adoption of a course, the characteristics that a redesigned course should posses in order to be transferable, and the level of usage of learning management systems.

Ninth, the incorporation of learning management systems also changed the academic work of department heads. Course planning became a critical task because it demanded following an operational plan developed by the Vice-rectory for Information Technology. The operation of learning management systems required redesigned courses to be uploaded to that system software, network server spaces needed to be assigned, faculty members needed to make the appropriate changes to the course for the new semester, and users’ accounts needed to be created. This process required a detailed schedule of steps that department heads needed to take into account.

Department heads accrued new functions in revising and approving redesigned courses as well as in searching for courses that could be adopted and supervising the application of redesigned courses during the academic period. In regard to hiring new part-time faculty members, department heads followed a new process for screening and selecting candidates. The new process demanded applicants to undergo part of the training in the educational model as well as becoming acquainted with the use of learning management systems.

Changes in the Academic Profession. In the Mexican Higher Education System a peculiar characteristic in the academic career is that prerogatives gained by faculty members in an institution are not transferable to other institutions when the faculty member moves from one to another. Therefore, a faculty member’s mobility is very limited and thus, an academic career is greatly bound by the institution’s policies.

Findings in this study show that certification in the educational model through the successful completion of the training program and the redesign or adoption of a course became part of the criteria which regulated the academic profession at the Tecnológico. The element of certification was factored into the salaries of fulltime and part-time faculty, at least for the first few years after the implementation of the educational model. It was also factored in the classification system of fulltime faculty members and in their participation in a sabbatical period.

The semester evaluation of campuses included a series of indicators that measured progress in the implementation of the educational model and thus, measured the progress of faculty members in the redesigning process. The reward system for faculty members and the system of progress indicators represented two salient aspects of a managerial mode of operation that affected the academic life of the professoriate and, hence, the academic profession at the Tecnológico.

Faculty De-centering. Information gathered from collected institutional documents shows that by its organizational statutes the Tecnológico's top administration regulates the general academic policies and norms and, consequently, a faculty member's academic career (Tecnológico de Monterrey, 1998a, 2000b, 2004). Therefore, the central role that faculty members from U. S. higher education institutions hold regarding issues like governance, curriculum and academic policies is quite different from that of faculty at the Tecnológico de Monterrey.

Having said that, the above findings show that administrators at the Tecnológico made fundamental decisions about curriculum and pedagogy and created various structures of domination and legitimation. Those decisions further de-centered the individual faculty member and imposed more controls over the academe. These findings corroborate and complement Rhoades' (2007) Mode III of instructional production.

Findings discussed in this section are exemplifications of some but not all of the characteristics of the academic capitalist knowledge/learning regime proposed by Slaughter and Rhoades (2004). Relevant characteristics of the theory of academic capitalism not found were organizational structures to commercialize redesigned courses or WebTec, the engagement of faculty and non-faculty members in revenue generating activities, the participation of faculty members in new circuits of knowledge, or the emergence of interstitial organizations. Academic capitalism at the Tecnológico does not focus on production of research based knowledge and control over it for commercialization, but on instructional knowledge and its control for competitive advantage and perpetuating leadership in educational information technology.

Strategic Management of the Tecnológico's Intellectual Capital

Intellectual capital focuses on the creation, transfer, and use of an organization's tacit and explicit knowledge as well as the relationship between knowledge, value creation and competitive advantage (Roos, J., Roos, G., Edvinsson & Dragoneti, 1998). Davenport and Prusak (1998) provide a useful working definition of knowledge for the sake of this study:

> Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.

Davenport and Prusak (1998) and Giddens (1984) argue that knowledge is created, shared, and used by individuals in their ongoing social interaction and working practices; therefore, knowledge is fundamental for human action. For Orlikowski (1992), the premise that human actors are knowledgeable and reflexive is central for her structurational model of technology. Orlikowski argues that actors' knowledge and reflexivity are applied to the design, production, and use of information technology, but this process is bounded by the structural properties (rules and resources) of the organization.

The production of any form of information technology that could become the university's intellectual capital is a central theme in the theory of academic capitalism (Slaughter & Rhoades, 2004). In the higher education setting, digitized instructional material is produced by the interaction of faculty members with information technology in their recurrent teaching practices (i.e. instructional production). In an academic capitalist knowledge/learning regime, once faculty members' intellectual work is committed to a digitized form, it can then be appropriated by the institution as part of its organizational stocks of intellectual assets and, hence, can be treated as a strategic resource (i.e. intellectual capital).

From the perspective of intellectual capital, instructional production can be regarded as the process by which the individual faculty member's knowledge (i.e. tacit knowledge) of the content and the didactics of a subject can be captured (i.e. explicit knowledge) and digitized in a form of information technology that can be easily repurposed, reproduced, and transferred. In other words, information technology as intellectual capital can be exploited as valuable products and services to the institution's advantage.

The aforementioned proposition was explored in this study. The analysis of the information gathered at interviews and from institutional documents was performed using Choo's and Bontis' (2002) framework for strategic intellectual capital management. Their framework comprises three organizational processes: knowledge creation, knowledge transfer, and knowledge utilization. In the knowledge creation process, the organization sets the conditions to facilitate and promote the creation of new knowledge. Then, the tacit knowledge that resides in the minds of the individuals is captured in ways that can be used by others. In the process of knowledge transfer, the organization deploys its stock of intellectual assets. Therefore, it works in the conditions that facilitate sharing the knowledge that has been created. In the knowledge utilization process, the organization integrates and coordinates its stock of knowledge to produce new goods and services. In regard to instructional production and delivery at the Tecnológico de Monterrey, the findings from the analysis will be presented following the aforementioned framework.

The Knowledge Creation Process

According to Jajko and Prime (1998), intellectual assets are created in an organization every time individuals record into a form of media any part of their knowledge, whether this knowledge is discursive or practical. According to Giddens (1984), individuals' discursive knowledge can be explicitly articulated and practical knowledge refers to tacit knowledge upon which actors may actively draw but are unable to easily express. Intellectual assets are also referred to as "codified knowledge" and, together with individuals' tacit knowledge, form the organization's intellectual capital (Sullivan, 1998c).

This section addresses the intellectual capital created at the Tecnológico by faculty and non-faculty members in the implementation of the educational model which entailed incorporation of information technology in the teaching and learning process. Faculty members who were interviewed expressed that they had created vast pedagogical knowledge related to the educational model; more specifically, to the didactic techniques together with the incorporation of learning management systems into on-campus courses. As an example, a faculty member at the Guadalajara campus provided the following account of the tacit knowledge he considered has been created:

> The knowledge that is generated is about how to do things, how to redesign, how to carry them out. Good experiences and bad experiences are generated… we share tips about "do not do this or do not do that", or "if you are going to do it, be careful with this." That is definitely generating knowledge and vice versa: "this

> has worked for me, this is great, put this in, or put that." That generates knowledge, even knowledge about information. Why? Because many times the professor is compelled to research papers, documents, journals, a bit more, and that generates knowledge about how to navigate, how to search, and what to search for…. You are generating that learning about how to move, where to move to, what to do, what to implement, what works, what does not work, and all that we are talking about pedagogy. Then, in some way, we are generating, not only using didactic techniques, but also improving how to teach.

Another faculty member at the same campus commented on the potential for higher education regarding the knowledge that has been generated. In this case, he was referring to a face-to-face didactic technique that has been modified to work in distance settings. The respondent explained:

> …many universities do not trust or do not believe in the possibility that a discussion of a case can be done asynchronously and that it could bring benefits to the students even so. I think that for the Tecnológico, for some programs, this is a perfectly daily activity and I think that we should start writing about this, that is, how we use means, conventional didactic resources such as face-to-face discussion in the Case method, utilizing the [information technology] resources or the electronic platform. I think that we have learned there; we have generated a lot of knowledge.

The respondent further added that by using learning management systems in their recurrent teaching practice, faculty members have learned to appropriately balance the use of information technology and face-to-face interaction in their courses. Another faculty member at the same campus stated that the developed model "establishes how that technology [learning management systems] supports the educational model, what are the advantages of using or not using them, because we have lived them in the flesh."

Other faculty members not only spoke about the pedagogical knowledge that has been created but also referred to the current pedagogical concerns they were facing. For example, a faculty member at the Guadalajara campus expressed that "you can do student-centered activities, you can do collaborative activities, you can apply PBL [Problem Based Learning], and you can apply projects, but the question is: how do I verify that learning really happened or how do I assess it? That is why I tell you that the complicated thing still has to do with assessment."

Faculty members underscored the work accomplished in designing new laboratory practices used by students to test commercially available products; the results provide real hard data for new cohorts with which to work. As an example, an agriculture faculty member at the Querétaro campus described the lab practices she has designed: "I deal a lot with biological control; therefore, I test the microorganisms in the laboratory and then I give them to the students and we test them against commercially available products, like a biological agrochemical. All those experiences are kept on Blackboard to support the practice they have to do in the laboratory or in the field." In relation to the aforementioned, another faculty member at Querétaro remarked that "there is a great richness in regard to all that has been developed for the courses. In the design of activities, in the [educational] materials that have been developed, and in research…"

To another faculty member at the Querétaro campus, the knowledge generated represents a repository concentrated in only one space in order to be shared among all faculty members. The respondent stated "It is like the Tecnológico's own pedagogical collection, the collection of knowledge about teaching courses, about the student-professor interaction … at the disposal of every professor in the system." The statement of the interviewee pointed toward the function of learning management systems for capturing the knowledge created by faculty members and students in both the redesign of a course and in their recurrent teaching practice. In this regard, a faculty member at the Querétaro campus remarked that "there was a need to transfer much of what was in the professor's head and in his/her teaching notes to some place accessible by the student." According to a mid-level academic administrator, learning management systems provided faculty members the opportunity to capture and document their teaching experiences and "put them to the consideration and to the service of others to enhance and improve the quality of learning."

By the same token, a mid-level information technology manager expressed that learning management systems had helped faculty members capture the knowledge they developed; however, he regarded this as an opportunity to methodically create and capture knowledge. The respondent stated "Converting the professor's tacit knowledge to explicit, because s/he needed to upload his/her course and, having that knowledge in a digitized format, that is a value added to any institution because the institution is prepared and at the door of the systematization of knowledge."

According to a mid-level academic administrator, by capturing the knowledge that is created, information technology will contribute to the institution's success because it allows the knowledge to remain at the disposal of faculty members even in the event that the creators leave the institution. In a similar manner, a top level administrator remarked the need to guard, organize, further develop, and utilize, in a more efficient way, the knowledge that has been created so, in the event that a professor leaves the Tecnológico, other faculty members could access everything that professor created.

According to several authors, organizational knowledge should be "codified" in order to capture it in a form usable by those who need it (Boisot, 2002; Davenport & Prusak, 1998; Roos et al, 1998). Therefore, knowledge codification requires some rules for the organization and structure of knowledge acquisition and recording. In the case of the Tecnológico, their educational model provided the rules and resources (i.e. structures of legitimation) to codify the instructional knowledge produced in the redesigning process.

In regard to the above, the interviewees considered redesigned courses as an educational material which the Tecnológico did not have prior to the implementation of the educational model. The collection of these redesigned courses was regarded as stocks of intellectual assets developed by faculty members in the redesigning process and enhanced in their teaching practice. For example, a faculty member at the Guadalajara campus stated "I would say that one of the most valuable assets is the knowledge made into a didactic instrument by faculty. That is what gives value to the 50 minutes of class a student has. That represents a gigantic database which I think we should have available, accessible, utilizable."

In a similar fashion, a faculty member at the Querétaro campus remarked "There is a huge amount of redesigned courses which is a gold mine. It is an immense database where we can see 10, 20, 30 different ways of teaching the same course. Therefore, I think that we do have a very valuable database of an awful lot of information."

According to a professor at the Guadalajara campus, this database of redesigned courses was very important because:

> … It is a repository, not only of information, but of the experiences of professors who taught the courses. Some of them are very successful with their students. There are professors who know how to address a subject in such a way that it is understood at the first time, I mean at the first time that it is presented to the student, and that type of thing could be useful to convey to other professors.

Academic administrators concurred with the aforementioned. As a top level academic administrator explained, because of learning management systems, “little by little, we will be putting the best teaching practices in knowledge databases, in knowledge repositories.” Otherwise, a mid-level information technology manager uttered, faculty members’ knowledge and best practices are not tangible anywhere and are only seen in the classroom and last the ephemeral time of the class session. Therefore, this tacit knowledge made explicit and codified is a great asset for the institution.

For a faculty member at the Guadalajara campus, the collection of this knowledge in the learning management systems is a contribution to the educational model because it “is a repository of information that the professor can exploit.”

In contrast to the aforesaid, a dissenting voice was uttered by a top level academic administrator who expressed that the database had not been pruned and, in the respondent’s opinion, there is not “a single library which contains the best courses.” According to this participant, there existed a collection of courses that have been kept over time, but there was not a mechanism to administer these intellectual assets; therefore, the database could not be exploited. The interviewee remarked “You are asking me: where is the knowledge database of the courses right now? Well, we do not have one…. There was one, but the point is that it was never completed…. We cannot have a great gold mine with all that knowledge because it is very dynamic and it evolves too fast.” According to the respondent, the drawbacks encountered in the existing collection of redesigned courses will be overcome in the design and implementation of the learning objects.

According to an academic department head at the Guadalajara campus, almost all the courses from the current academic programs were already redesigned. There is a database where faculty can check “redesigned courses, from what campus, what type of platform it is mounted on… if it has a didactic technique or not,” and so on. For another academic department head at the same campus, these stocks of knowledge represent “the documentation of the work and effort devoted in undertaking a new educational model, which still needs to become fully developed and still needs to arrive at full stature.” Most certainly, the number of courses redesigned at the system level that are mounted on learning management systems is quite large. According to the most recent institutional report, 72% of all the courses offered at the Tecnológico in all its campuses are codified on learning management systems (Tecnológico de Monterrey, 2007). This collection can be considered a large database of intellectual assets by anyone.

From the information gathered at interviews and collected institutional documents, it can be readily determined that redesigned courses and learning objects were not the only intellectual assets created at the Tecnológico. The different information technology that was developed in the form of software applications can also be considered instances of intellectual capital. As a mid-level academic administrator stated, “I was thinking only about the courses, but there are two. One is the content and the other is the platform.” The most pre-eminent information technologies created are WebTec, the in-house learning management system and its further development, Sapiens, and the e-Academic Assistant. As a matter of interest, it is worth mentioning that only two of the interviewees directly mentioned these information technologies as part of the stocks of knowledge that the Tecnológico posses as a result of the implementation of its educational model. One of these two participants was a mid-level information technology manager and the other was a mid-level academic administrator. The majority cited only redesigned courses and learning objects.

Several academic administrators and information technology managers mentioned another type of organizational knowledge which has been developed along with the implementation and operation of learning management systems. They were referring to the *operational knowledge* created. As an example, a top level administrator recalled that they had intensely tested three different learning management systems and stated “From that point of view, I have no doubt that we have learned a lot: what capacity they should have, what their limitations are, etc. How you train professors in a massive way? How you train students in massive quantities? I do not have a doubt that we have learned an awful lot.” The interviewee also expressed that they had develop processes for converting redesigned courses from one learning management system to another. The respondent stated “We have moved courses in a massive way from platform to platform, starting with Learning Space and continuing with Blackboard and then WebTec. We have done the process of exchanging from one platform to the other very agile. Technology has not been a problem.”

A mid-level information technology manager expressed that the "intangible" knowledge they have created with regard to learning management systems was in terms of stabilizing software and hardware operations on all campuses, achieving a robust information technology system, and centralizing the information technology process in a multi-campus higher education system like the Tecnológico. At the campus level, much has been learned from the administration of learning management systems. As an information technology staff member at the Guadalajara campus expressed: "… At the beginning, everything was manual… With time, we automated processes and procedures… which allowed us to be more efficient and effective. Now we do not require that many people to provide that support."

The above findings show that varied knowledge was created in the implementation of the education model. Some of it was captured and codified, but other knowledge still remains tacit. They also show the way faculty members and administrators perceived the stocks of knowledge that have been developed.

The Knowledge Transfer Process

The management of intellectual capital implies formalized transfer of intellectual assets and tacit knowledge. Sharing knowledge is vital to the organization's success and to the creation of new knowledge; therefore, the organization must set in place the mechanisms and the strategy to facilitate and promote knowledge transfer (Choo & Bontis, 2002; Davenport & Prusak, 1998; Roos et al, 1998).

During the interviews conducted, participants in this study mentioned that the design of the courses affected their transferability. They expressed that there does not exist a culture for documenting individual experiences and the absence of such a culture creates obstacles to organizational learning. They also mentioned the ways in which knowledge is shared within the institution among faculty members as well as the knowledge transferred between the Tecnológico and commercial corporations.

For example, a mid-level academic administrator expressed that sound redesigned courses included the necessary information and instructions for faculty members to adopt them. The respondent stated “A well organized course must include the documentation on how the professor works, and the feedback. Everything gets documented because, naturally, that information explains how the course can be administered.” A faculty member at the Guadalajara campus added “When the course is very well developed, it is well documented and it is easier to make some improvements to it in the following semesters.” An inadequate documentation of a course hinders its transferability, as an academic department head at Guadalajara stated:

> I believe it has a lot to do with the documentation. Sometimes, maybe a course does not have all the documentation that allows the professor to convey what was the idea of the designer, what exactly was s/he thinking or what s/he was trying to do when s/he made the redesign…. in the culture of documenting, there are things that we do not describe completely, they are partially described, and the whole idea about the intent of the professor cannot be conveyed.

With the experience gained in redesigning and transferring entire courses, the institution is now developing smaller modules called learning objects using different criteria which include international standards. Developing smaller elements of instructional material may allow better documentation. Learning objects were considered to be a more flexible approach for producing redesigned courses and, hence, for promoting the transferability of these intellectual assets.

The participants in this study recognized that redesigned courses enclosed at least a partial documentation regarding the administration of the course, the teaching notes, and directions from the individual author(s). They also acknowledged that the collective experience in the implementation and accomplishment of the educational model was not documented and, thus, was not available to further organizational learning. In reference to the knowledge created at the institution, a top level academic administrator stated:

> I do not think we were able to encapsulate it. I think we do not have the time to do it. We have always lived a lot in such a dynamic activity that it does not allow us the final step which is documenting. Although we made a lot of progress in that aspect with this project because nowadays the professor has all the processes documented in his/her courses.

An academic department head at the Guadalajara campus uttered with emphasis: “I think that at the system level there is a lack of effort to capture all these experiences, because you can talk about your current experience… but we lack capturing, documenting the experiences.” A faculty member at the same campus agreed on the aforementioned and added:

> I do not think that we have, up to this moment, a systematic process to recover these learnings which is where our capital is. This is to say, we do not have machinery, we rather have concepts, ideas, and those are handled by the people who are walking around, but those are not incorporated to a recovery mechanism for experiences and knowledge.

At the Querétaro campus, interviewees agreed with the aforesaid. “All that knowledge remained in the private files of each professor” a top administrator expressed. In the opinion of an academic department head at Querétaro, most of the knowledge created is still tacit and resides in the heads of each faculty member. The respondent remarked:

> I think that [the knowledge created] is being transferred by word of mouth. It is neither being taken advantage of in a conscious manner; nor is it being recorded…. The best practices or the good practices, or the good methods that are found still remain in the professor and they circulate in the department at the most, if s/he talks about it, if s/he lets it known. I think that what we have achieved at the system level is being lost or it remains in the people who did it, who developed it, who are trying it out; and maybe in a small circle around but not farther. I do not think that we are consciously making a record.

In the words of a top level administrator at the system level: "One of the problems that we have is that we document things very little, we have that weakness." The latter statement was echoed by a top level administrator at the Querétaro campus. The interviewee expressed that:

> I think that we are an organization who does not pay much attention in documenting the experiences… I would say that in the campuses we are so engaged in the day-to-day operation that we hardly give ourselves the time to document what we are living, what we are learning. I think that, in general, we capitalize little on our knowledge.

According to Choo and Bontis (2002), a critical element for an organization to leverage its intellectual capital is management of the knowledge that is created. In other words, by capturing and codifying each individual's knowledge, a collective stock of organizational knowledge is generated. These stocks of knowledge need to be organized, maintained, and administered. Participants in these multiple-case studies indicated that the management of redesigned courses was still an issue at the Tecnológico. Several of the interviewees referred to a central database that was developed to enclose and manage all the redesigned courses in the system. There were respondents who focused on the benefits of such a database and there were others who provided a more critical perspective and spoke of the redundancy and obsolescence of courses in the database. Management of the redesigned courses database was clearly a concern as a top level academic administrator expressed: "We have been in the *struggling,* in the anguish of how to manage this knowledge." The respondent added that the database included all the redesigned courses as well as all the modifications made to adopted courses which were in turn recorded as newly redesigned courses. The interviewee stated "That resulted in an enormous redundancy because at the end there were a series of contents which were the same except certain things." In addition to the aforementioned, a mid-level academic administrator at the Guadalajara campus added: "[Some] of the approved courses at the system level that reside there are obsolete, some are not taught anymore. Some have evolved and have not been updated."

Several of the interviewees underscored the dynamic nature of the knowledge created and codified as redesigned courses; therefore, it had to be revised and updated permanently. In this regard, a top level administrator indicated that a tremendous effort was once made to purge the database and about 8,000 courses were eliminated. Among these courses, there were duplicate courses as well as courses no longer in use. The respondent further added:

> If we take a look right now, I am sure that there is again a number of courses there that are taught only once, that the author was a part-time professor and that s/he is no longer in the institution, or replicated courses or adopted courses. It is highly complicated to administer a knowledge database for an institution that is so dynamic, that is growing or have grown and with the creativity that each professor incorporates. It is very difficult.

In spite of the above, a clearly positive aspect was the fact that the Tecnológico did develop a database which was perceived as beneficial for several of the participants. As an example, a mid-level academic administrator remarked that "a database has been created which is organized in such a way that a professor goes in and can find everything s/he needs to be able to improve his/her teaching practice." A mid-level academic administrator at the Querétaro campus concurred with the latter and further explained: "When a course is approved at the system level it is kept in the database and the door is open for everybody to enter and choose any course… from any of the undergraduate programs and any discipline." In the same order of ideas, a faculty member at the Guadalajara campus underscored:

> I had access to all the courses that were designed in all the country, in the entire system, and that is an extraordinary knowledge. Once you were given the access key to any of the courses which were redesigned, you could review the work of many hours, of many professors, around a same subject, around a same content.

Similarly, a faculty member at the Querétaro campus argued that learning management systems allowed faculty members in the entire Tecnológico's university system to exchange their knowledge. The respondent explained:

> Yes, because you have access to any course. If I say today: "I want to know how the Operations Research III course is being taught at the Chiapas campus," I can go in and check, access the course, and see the book the professor is using, the type of assignments that s/he is giving, the type of quizzes s/he is giving; that is, there exists the possibility to share knowledge. I think that knowledge is being shared. This is an opportunity to generate new knowledge, because I can [see]… "Look, this professor is doing this, and this professor is doing that," and there can be synergy. This can generate new knowledge, I believe so.

A mid-level academic administrator at the system level underscored that "the fact of having these resources available allows one to advance faster because of the advantage of being able to adjust it and reutilize it;" however, one of her peers at the Querétaro campus warned that "it is an accumulated experience, but if it is not promoted or if it is not known what to do with it, it is a dead resource." The respondent further expressed that more work has to be done in this regard.

In addition to the obsolescence and redundancy the interviewees spoke about, other deficiencies of the redesigned course database were perceived. For example, the structure and organization of the database was mentioned as one of the drawbacks which hamper the transfer of redesigned courses. According to a top level administrator at the Guadalajara campus, the database does not provide a useful mechanism for promoting the sharing of the resources contained in it. The respondent explained:

> We have a large database which we have always dreamed of considering as the knowledge database and managing the knowledge the Tec has. However, it seems to me, in reality, that its use is very impractical. We have not been able to develop taxonomy or a classification of all the components of the database which will facilitate to search by topic, by key words, by duration…. For example, you see a History course developed by a professor. It has a quantity of his/her own text, photographs, drawings, activities, and everything; but how does another professor, who is in another place, discover it and how does s/he takes only part of it, not all. That exchange mechanism requires a classification and a reasonable structure that everybody understands. That is why it has become difficult …because we are a very complex organization and faculty members in general are complex.

In regard to the redesigned courses in the database, a top level information technology manager stated "We have not found a way to put them in order; that is why maybe a knowledge database will help us to put it in order." The respondent further added "There is not a mechanism where you can say: 'How do I … break this down into topics?' at least into topics and record those in case somebody wants to use them."

It was mentioned that the work being done to define learning objects will facilitate their transferability. One criterion was to develop a common understanding of the concept to facilitate sharing those learning objects. Other criteria mentioned by a top level academic administrator referred to how they will be classified, "by topic or subtopic, by quality? Who will be authorized to put it there and withdraw it from there? And, who will look after their quality?"

Another obstacle mentioned with regard to the transfer of redesigned courses in the database was the lack of a well designed, formally established, system wide process and program to disseminate and publicize the information about the courses available in the database and their characteristics. It was found that each campus implemented its own process, if any, to facilitate the transfer of redesigned courses. A mid-level academic administrator at the Guadalajara campus stated "There is a lack of information propagation. I think something that needs to be improved is the promotion of the courses." Another mid-level academic administrator at the Querétaro campus remarked "Right this moment, we are doing very little [with the knowledge created], further than knowing that the database exists… maybe it is a responsibility of the directors for academic development to promote the utilization of that knowledge already accumulated." Coincidently, a staff member of the department for academic development at Querétaro remarked that they provide information about redesigned courses in the database to faculty members who ask for them. The respondent stated "We provide the support for that [searching the database]. When a professor comes and says 'I am going to redesign,' the first we do is go in and check. We download the five courses that are available for that class. Hence, we encourage that, particularly with new coming professors who are not involved in this."

In the case of the Guadalajara campus, the redesign support center played an important role in promoting the courses available in the database. As an example, a faculty member explained: “How does one find out? Well, for example, in my case of Multivariate Statistics for Management, the Department for Educational Technology in this campus gave me CD’s with the links and information of other courses… of my same subject which were in other campuses.” The respondent further added that faculty members can have access to redesigned courses, but the requirement is not institutionalized; faculty members have to search the database first to look for already designed courses when they need to teach a course. An academic department head at the same campus expressed, “We have to be honest and recognize that this process of information transmission has not been the best. We really would like that the best practices of a faculty member to permeate to other professors.”

When asked for the mechanism by which faculty members find out about redesigned courses that can be transferred, a top level administrator at the Guadalajara campus mentioned the existence of a web portal which provided access to the database of approved redesigned courses. Besides not being sure if it was kept up-to-date, the respondent suspected the transfer of courses have increasingly been carried out through personal contact between faculty members who know each other and between campuses which are connected.

In regard to the above, it was found that the Tecnológico did not have a formal mechanism in place for the transfer of knowledge between authors and faculty members adopting the course, particularly when each were in different campuses. Faculty members who authored a redesigned course expressed that adopters of their course communicated with them personally in order to ask questions, ask for materials, and advice. That was perceived as valuable because it contributed to creating links between faculty members and to promoting the sharing of knowledge, but the down side was that it demanded more work and time on the part of the author faculty member. As an example, a faculty member at the Querétaro campus stated "It is not that I do not want to [share my knowledge], but it is that I do not have the time to do it." Another faculty member at the Guadalajara campus complained "I already redesigned. Why do I have to interact with… [the adopter]? Why do I have to send him/her things? It demanded much more work and no consideration was given to this process."

Faculty members mentioned other informal networks for transferring knowledge that were developed by some of them for example, while attending the facilities in the redesign support centers or while participating in the training program for the educational model.

Several of the interviewees reported that there is an annual conference at the system level where faculty members share their experiences; unfortunately, not all faculty members attend this conference. They also mentioned regional efforts to formally gather faculty members, but they were perceived as discrete events. The respondents concurred that these events are "rarely documented and are seldom capitalized." A top level administrator at the Querétaro campus remarked that there are academic meetings, but there is not "a systematic documentation that generates history." The respondent added that much of the organizational knowledge is still transmitted orally. It is worthwhile mentioning that the interviewee indicated there was no follow-up of the memoirs from the few events that were documented because there were no lines of research and there was no time for follow-up either.

Information technology staff members mentioned that their local processes were not documented and that their knowledge is not formally shared among campuses. The same view was held by staff members in the departments for academic development.

Other formal mechanisms found for transferring knowledge among faculty members which were not explicitly mentioned as such by the interviewees were the communities of practice that have been created and the project SINERGIA developed by the Guadalajara campus. Interestingly, none of the participants in this study mentioned a connection, neither a formal nor an informal one, with the Tecnológico's graduate programs in education and research being conducted there. When directly asked, one of the interviewees stated that there is no relationship between those programs and the people involved in the development of WebTec and Sapiens.

Choo and Bontis (2002) argue that knowledge is not only transferred within the organization, but also between organizations. In regard to learning management systems, the Tecnológico worked closely with Blackboard to stabilize their software application and also shared some information about the Tecnológico's educational model. As a mid-level administrator stated "Blackboard wanted us to tell them about our model, how we did it. In fact, at some point, they wanted us to help them with the content of our's, to develop courses for them, and they would translate them." Another mid-level administrator underscored that the functionalities of WebTec have been presented to other universities as well as other software and hardware organizations such as

Blackboard, Microsoft, WebCT, Google, Hewlett-Packard, Intel, Emerson, Sisco, and the Carnegie Melon Institute, but no relationship for transferring knowledge has been established.

A mid-level administrator at the Guadalajara campus mentioned that the Tecnológico is a founding member of the Corporación Universitaria para el Desarrollo de Internet (Corporation of Universities for the Advancement of Internet). The corporation encompasses Mexican universities interested in joint research participation, conferences and workshops about the use of information and communication technologies in higher education, and coordinating the Internet 2 international project in Mexico. According to the respondent, the Tecnológico has participated in courses about learning objects and presenting their experience in using learning management systems.

The Knowledge Utilization Process

In the knowledge utilization process, the organization integrates and coordinates its stock of knowledge to produce goods and services. The organization employs its intellectual capital in ways that create value; therefore, the organization looks for new ways to apply its knowledge as well as for new forms of knowledge (Boisot, 2002; Choo & Bontis, 2002; Davenport & Prusak, 1998; Roos et al, 1998).

In this study, several of the interviewees expressed that the Tecnológico has not capitalized on the instructional knowledge that has been created. Some respondents pictured the database of redesigned courses as an unexploited “gold mine” of which the accumulated content is not known by the majority of faculty members. A faculty member at the Querétaro campus expressed “It is like a gold mine which is locked and somebody has to take charge of opening it up." At the Guadalajara campus, an academic department head stated "From 1997 up to now, we have accumulated a great amount of material and I feel we do not really know all that we have done, except for a few people. We still do not know the size of the accumulated material we have." In the opinion of another faculty member at the Querétaro campus "The first step that has to be achieved is that professors at the Tec start exploiting the gold mine… We have to exchange all the knowledge that we are generating."

Faculty members and staff members at the departments for academic development concurred that the Tecnológico could capitalize on its stocks of instructional knowledge to improve the teaching and learning process. By sharing their expertise and their best practices, faculty members could learn from each other and enhance their teaching and thus, "that could be translated into the improvement of students' learning." A faculty member at the Guadalajara campus expressed:

> I think in a knowledge database that allows you to share your individual knowledge as professor and gives you the possibility to enrich your practice with what others do…. I imagine it as a system where I as an individual can come and contribute with something, but also from where I can extract information, knowledge from many professors. From people who have more experience. From people who are sending their contributions. Where [knowledge] is kept fresh. Where I have the possibility of correcting it and it does not get stuck, covered with dust….It would be a place or a space from which, as an organization, we can learn and keep up-to-date, and moving.

By reutilizing the instructional materials that have been developed, faculty members' best teaching practices can be replicated and therefore other faculty members' instruction can be leveraged. As a faculty member stated "A course can be taught in a thousand different ways. I am teaching it in a way but, if I access another professor's course, I realize that the other professor is teaching it in another completely different way. The professor is using a completely different book, is using a didactic technique which I did not think was possible.” Another faculty member stated:

> By having a collection of didactic material on the [technology platforms] a professor who is going to teach a course for the first time does not start from zero… the professor is able to question what s/he has already done and see if it can be done in a different way. The professor is able to change the approach in covering the course content or adapt it to the student’s learning style.

Despite the value assigned to the stocks of instructional knowledge, faculty members identified the major factors affecting the exploitation of their gold mine. Three primary factors were mentioned: the lack of an institutional policy, the lack of time, and an inadequate database structure and organization. For example, a faculty member at the Guadalajara campus mentioned that, even though the practice of employing the database of redesigned courses is not uncommon, it is not yet generalized. The respondent stated “I would say it is common in the sense that if I am interested I can do it. It is not generalized in the sense that I do not feel it is something that is institutionalized.”

A faculty member at the Querétaro campus underscored that some of his colleagues use the database because they have to adopt a course, not because they are convinced to invest their time in doing it. “I do not review courses from other professors at other campuses and that is my mistake,” stated an interviewee at the same campus. “There is no time because there are always a lot of activities going on; hence, the thing is to generate knowledge and to keep it there, for it not to be lost, at least,” expressed another faculty member at Querétaro.

Participants at the Guadalajara campus held opinions similar to their peers at Querétaro. An academic department head expressed that they can download a number of redesigned courses, review them, and choose the best among them. However, the respondent remarked “In principle, that is an extraordinary idea; but, the time that the professor has to reflect on them is somewhat limited in order to make a good choice.” As an example, a faculty member confessed that some of the choices made by her were “by feeling” or because she knew the author and not because she reviewed the “six courses that were available.” The respondent underscored that the span of time available was too small compared to the span of time expected for faculty members to teach all their courses in the format required by the educational model.

In regard to the database organization, a faculty member at the Querétaro campus stated:

> We need somebody for organizing and providing feedback about the possibilities that are there. That way, we could have a type of electronic bulletin that could tell us: there are so many redesigned courses of this class, the structures are these… That could give us a statistical summary of the available courses, the way they are, the levels they have, etc., etc. That they could organize them better, and that we, the users, the professors, could clearly see the interesting things we could use. Right now, I feel like everything is massively put in there and, of course, it is organized but not sufficiently organized for us to feel motivated enough to go in and explore what is inside there.

Several of the interviewees were interested and expected with confidence that the development of Sapiens could overcome the deficiencies in organizing instructional knowledge and could become a “meta-database” of learning objects. A mid-level administrator at the system level stated “In theory, we should have a repository of learning objects. It would be ideal for it to contain, I do not know, five different ways of explaining a concept. Perhaps, some of them are more practical and the other more theoretical." Faculty members could choose from the array of available learning objects accordingly to their personal style, characteristics, or interests. The respondent further added:

> We can even move more toward the student: What is the student's [learning] style? Which one s/he wants to learn with? I put them all for him/her. "Do you like lab practices? Theory? Reading?" And the student could say: I feel fine with this type. "Well, then take it." Thus, you could have all that available so students could better learn the concept.

For a top level academic administrator at the system level, the strategy was that faculty members could take the best learning objects developed by an individual or a team of faculty members and incorporate them into a newly designed course.

In addition to the above, participants identified other possible modes of using the stocks of instructional knowledge in conjunction with other forms of organizational knowledge. For example, several interviewees mentioned that learning management systems have been used in some academic programs to create students' electronic portfolios which can assess students' performance or progress in their entire program. This compilation can also be used by students in their search for a job to demonstrate their qualifications to potential employers. The respondents underscored that electronic portfolios were already being used in the architecture undergraduate program.

A second example was provided by a mid-level academic administrator at the Vice-Rectory for Academic Affairs. The respondent mentioned they were going to develop a means to assess the level of student's self-management of the learning process in the Tecnológico's Educational Model. The last example of knowledge utilization came from the Guadalajara campus. An academic department head described their idea of using the student's academic performance history in mathematics to identify his/her weaknesses and thus, prior to a class, recommend to the student a set of remedial learning objects. The interviewee stated "We did some research in the students' database and found the information that could give us an idea on the expected performance of the students [in the course]. We were basically looking for the students who could require special assistance in order to provide it opportunely in such a way that they do not lag behind during the semester."

The above findings show that, in the respondent's mindset, the first and foremost notion regarding ways to capitalize on the accumulated instructional knowledge was to improve and enhance the internal academic service provided to students and faculty's academic work. However, participants also brought forward other current examples of usage as well as potential usage that diverge from the above. For example, several interviewees mentioned the possibility of sharing learning objects or complete courses with universities in México and abroad and forming a network of universities interconnected to a database of instructional knowledge. In this regard, a staff member at the department for academic development stated "A knowledge database to which many universities have access and are able to choose material from MIT, Stanford, the Tec de Monterrey, and have a membership. Then, I think that a lot of advantage can be gained not only looking at it in the short scope of the mere institution, but going beyond it."

Other respondents mentioned the commercialization of the expertise in using learning management systems and of the instructional knowledge for revenue generating purposes. A top level administrator at the Querétaro campus remarked “It certainly must have a commercial value, but I do not have the slightest idea if anybody is looking after that.” Interestingly enough, only a few of the interviewees mentioned the potential commercial value of the organizational stocks of knowledge. Furthermore, only two of the participants expressed the potential commercialization of WebTec.

With regard to WebTec as an element of the Tecnológico’s intellectual capital, it was mentioned that it supported the creation of the Universidad TecMilenio, PrepaNet, and the Community Learning Centers. The Universidad TecMilenio, created in 2002, is sponsored by the Tecnológico. Its goal is to increase access to education for low and mid-level income students. It offers high school, undergraduate, and master’s programs aimed at developing professional competencies and skills and enabling graduates to rapidly enter the labor market. Academic programs are offered in two modes: face-to-face and online. In fall of 2006, the Universidad TecMilenio had an enrollment of 17,158 students in its 31 campuses located in different cities throughout the country (Tecnológico de Monterrey, 2007).

PrepaNet and the Community Learning Centers are other two examples of the Tecnológico’s social commitment. These two programs were created to promote the sustainable development of marginalized communities at a disadvantage. Both programs are linked to the Tecnológico’s mandatory social community service for its students. The Tecnológico’s social community service is an important entrepreneurial countertrend to academic capitalism’s neo-liberal model (Rhoades, Maldonado-Maldonado, Ordorika & Velazquez, 2004).

PrepaNet is an online education program created for those who did not have the opportunity to carry out their high school studies for economic or geographic reasons. PrepaNet courses are designed by faculty members at the Tecnológico and its students work as tutors as part of their community social service. PrepaNet started operations in 2005 with 421 tutors providing academic service to 1,125 students from different parts of México and from Houston, Texas (Tecnológico de Monterrey, 2006e).

The Community Learning Centers are educational spaces and facilities for people in geographically isolated areas of México who lack traditional educational services and for Latino communities in the United States. These centers offer programs and courses fundamental to lifelong learning. Through learning management systems and computer networks, these centers offer courses in support of basic education as well as courses on community development, health, and family. Community Learning Centers started in February 2001. In 2005, more than 63,000 student-sessions were taught (Tecnológico de Monterrey, 2006e) in a total of 1,697 centers; 1,542 of those centers are in México, 16 in Latin America, and 139 in 12 different states in the United States (Tecnológico de Monterrey, n.d.c). The Tecnológico provides WebTec as the learning management system for the delivery of courses; its faculty design and develop the programs and course contents; and it manages the academic process. Diverse organizations along with governmental and non-governmental institutions combine efforts to make possible the existence of Community Learning Centers.

The findings above confirm the previously stated in regard to the ethos of the Tecnológico's instructional production as intellectual capital. From the information gathered, no evidence was found to indicate that the Tecnológico is exploiting its intellectual capital developed in the implementation of its educational model for the purposes of generating revenue. The responses of the participants pointed mostly to an internal application of their intellectual capital in pursuit of implementing and improving their educational model. However, it can be argued that by doing so the Tecnológico is looking after a branding strategy to position itself in the private higher education sector and to achieve a competitive advantage.

The case of the Universidad TecMilenio exemplifies how the Tecnológico diversified its operation by taking advantage of its experience in the educational model and its in-house learning management system. It can be argued that by creating this university the Tecnológico is looking to legitimize itself before the eyes of its constituents and society in general.

From an academic capitalist perspective, an unexpected finding was the utilization of the Tecnológico's intellectual capital for social welfare through PrepaNet and Community Learning Centers. However, it can also be argued as a contribution towards the legitimization of the Tecnológico.

Conclusions

During the interviews, respondents clarified that technology was not equivalent to the educational model, but an essential part of it. Nevertheless, their difficulty in separating learning management systems from the Tecnológico's educational model was evident in the participants' responses. In many cases, the interviewees were asked to focus on the information technology component of the educational model. This phenomenon and the findings in this study strongly suggest that the institution's educational model provided a shared meaning for the use of information technology and influenced faculty members' interactions with the technology. Respondents mentioned the development of a new pedagogical conversation and the development of the Tecnológico's instructional capacity.

Advocacy by the Tecnológico for the use of information technology in education was clear. Educational innovation and information technology were perceived as intertwined concepts and integral to the Tecnológico's essence. Therefore, the utilization of learning management systems was a technological imperative. The perceptions of administrators and faculty members about the purpose of incorporating learning management systems into the teaching and learning process somewhat resembled those of true believers in technology. These perceptions were independent of the type and source of learning management systems being utilized.

The educational model and the use of learning management systems generated a pedagogical conversation which influenced faculty members' behavior and work. In the words of a faculty member: "Nowadays, it is not uncommon to find a professor who really discerns the benefits of opening an asynchronous discussion, for example, or if a particular activity produces more learning by carrying it out directly in the classroom. This was possible because of the incorporation of [IT] technology platforms."

A department head referred to the instructional capacity that was built at the Tecnológico as a consequence of its training in the educational model and the redesigning strategy. The respondent stated "This has taken us to have professors with a greater degree of experience; it could be called expertise, in the pedagogy domain. This to say, I feel we have stepped into new fields in the way of teaching a discipline."

In regard to the development of their intellectual capital, diverse participants concurred that the Tecnológico has learned a great deal with regard to the incorporation of learning management systems into the teaching and learning process, although this knowledge has not been equal at all the campuses in the system. A top-level administrator stated "There are campuses with great learning, there are campuses with little learning; thus, it has been difficult to share all this experience. However, I believe we have achieved a lot with regard to the use of technology for the teaching and learning process."

Even though their perceptions concurred about learning management systems regardless of type, the findings showed that each campus at different regions had different degrees of involvement with the design and required use of learning management systems. Guadalajara developed a larger and more complex organizational support structure for redesigning and was more concerned with meeting the system's benchmarks. Guadalajara was more influenced by the structures of legitimation and, therefore, followed more closely the rules for redesigning and adopting. Guadalajara engaged in the development of META courses and their adoption; thus, faculty members were more critical about the rigid structure of these courses and perceived them as a "straitjacket." The Guadalajara campus showed far more involvement in the design and development of learning objects and developed the SINERGIA project. It was evident that they were true advocates of WebTec, the in-house learning management system.

Querétaro showed less concern with regard to meeting the system's benchmarks and were less concerned and less involved with the choice and design of learning management systems. They developed a smaller and less complex organizational support structure for redesigning courses.

In spite of the development of organizational structures to support redesigning, it can be argued that the redesigning process required faculty members to develop new skills and competencies. This set of new competencies or "*intellective skills"* is required to master a computer-mediated environment (Zuboff, 1988). The design of the Program for the Development of Teaching Skills and dismantling the Redesign Support Centers support the aforementioned.

The incorporation of learning management systems to the teaching and learning process required a major organizational change. This had an impact in the teaching and learning process and in faculty's work. Overall, faculty members perceived learning management systems as a resource which helped faculty members to better structure and organize their courses, allowed them and their students to "extend" the classroom by providing access to more academic resources and activities, and provided a means for communication and interaction beyond the class session.

Furthermore, the organizational structures of domination and legitimation created as a consequence of the extensive and massive use of learning management systems made evident the enlargement of the Tecnológico's administrative structure and the increase in managerial control over faculty. The findings in this study provide enough evidence to conclude that the Tecnológico's organizing principle around the use of instructional information technology was not an economic one, but rather the development of its instructional capacity and an educational model that could differentiate the Tecnológico from its competitors. Their educational model, which entails a particular pedagogy and the utilization of learning management systems, is being marketed as innovative and outmost suitable to prepare students for the new global economy.

The findings also support that the first and foremost value assigned to the intellectual assets generated by faculty members and information technology developers is an academic value. Although the intellectual property structures of domination found revealed the acknowledgement of the potential commercial value of the Tecnológico's intellectual capital, exploitation of revenue generation was not found in any form in either redesigned courses or WebTec, and organizational structures developed for such commercial exploitation were not found. It was found that the Tecnológico has taken advantage of its intellectual capital to create, sponsor and support a different university, TecMilenio, thus expanding its services to target a different student population. An unexpected finding was the Tecnológico's utilization of its intellectual capital for the public good as demonstrated by the creation of PrepaNet and the Community Learning Centers. In spite of the aforementioned, it was clear that the Tecnológico has focused on utilization of its intellectual capital and has not yet transferred this knowledge to other higher education institutions. As a top-level administrator stated, "I am not sure we had transferred much knowledge, but an enormous interest arose and many institutions have tried to use [technology] platforms in a limited way. I believe this has had a real impact and Mexico is probably more advanced in this regard than developed countries." A faculty member underscored "I would say that after we started with these [technology] platforms, many universities followed this movement. They started to have these platforms; I think they saw their advantages."

The various participants in this study concurred that the Tecnológico's major contribution to higher education in Mexico was its leading role with regard to the incorporation of instructional technology into the teaching and learning process. A top-level administrator remarked that "It has really had a strong impact in the country and I have no doubt that the Tec has been the leader. There has not been another university which has done it in the same magnitude, in that volume, and with that effort." The respondents believed that leading institutions as the Tecnológico are always being closely observed by other institutions and are influenced by what they do. A mid-level academic administrator pondered "How do other universities get informed about where innovations are going? They study the Tec and they follow where the Tec is going."

Leading institutions face many challenges which they have to overcome, as a mid-level information technology manager explained: “To me the contribution was that it was the first [institution] to take all the risks involved in adopting an academic model based on technology platforms. Thus, it contributed with that experience of how to adopt such a model, of using platforms, and the results that can be achieved.”

Even though the various interviewees were uncertain of the degree of the Tecnológico’s contribution, they truly believed they had contributed to the development of information and communication technology in higher education.

CHAPTER V: CONCLUSIONS

Introduction

In this last chapter, findings presented in the previous chapter are advantageously used to set forth an answer for each research question. Responses to the three research questions provide reasoned conclusions for this study on instructional production as intellectual capital. In addition, these concluding remarks led the way for concretizing important implications for the literature as well as for practice and for making useful recommendations regarding future research on this topic. First, the purpose of this study and research questions are revisited. Then, implications for literature and for practice are stated; and finally, recommendations for future research are conveyed.

Revisiting the Purpose of the Study and Research Questions

The purpose of this study was to examine and analyze: (a) the impact of educational information technology on the organization of higher education and on faculty's academic work with regard to instructional production and delivery; and (b) the intellectual capital created through instructional production and delivery of information technology enhanced courses and its strategic management.

Research questions are restated here in an attempt to underscore the findings related to each, the inter-connections between them, and the theories used in the theoretical framework.

Regarding the Role of Learning Management Systems in Higher Education

The first research question asks: "What is the interpretive technological framework of administrators and faculty members regarding the role of learning management systems in higher education?" From responses provided by the interviewees, it became evident that all participants had difficulty detaching the learning management systems from the educational model when framing such educational information technology. Several of them made an effort to remark that learning management systems should not be equated to the educational model, that the educational model was independent of that information technology, and that learning management systems served the educational model and not the other way around.

Findings show that participants framed learning management systems in a variety of ways. Faculty members and administrators (information technology staff, academic administrators, and top level administrators) concurred in perceiving learning management systems as a constituting essence of the Tecnológico. In this regard, they shared the view of information technology as a technological imperative to achieve educational innovation. Information technology and educational innovation were perceived as two intertwined concepts integral to the Tecnológico's essence. The quest for educational innovation seemed to be the strategy to perpetuate the Tecnológico's leadership by incorporating information technology into the teaching and learning process; therefore, the utilization of learning management systems was legitimized.

Administrators and faculty members also viewed information technology as an opportunity for students to develop job related skills. Learning management systems were again considered as a technological imperative for a more integral education and a competitive advantage that students must acquire in order to be successful in their jobs. This objective not only legitimized the utilization of educational information technology, but also illustrated the Tecnológico's closeness to the job market.

Administrators and faculty members also perceived learning management systems as a mediating resource for teaching and learning, but emphasized they are useless without an educational model guiding their use. Learning management systems are a useful resource which allows "extending" the classroom by facilitating communication, interaction, and access to educational material and learning activities. This optimizes classroom time and allows for the concurrence of learning processes. Learning management systems and the educational model allow faculty members to: (a) better structure and organize their courses; (b) produce enhanced educational material; (c) enrich and complement the classroom experience; (d) increase student's engagement and responsibility in his/her own learning; and (e) administer the educational process. The aforementioned supports legitimizing the use of learning management systems as an essential element in the educational model and, thus, represents also a technological imperative.

It is important to note that administrators were the only participants who framed information technology as instrumental to the implementation of the redesign strategy. Faculty members did not. This view of learning management systems as the vehicle to carry out the educational model at the 33 campuses strongly supports the technological imperative conception for their use.

Information technology was not perceived by any participant as a tool to achieve efficiency in the organization. They all expressed that the utilization of learning management systems had no impact whatsoever on: (a) the setting for on-campus, face-to-face courses; (b) teaching load; (c) class size; or (d) faculty composition. Data gathered from institutional reports provided hard evidence on the aforesaid. Furthermore, adoption of already redesigned courses was not viewed as efficiency-seeking. Instead, it was viewed as a way to expedite the implementation of the educational model and as quality assurance achieved by standardizing educational objectives, contents, skills, and aptitudes. Findings show that the decision to adopt already redesigned courses was left to the individual faculty member, although part-time professors were strongly encouraged to adopt. Findings also show that the adoption process was highly inefficient because adopted courses were generally modified and adapted; therefore, there were multiple, almost identical, versions of the same course and the number of redundant courses grew substantially. The evidence strongly supports that the Tecnológico was not seeking faculty members to adopt redesigned courses for efficiency purposes; otherwise, they could have implemented more effective structures of domination and legitimation toward this end.

Administrators and faculty members alike did not frame information technology as a strategic resource to develop the Tecnológico’s intellectual capital. Structures of domination that were found support this view. For example, the intellectual property policy set in place was mainly enforced to avoid plagiarism; moreover, it was poorly designed and implemented. The reward system focused only on the redesign of courses and left unattended the adoption of courses, affecting both the author and the adopter. In other words, the knowledge creation process was well developed and fostered, but the knowledge transfer process was poorly designed and implemented. Moreover, the reward system was not evenly applied throughout the university system and differed in its composition from one rectory zone to another.

Findings show that the decision to use learning management systems in the educational model was made centrally by top level administrators and the decision to promote the use of either Blackboard or WebTec was made by each zone's rector. Faculty members expressed that having two learning management systems was for diversification and variety of choice. Although WebTec was acknowledged as best suited for the Tecnológico's educational model, findings strongly suggest that the top administration based their decision on a rational-political reason to foster the use of Blackboard over WebTec. The choice was made based on Blackboard's technical characteristics to support massive concurrent usage. The decision by top administration to continue the development of WebTec seems to be motivated more by the fear of losing Blackboard's support, as that had happened in the past with Lotus Notes. By the same token, top administration is looking after open source learning management systems such as Moodle and Sakai.

Even though WebTec includes more elements of the educational model, findings show that the characteristics sought in learning management systems were based more on aspects of the academic administrative process in lieu of the construction of knowledge by students in their learning process.

Based on the above, WebTec is not considered by the Tecnológico as a strategic resource to develop the organization's intellectual capital, but rather as an academic project developed by the "visible creatives" and promoted by its advocates. Therefore, the resources allocated to its development and improvements are very limited.

Findings also show that there was an on-going dispute within the organization about whether the Tecnológico should or should not engage in the enterprise of developing WebTec. A faculty member at Querétaro questioned "Why does the Tec engage in designing a [technology] platform if this is not part of its Mission? The Tec's mission is to educate, research, and other things. It is a university. I don't know why it undertakes the design of [technology] platforms." A mid-level academic administrator at the system level argued that "there are people who don't believe in this tool [WebTec] and don't think we should be doing this [its development]. They believe we should wait for someone else to do it." A mid-level information technology manager at the system level asserted that the Tecnológico's business is to educate, not to develop educational software applications, and that is why it has always outsourced its information technology. Nevertheless, the participant considered that, in this case, learning management systems were strategic for the educational model. The respondent underscored, "We still have this cultural burden. We think that investing in our own technology is a distraction and that it is better to find it and purchase it. However, there is a risk of depending on technology that is going to be our core business when they [suppliers] close the door on us one day."

Learning management systems are not perceived as a strategic resource for the core function of teaching and learning; therefore, this perception widely favors a business-like strategy to outsource them.

According to participant responses, they make sense of educational information technology through the educational model and their Mission. The 2005 Mission was a strategic planning exercise conducted by top administration with the educational model as the Tecnológico's number one strategy. Therefore, the Tecnológico's mission of 2005 and its educational model are learning management systems *raison d'être* in the teaching and learning process.

In summary, the participants' perceptions neither differed by campus nor by the type of learning management system being used. Learning management systems were neither framed as an efficiency tool nor as a strategic resource to develop the Tecnológico's intellectual capital. Furthermore, administrators and faculty members concurred in perceiving learning management systems as a constituting essence of the Tecnológico as a mediating resource for teaching and learning and as an opportunity for students to develop job related skills. Additionally, administrators were the only participants who perceived learning management systems as instrumental to the implementation of the redesign strategy.

Administrators and faculty members' perceptions are framed by the Tecnológico's educational model and by a technological imperative for educational innovation which was conveyed as a shared social construct of modernity among these relevant groups. According to participants, the Tecnológico's competitive strategy to perpetuate its leadership and attract students is to be regarded as "state of the art" by incorporating information technology into its educational model. Furthermore, information technology is considered a major aspect in preparing students for the job market and for them to be competitive in a globalized economy. Hence, in order to recruit students, information technology is strategically utilized to position the Tecnológico as a modern, innovative institution and bound closely to the international business world.

The administrator's mindset was dominant in the decision for technology choice. It became evident that the strategy was not to construct new knowledge in educational information technology, but to rapidly accommodate to a U.S. developed learning management system to deploy redesigned courses system-wide and across the curriculum. An administrator's outsourcing decision was not only the fastest path to modernity, but it was also regarded as internationally interconnected with important business corporations like Blackboard. Educational information technology provided by a U.S. Multi-national Corporation not only legitimizes the use of such technologies, but also suffices a third world country's idiosyncrasy that technology should be brought from abroad, not developed in-house. Although, administrators fear vendor lock-in, they are still considering depending on foreign technology as the only alternative.

Regarding Organizational Structures

Another research question asks: "To what extent, if at all, are the different strategies of in-house development and outsourcing of learning management systems related to different patterns of organizational structures?" Findings in this study revealed the existence of several structures of domination and legitimation that were created in order to condition faculty members' interaction with learning management systems in their teaching practice. Thereafter, these structures were modified as a consequence of such ongoing interaction. Among these structures were auxiliary offices for the implementation of learning management systems, such as: (a) the Vice-rectory for Information Technology; (b) the Department for Educational Research and Development at the Vice-rectory for Academic Affairs; (c) Redesign Support Centers at each campus; and (d) a few Production Cells at some campuses. The creation of these organizational structures translated into an evident increase in the number of managerial professionals at the Tecnológico. Some of these organizational structures such as the Redesign Support Centers and the Production Cells required faculty members to work together with managerial professionals, thereby forming new networks of actors.

Unfortunately, there was no data available on the number of these managerial professionals who were hired during the implementation of the educational model in order to thoroughly and soundly analyze the degree of expansion in managerial activity.

Other structures of domination and legitimation imposed more controls over the professoriate, particularly in regulating instructional production and delivery which was mediated by learning management systems. Administrators were able to exercise power and sanction conduct through: (a) intellectual property policies; (b) reward systems; (c) training in the educational model; (d) certification of training used in classification of faculty members and sabbatical attainment; (e) the set of criteria for redesigning and the use of software templates; (f) rules for course adoption; (g) the adopted courses themselves; and (h) the approval process for redesigned courses.

Findings show that some initial structures of legitimation were transformed as a consequence of interaction with learning management systems because of faculty members' agency. Faculty members could exercise power by: (a) regulating their engagement in the use of learning management systems; (b) resisting adoption of already redesigned courses without making changes to them; and (c) urging for a more flexible and modular redesigning paradigm. Consequently, the norm was changed for adopting courses without adaptation and the set of criteria was modified for redesigning a course. From that point on, the notion of learning objects was introduced and embraced; therefore, new criteria were developed for redesigning these learning objects. Lastly, the institution formally recognized four levels of information technology usage according to the engagement of faculty members with the utilization of learning management systems in their teaching practice. These four levels became the new norm for the structure of legitimation.

Findings provided enough evidence to conclude that the aforementioned institutional properties related to and applied equally to both Blackboard and WebTec learning management systems. Regarding instructional production, no different patterns of organizational structures were related to the different strategies of in-house development and outsourcing of learning management systems. Furthermore, due to transportability issues, redesigned courses and learning objects were first produced in a "generic" format and then uploaded to the corresponding learning management system. Software templates, like the e-Assistant, enabled the designer to accomplish the latter.

Thus, redesigning was independent from the learning management system used to deliver the course.

An expected finding was that the Program for the Development of Teaching Skills, an important structure of domination, was not significantly different in relation to the sourcing strategy for learning management systems. The only relevant difference found was one module concerned with training the participant in the specific learning management system s/he was going to utilize to deliver his/her course.

In regard to the support provided for instructional production by each campus, some differences were found. For example, Guadalajara campus developed a larger and more robust Redesign Support Center and even created a Production Cell which focused on the production of META courses. Faculty members at Guadalajara were more involved with the development of learning objects as well as with the Sapiens project. Faculty members at the Querétaro campus were less concerned with the choice of learning management systems and, therefore, less engaged in the academic discussion about their appropriateness for the educational model.

Furthermore, each campus developed different support structures for implementation and operation of the redesigning process. Evidence suggests that this depended more on the campus engagement and concern with (a) the utilization of learning management systems and (b) the system of indicators about advancements in the implementation of the educational model rather than on a particular learning management system. However, the Guadalajara campus demonstrated strong advocacy for WebTec and was actively participating in furthering its development. Participants from the

Querétaro campus were more detached from the academic discussion about the appropriateness of a particular learning management system for the educational model.

Findings also show that the outsourcing strategy had considerable more support from top administration and that the in-house development strategy was considered to be more of an academic project by the “visible creatives” in the organization. The Vice-rectory for Information Technology has devoted more resources to make Blackboard functional for its massive use and has maintained low utilization of WebTec. Since WebTec has been more an academe’s endeavor, the team of developers was not part of the Vice-rectory for Information Technology. Currently, the team reports directly to the Vice-rectory for Academic Affairs. This circumstance is the most eminent and important difference in organizational structures regarding the sourcing strategy of learning management systems.

Other important differences found relate to utilization of the in-house learning management system for mediating collaboration of faculty members in relevant academic projects. WebTec is being utilized to support the work of various communities of practice and the Sinergia project. Furthermore, WebTec is the foundation for the development of Sapiens, the strategy for redesigning, sharing, and administering learning objects.

It is interesting to note that WebTec is the learning management system being used to support the Tecnológico’s social projects such as PrepaNet and the Community Learning Centers which are of utmost importance to the Institution. Also, the Universidad TecMilenio began its operation relying solely on WebTec as the learning management system to support their teaching and learning process. The Universidad TecMilenio recently started using Blackboard as well.

The Tecnológico's Virtual University offers five graduate programs in education: (a) a PhD in Educational Innovation; (b) a Master program in administration of educational institutions; (c) a Master program in education; (d) a Master program in educational technology; and (e) a joint Master program in educational technology with the University of British Columbia. Interestingly, these graduate programs as well as graduate research in education, and the Virtual University's Center for the Study of Education were not interconnected with the department for Educational Research and Development at the Vice-rectory for Academic Affairs, the Vice-rectory for Information Technology, or WebTec's team of developers, with regard to the educational model and the use of learning management systems in instructional production and delivery.

A possible explanation for the lack of connection with the Tecnológico's educational model could be that the Virtual University is concerned with distance education, particularly online. Still, it is worth noting that the Tecnológico is not capitalizing on its intellectual capital by not fostering creation of new circuits of knowledge between researchers, practitioners, and faculty members in order to promote sharing and transferring instructional knowledge.

A thorough analysis of changes in organizational structures is not complete without discussing unchanged or unaffected structures. Findings show that academic organization did not change as a consequence of the incorporation of learning management systems for instructional production and delivery. Academic divisions and departments, the two main academic organizational units, did not suffer any changes. Also, as stated before, the traditional class format remains the same: faculty members and students meet in a classroom for the entire class period throughout the semester.

In summary, no structures for commercialization of instructional intellectual capital were found. The organizational structures created were concerned with the educational payoff of incorporating learning management systems into the teaching and learning process. These organizational structures applied equally to both strategies of in-house development and outsourcing of learning management systems.

The structures of domination and legitimation developed at the Tecnológico increased administrators' control over the academe and re-structured faculty members' academic work and teaching practices. They also fostered patterns of mechanistic thinking with regard to instructional production and delivery, and quality assurance via standardizing the educational model. The educational model is bound by the learning management systems which are being used under a deterministic approach.

Faculty agency was constrained by these structures of domination and legitimation. The Tecnológico's organization is trying to meet its goals through systems of strong top-down controls. Noncompliance to the educational model may result in not re-hiring part-time faculty members, and at the extreme, jeopardize a full-time contract. In spite of the above, one-third of course sections system-wide are not being offered under the educational model. Faculty members exert different degrees of freedom in relation to the level of usage of learning management systems even though there are no rewards related to the level of usage.

With regard to the sourcing strategy of learning management systems, the most salient difference in the organization is that Blackboard is a more robust learning management system that supports massive concurrent use and is, in fact, widely used. WebTec appears to be more appropriate for the Tecnológico's educational model and for mediating collaboration among faculty members, but is considered an academic project that does not support massive concurrent use. Therefore, its development has purposely been kept low. Aside from the official discourse that two learning management systems offer diversity and variety of choice and are based on the degree of investment of resources and their usage, it seems like the strategic purpose of Blackboard is to develop human capital for multi-national corporations while WebTec supports the Tecnológico's social projects.

Regarding Intellectual Capital

The third research question inquires: "To what extent, if at all, are administrators considering different ways of organizing learning management systems and consciously managing the organization's intellectual capital?"

Findings show that the Tecnológico devoted considerable resources to the implementation of its educational model which entails the incorporation of learning management systems as an essential element for instructional production and delivery. Taking the model for strategic management of intellectual capital as its framework, the implementation of the Tecnológico's educational model corresponds to the knowledge creation process. By its nature, this process is continuous and overlaps with the processes of knowledge transfer and knowledge utilization. Moreover, findings suggest that these three processes are inter-related and influence each other.

As mentioned in the previous section, the Tecnológico established diverse institutional conditions for instructional production and delivery at the system level. At the campus level, each campus developed different supporting structures for the production of redesigned courses. During the implementation of the educational model, faculty and non-faculty members created vast amounts of instructional knowledge as well as operational knowledge. Instructional knowledge can be regarded as the experience and practical knowledge derived from combining the use of various didactic techniques, a pedagogical model, and learning management systems in faculty members' recurrent teaching practice. The outcomes of instructional production at the Tecnológico are embodied in a vast amount of digitized educational material that encompasses learning activities, teaching-learning environments, redesigned courses, and learning objects. Other outcomes are the various software applications that were developed such as the e-Academic Assistant, WebTec, and Sapiens. The aforementioned outcomes are examples of intellectual assets or tangible, explicit knowledge, but there still is a considerable amount of instructional knowledge that remains tacit.

Operational knowledge refers to the knowledge contained in practices, processes, and procedures developed primarily by managerial professionals in the implementation and operation of learning management systems. Findings suggest that a considerable amount of this knowledge has not been captured and codified; therefore, it still remains tacit.

In the knowledge creation process, learning management systems were the vehicle to make instructional knowledge explicit. Following the redesigning guidelines in the educational model, instructional knowledge was codified into redesigned courses and learning objects, then captured by uploading it to learning management systems. The delivery of on-campus, face-to-face, redesigned courses was supported by the use of learning management systems which allowed concurrence of learning processes, optimized class time, and "extension" of the classroom.

With regard to the knowledge transfer process, participants acknowledged that the Tecnológico has developed an immense repository of redesigned courses. However, several participants identified relevant database deficiencies. They underscored that redesigned courses contained therein are rigid and monolithically aggregated; consequently, those conditions hinder their transferability for adoption. Furthermore, the database contains a large number of obsolete courses as well as redundant courses that have been slightly changed by adopters. Another objectionable feature of the database noted by participants was that redesigned courses are not arranged by a systematic, planned, and united effort; therefore, users cannot perform advanced searches for information in the database and useful and valuable information cannot be found easily. In addition, the institution has no formal mechanisms for knowledge transfer between authors and adopters or to promote the courses in the database. A well-designed, formally established, system-wide process and program to communicate and publicize the information about the courses available and their characteristics is sorely lacking. Lastly, participants emphasized the absence of a culture for documenting experiences and learning. Participants agreed that knowledge is transferred informally, primarily by word of mouth.

Differences related to the knowledge transfer process were observed from one campus to the other. For example, participants at Querétaro were more optimistic about the database value, whereas participants at Guadalajara were more critical about it, had higher expectations, and were more demanding. Faculty members at Guadalajara were more involved in formal and systematic knowledge transfer mechanisms, such as communities of practice. Moreover, they developed the SINERGIA project to formally integrate teams of faculty members involved in the development of learning objects. Learning objects are modules of a course designed with a set of criteria which will allow their transferability.

Regarding the knowledge utilization process, participants concurred that the Tecnológico has not capitalized on the instructional and operational knowledge generated. They referred to the database of redesigned courses as an unexploited "gold mine" in reference to faculty members' best practices contained therein. Faculty members at both campuses identified three major factors that affect the exploitation of the Tecnológico's database: (a) the lack of an institutional policy; (b) the lack of faculty members' time; and (c) an inadequate database structure and organization. In regard to the latter, participants at Guadalajara expect that the deficiencies of organizing the generated instructional knowledge would be offset by the development of learning objects and the Sapiens project.

Findings show that the accumulated knowledge is being utilized in few different ways. Examples of this are the development of electronic portfolios, assessment of the student's level of self-management in the learning process, and raising remedial student competence. The few examples provided and participant responses suggest that the Tecnológico has not yet capitalized on its intellectual capital. Moreover, they show that the current exploitation of their intellectual capital is merely for improving and enhancing the teaching and learning process. The Tecnológico's intellectual capital "gold mine" is regarded as providing educational value and having learning potential, not economic value or potential for revenue generation.

The aforementioned strongly suggests the Tecnológico embarked in re-engineering the teaching and learning process without a clearly defined strategy to systematically manage intellectual capital developed from instructional production and delivery; furthermore, they do not seem to have such a strategy in place yet. Findings show that the Tecnológico's concerns focused on design and implementation of their educational model and extensive use of learning management systems without a clear vision about the fate of tangible intellectual assets and the vast tacit knowledge that the institution now possesses. Therefore, they did not set in place an integral, well-conceived management system and institutional policies for their intellectual capital.

With regard to considering different ways of organizing learning management systems, it became evident that administrators consider Blackboard instrumental to massive deployment of redesigned courses. Blackboard is regarded as and being used for a content delivery tool and the Tecnológico has not taken advantage of newer versions which include different and improved features. There is no evidence to suggest that the Tecnológico has asked Blackboard to modify their products to better suit the educational model or that it has engaged in partnership with Blackboard to design different ways of organizing Blackboard's products. Instead, findings suggest that the Tecnológico has accommodated itself to the characteristics of Blackboard's learning management system with regard to structure and organization of educational content.

All participants concurred that WebTec has been developed according to the requirements of the educational model; thus, it is regarded as best suited. Administrators and faculty members recognized that its internal communication system, based on transactions, underpins a system for academic monitoring of each individual student. Since inception, WebTec was designed to perform four functions: (a) design of a course or module; (b) delivery of the course; (c) academic administration of the teaching and learning process; and (d) management of a database of entire courses or modules. Furthermore, WebTec is the predecessor of a more comprehensive learning management system called Sapiens. Sapiens integrates the functionalities of WebTec, the e-Academic Assistant for the design of learning objects, and the organization and management of a learning objects database. In spite of Sapiens' importance and relevance for the educational model, it has always been regarded as an academic project and, consequently, it is the academe who has thought of different ways to organize the in-house learning management system in lieu of administrators.

In summary, the Tecnológico has created a vast amount of intellectual assets in the form of redesigned courses, in-house learning management system development, and other software applications. Combined with tacit instructional and operational knowledge, these assets constitute its intellectual capital. Rigidity of redesigned courses, lack of documentation and formal mechanisms, and a poor knowledge management system have impeded the transfer of the Tecnológico's intellectual assets. Findings show that the Tecnológico's intellectual capital is a valuable untapped resource which requires conscientious management and exploitation to the Tecnológico's fullest advantage. Findings also show that administrators perceive the role of learning management systems as instrumental and are not considering different ways of organizing them.

Administrators and faculty members alike did not view information technology as a strategic resource to develop the Tecnológico's intellectual capital. It seems that the Tecnológico's cultural burden and attitude about its role and capacity for creating new knowledge is the most important constraining factor towards development of its own instructional information technology and the transfer and exploitation of its intellectual capital. It was clear that the Tecnológico was not interested in developing new information technology in the form of learning management systems. Its strategy in the creation process was centered in the production of redesigned courses; thus, it underestimated its own size and potential and favored the dependency on foreign information technology.

Implications for the Literature

A salient characteristic of the theoretical framework used in this study is that data collected was analyzed not only through the perspective of each theory individually, but also by interlacing these theories. The latter was possible due to the overlapping of these theories even though they come from different disciplines.

For example, the theories of technology and organization used in this framework explain that the role of information technology in organizations goes beyond technological determinism and also explain the impact that information technology has on organizational structures and vice versa. These theories are most helpful for analyzing and understanding whether and how the restructuring of higher education institutions, the academic profession, and academic practices expressed in academic capitalism occurs due to the extensive and massive incorporation of learning management systems in traditional higher education institutions.

The conceptualization of information technology as a product of human action in the structurational model of technology connects with the tacit and explicit knowledge that is created in the design and use of information technology in the Tecnológico's educational model. Furthermore, the model for strategic management of intellectual capital is useful for analyzing and understanding whether and how this intellectual capital is managed according to an academic capitalist knowledge/learning regime.

This study contributes to the literature concerning the application of structurational models and analyzes the influence of information technology on the organizational structure in higher education settings from a socio-political perspective. The theory and model for strategic management of intellectual capital used in the business field intersects with the theory of academic capitalism in analyzing the fate of instructional knowledge from a political economy perspective.

Higher education institutions are complex, dynamic social systems of interaction. Nevertheless, their components match those of the structurational model of technology. For example, faculty members, academic department heads, information technology staff, academic administrators, and administrators constitute the human components of the model. The technology element comprises learning management systems and other software developments like the e-academic assistant and Sapiens as well as the redesigned courses and learning objects. The structures of domination, legitimation, and signification constitute the institutional properties of the organization.

The structurational model of technology has commonly been used to analyze the influence of institutional properties on information technology as a product and as a medium of human action. In this particular study, the structurational model of technology was not only used for that purpose but to help identify and analyze the institutional properties that condition the interaction with information technology. The model was also used to identify and analyze the institutional properties modified as a consequence of faculty members' human agency in their interaction with information technology.

The theory of academic capitalism contemplates the changes of higher education organizational structures, academic profession, and academic work in developed countries. The academic capitalist knowledge/learning regime has not extensively been studied in developing countries, particularly private higher education institutions which: (a) are not research focused, but rather have a teaching orientation; and (b) are not funded by governmental resources. The main source of revenue for these higher education institutions is derived from student tuition and fees. Therefore, as the findings in this study show, the educational dimension for this kind of institution is central to their brand. Implementation of educational models which utilize state-of-the-art information technology gives them a competitive edge attracting higher student enrollment while maintaining close proximity to the labor market.

With regard to knowledge creation, transfer and utilization, academic capitalism has previously focused on research knowledge; herein, attention was concentrated on instructional knowledge. In addition, with regard to the incorporation of information technology into the teaching and learning process, this study considered not only its influence on faculty member's work and practices but also examined instructional production as intellectual capital and how it is being managed. Furthermore, this study provides evidence of trends counter to the academic capitalist knowledge/learning regime in which higher education institutions treat instructional knowledge as a commodity and seek their potential for commercialization. Findings show that the Tecnológico was more concerned with the educational payoff of its intellectual capital in general. In addition, clear examples were found in regard to instructional knowledge developed at the Tecnológico which was utilized for the public good. The more salient examples are PrepaNet and the Learning Community Centers.

Implications for Practice

This research addressed diverse fields of study such as organizational change, sociology of organizations, and political economy of organizations. Analysis guided by research questions stated here allows the reader and administrators to acquire a comprehensive understanding of concepts, theoretical framework, and working practices related to instructional production as intellectual capital.

Findings in this study are significant and valuable for improving practice and educational change; therefore, their consideration is strongly recommended for faculty members and administrators alike at the Tecnológico de Monterrey and other higher education institutions.

Theories of technology and organization utilized in this research contend the technological determinism perspective. Moreover, findings in this study support the socio-political view in the decision to incorporate information technology into the teaching and learning process and in the choice of information technology. This is an important contribution of this study, particularly for a higher education institution such as the Tecnológico whose educational model entails extensive use of learning management systems.

It has been shown that information technology influences an organization and that institutional properties influence the design and use of information technology. Therefore, top administrators should know the effects of information technology on faculty, students, and the organization, and find out how such information technology benefits professional development, improves academic work and student's learning, and advances the organization. Awareness of the latter would allow administrators to better design and implement structures of signification, domination, and legitimation, particularly with regard to the organization's human, structural, and relational capital.

Regarding its human capital, it has been shown that the Tecnológico developed considerable instructional capacity. Nevertheless, it needs to define the strategies and develop the organizational structures required for capitalizing on it. As an example, findings strongly suggest that the Tecnológico has not fully recognized the potential of its human capital and has not developed new internal circuits of knowledge between faculty members and researchers at the Virtual University, between faculty members and academic administrators in the educational model, and designers of WebTec and Sapiens. Ultimately, the Tecnológico needs to foster the creation of new circuits of knowledge in order to leverage its intellectual capital.

Information technology is an enacted environment; therefore, structures of domination and legitimation directly impact managerial capacity, academic work and the academic profession. Hence, it is advised that the Tecnológico increase faculty agency for improving its educational model and its strategy for the management of its intellectual capital. By exhaustively researching the factors that hinder adoption of redesigned courses and how faculty members use information technology effectively, the Tecnológico can achieve a greater transfer and exploitation of its intellectual assets.

The Tecnológico's institutional conditions of interaction with technology focused primarily on fostering the development of redesigned courses as a form of information technology. Thousands of courses were developed and registered in a huge database which, together with its in-house learning management system development and other software applications, constitutes the Tecnológico's structural capital. However, this knowledge creation process was not accompanied by well-designed knowledge transfer and knowledge utilization processes. The latter shows lack of awareness of the strategic value of its intellectual capital, especially in an academic capitalist knowledge/learning regime.

The Tecnológico's most conspicuous strategy for knowledge transfer was the adoption of redesigned courses contained in the database. However, findings show the drawbacks of rigid, monolithic, redesigned courses and deficiencies in structure and organization of the database. These conditions hindered the transfer of these intellectual assets. In addition, documentation of tacit knowledge was lacking and viewed as an obstacle for sharing the organization's intellectual capital. Moreover, faculty members underscored the lack of a well-designed mechanism to create social networks among designers and adopters. Such a mechanism should include a process for disseminating information and fostering the process of course adoption. Therefore, the Tecnológico needs to develop appropriate structures of domination and legitimation that encourage instructional production of learning objects as well as effective knowledge management systems. The latter can be achieved by supporting the development of Sapiens or by partnering with Blackboard to develop a similar software system.

With regard to the process of knowledge utilization, it was shown that administrators were not familiar with academic capitalism. This concept has not previously been applied in private Mexican universities. The majority of participants did not value the commercial potential of their intellectual capital and did not consider the potential loss of knowledge that is transferred to Blackboard. They did not see the Tecnológico as a test bed for business corporations. These two aspects hold forth academic capitalism as being foreign to the Tecnológico culture. In spite of being closely connected to the business sector, the Tecnológico does not think and does not act like a business corporation with regard to instructional knowledge exploitation.

The educational model is a core process for the Tecnológico. Nevertheless, the development of WebTec is seen merely as an academic project and participants lack the vision of an academic capitalism strategy toward its development. Furthermore, their current perspective about WebTec and Sapiens challenges the Tecnológico's entrepreneurship mission for the development of educational information technology.

A lack of awareness of the commercial potential of instructional information technology in the form of redesigned courses, learning objects, and learning management systems translates into deficient intellectual property policies. The aforementioned are considered an instrumental resource rather than a strategic resource. The latter is of utmost importance. If the innovative idea that information technology transforms education holds true for the Tecnológico, then learning management systems should be considered as strategic resources.

With the latter in mind, it is advised that the Tecnológico consider the knowledge that is being produced and establish its real value and potential as intellectual capital marketable within México and to Latin America.

A decision to overcome its cultural burden and attitude about whether the Tecnológico should create and exploit its intellectual capital demands the creation of appropriate structures of signification, legitimation and domination. These new structures should further the investment in developing its own information technology, the commercialization of its intellectual capital, and financial rewards for faculty members and administrators. This, undoubtedly, is a very important decision to be made.

As part of its structural capital, the Tecnológico is entitled to patent the messaging system developed in WebTec and to transfer this technology either for the public good or for commercialization. Findings demonstrate that WebTec already includes the features for the academic administration of a course that other commercial learning management systems offer; therefore, this might not be the best arena in which to compete. With its vast experience and developed intellectual capital, the Tecnológico is in an advantageous position to design and organize WebTec as a useful resource for the construction of knowledge. This would be a strategic market, a niche that is worth investing resources. The latter would definitely require more active faculty involvement in the design of the educational model and would further enrich and develop the Tecnológico's intellectual capital.

It has been shown that the Tecnológico's main concern has been to develop its human and structural capital which it has accomplished with limited success. However, it has failed to pay attention to the development and exploitation of its relational capital. Commercial software companies like Blackboard can provide a tool for instructional production and delivery. Higher education institutions are the entities with direct student contact and they should take advantage of such information technologies to foster the development of their relational capital. Whether outsourced or developed in-house, the perception of learning management systems as a strategic resource for the development of human, structural and relational capital is of utmost importance for leveraging instructional production as intellectual capital.

From its inception, the Tecnológico de Monterrey has been a pragmatic institution. The Tecnológico was originally created to resolve the need for well-educated professionals, not to bring together academic professionals who generate scientific knowledge. The Tecnológico is a teaching oriented institution remarkably focused on the education and development of its students. Therefore, its instructional intellectual capital should be regarded more strategically and not merely as an instrument for its educational model.

The Tecnológico's intellectual capital is an untapped strategic resource whose potential has not been leveraged. Findings presented in this study will permit higher education leaders to account intellectual capital more formally, deliberately nurture its development, and invest it wisely. This study has important implications for higher education leader decision-making to the extent they can now consider intellectual capital as a valuable and strategic resource. The results of the study will aid these leaders in developing internal policies, procedures, and decision-making processes to manage their intellectual capital consistently for their own benefit and for the benefit of higher education.

Recommendations for Future Research

Regarding the qualitative method employed in this study and issues concerning academic capitalism in developing countries, several aspects are worth mentioning pertaining to further research on instructional production as intellectual capital.

For example, the sample population involved in the present study included only fulltime faculty members at the undergraduate level as users of information technology. Part-time faculty members and students also use this technology in the teaching and learning process; their participation in this study would provide different perspectives on how they understand and use learning management systems and how this technology structures their working practices and learning/studying practices. Furthermore, it would be interesting to include faculty members and students at the graduate level and from the Virtual University and TecMilenio. The latter implies considering international students, mainly from Latin America, as well as students from different socio-economic backgrounds in México.

Findings in this study could be enhanced and complemented by conducting research at other campuses from different zones. For example, the largest campuses in the Tecnológico located in the metropolitan zones of Monterrey and México City could be contrasted with small campuses in other parts of the country. Another possibility is to replicate the study in the northern and southern zones at campuses similar to the sub-sites selected for this study.

Future research should certainly consider findings in this study which strongly suggest that teaching oriented institutions primarily regard instructional information technology as educational intellectual capital in lieu of a marketable commodity. Findings show that the market potential of this intellectual capital was foreign to the Tecnológico culture and could be the same for other non-commercially-oriented higher education institutions.

Academic capitalism considers that universities integrating into the new knowledge economy are influenced by changes in the political economy; therefore, it is important to go beyond the boundaries of a single higher education institution and study other institutions. For example, valuable information could be gained by studying other private universities in México and abroad that use commercial learning management systems such as Blackboard. Other possible lines of inquiry with the potential to shed more light on the subject of instructional production as intellectual capital are: (a) research-oriented institutions, (b) open source initiatives that bring together a network of universities willing to share knowledge freely, and (c) assessing the knowledge currently transferred between higher education institutions and business corporations such as Blackboard. Moreover, issues of periphery-center among higher education institutions and technology dependency between developed and developing countries could be addressed in future research.

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