AN INTEGRATED MODEL FOR THE ADOPTION OF INFORMATION TECHNOLOGIES IN U.S. COLLEGES AND UNIVERSITIES

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By

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ABSTRACT

This thesis fulfills the requirements of a Doctor of Liberal Studies degree at Georgetown University. It advances our knowledge of the rationale and mechanisms surrounding the spread, adoption and abandonment of information and communication technologies in tertiary education institutions in the United States. This interdisciplinary thesis approaches the topic from four disciplines: law, communication, economic and technology studies. It also relies heavily on first-hand, experiential accounts of technology adoption initiatives at Georgetown University from 2000 to 2012.

U.S. colleges and universities spend considerable resources adopting information and communication technologies. Yet, why has United States tertiary education not adopted information technologies the better to fulfill its mission of preparing the next generation of knowledge workers, and of creating, disseminating and preserving knowledge? This thesis shows the constraints and enablers for this condition, which are rooted in legal, social, economic and technical factors. The thesis proposes an integrated model to improve the adoption of information technologies by higher education faculty, staff, students and administrators leveraging four drivers: legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technical elements. The integrated model helps identify and resolve conflicts among factors and among actors when evaluating, deliberating and executing technology adoption initiatives. Using the
model, colleges and universities can adopt technology better to be more efficient, to prepare students better and to spread more knowledge to more people, therefore benefitting society. The model can facilitate the adoption of technologies that enable distance learning, including MOOCS or Massive Online Open Courses.
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INTRODUCTION

This thesis explores the rationale and mechanisms surrounding the spread, adoption and abandonment of information and communication technologies in colleges and universities in the United States. This interdisciplinary thesis approaches the topic from four theoretical disciplines: law, communication, economic and technology studies. It also draws heavily from first-hand, experiential accounts of technology adoption initiatives at Georgetown University and other institutions from 2000 to 2012.

U.S. higher education institutions spend much time and money on information and communication technologies. Yet, what do they have to show for it? Why have colleges and universities, and their constituents, not adopted information technologies better to fulfill their academic mission of preparing the next generation of knowledge workers, and of creating, disseminating and preserving knowledge? This thesis shows the constraints and enabling conditions behind this outcome, which are rooted in the combined effects of legal, social, economic and technical factors. The thesis proposes an integrated model to improve the adoption of new information technologies by higher education faculty, staff, students and administrators leveraging four drivers: legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technical elements. Using the model, higher education institutions can become more efficient, therefore benefitting society with more and better educational opportunities.

Technology decisions on campus usually happen in this way. An influential member of the community, e.g., a department head, will decide based on something that she learned from friends or relatives, peers at sister schools or in the media that she
would like to adopt a given technology. She would then tell the CIO that she wants the
technology. In turn, the CIO will evaluate the technical architecture, that is, whether or
not the technology could work on campus as well as its technical merits. Then, the CFO
will determine whether or not there are sufficient funds for the acquisition and
maintenance fees. Finally, legal counsel will examine the terms of the contract.

Each of the decision makers examines the desired technology from a very narrow
perspective. In this process, there is not an integrated model to ensure that the specific
implementation of a given technology on campus will be legal, will be adopted by
community members, will make economic sense and will offer the appropriate
functionality. Furthermore, the process does not call for a concerted effort to come up
with the necessary drivers – legal and policy instruments, diffusion of innovation
dynamics, economic incentives and technology elements - to ensure that technology
adoption happens successfully. The traditional approach fails to identify and resolve
conflicts among actors and conflicts against the backdrop of the interaction among legal,
social, economic and architectural factors.

Lawrence Lessig inspired the theoretical foundation of the alternative integrated
model proposed in this dissertation. In his book, *Code*, Lawrence Lessig claims that there
are four modalities that can be used independently or jointly to regulate cyberspace:
“rules, norms, prices, or architecture.”¹ Rules are laws and regulations; norms are social
conventions and pressures; prices are economic and market forces; architecture is the set
of characteristics that shape how a given technology works, including software, hardware
and configurations.

Similarly, the adoption of technology in colleges and universities is shaped by these four factors: rules, norms, prices and architecture. Lessig provides an example of technology behavior regulation in higher education by considering how “not all universities adopted the Net in the same way.” He compares how access to the Internet was granted at the University of Chicago and at Harvard University circa 2000. In the case of Chicago, access to the network did not require user registration. In the case of Harvard, users had to register before being able to tap into the campus network and connect to the Internet. These two different approaches had privacy implications, which in turn affected how faculty, staff and students used the Internet at each institution. People at Harvard were aware that it was technically possible for administrators or

\[\text{Ibid., 34.}\]
technicians to monitor their online activities; therefore, they were mindful of the web sites that they visited while on campus.

To improve the way technology is adopted on campus, institutional actors must consider four primary factors: rules, norms, prices and architecture. These four factors and their interactions either facilitate or impede the adoption of information and communication technologies among campus community members. Not only are all factors critical, but their interactions are also critical.

For example, administrators usually respond to a data leak on campus by crafting new policies and having technologists implement onerous security controls to protect information systems. This creates tension between the administrators on one side and the faculty, staff and students on the other side, because additional security controls often make it harder for these groups to use the available technology in its resultant state.

This also creates tension between the rules and the architecture on the one hand, and the prices and the norms on the other hand. The rules and architecture factors compel the faculty, staff and students to use the new security controls. However, the norms and the prices factors push the faculty, staff and students to reject the systems with the new security controls and to circumvent them to do their work.

To address these conflicts and improve technology adoption on campus, I propose an integrated and dynamic model using the four drivers identified in the following chapters: legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements. The four-driver integrated model lets higher education institutions and their constituents reduce the gap between the potential benefits of new technologies and the actual benefits. In the context of the model, a technology
initiative is any combination of drivers--legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements--devised to change technology behavior on campus.

The proposed model is both integrated and dynamic because it takes into account the effects of the drivers on the factors and the actors. We know what the four factors are, so we can use drivers to change the corresponding factors. A driver is an action that the institution or its actors can promote to change the status quo, that is, the current factors conditioning the technology adoption process. Examples of drivers would be: writing a new technology policy for students, offering staff training on the use of social networking, giving pedagogical grants to faculty who purchase a new hardware device for teaching, and installing fast wireless networks in campus classrooms.

Each driver is meant to affect primarily its corresponding factor but can also influence the other three. For example, the legal and policy instruments driver mostly changes the rules factor but to a lesser extent can also change the norms, prices and architecture factors. The same is true for the other three drivers: diffusion of innovation dynamics, economic incentives and technology elements.

The integrated model takes into account how the factors shape the use of technology by campus actors. There are many actors involved in the technology adoption process on campus, including outside parties like government officials, vendors, local residents and web site visitors. This thesis focuses on the roles of four groups: faculty, staff, students and administrators. In technology adoption, members of a group influence the behavior of other members of the same group, as well as the behavior of members of other groups.
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Table 1. Sample drivers in the technology adoption model for higher education.

The first four chapters study the factors influencing the use of technology on campus, as well as some of the drivers that can change those factors. The structure of this thesis follows an interdisciplinary approach after Lessig’s taxonomy: legal, social, economic and technological methodologies. The fifth chapter presents the integrated model. The conclusion summarizes the findings, suggests further research and explains why applying the model is important to higher education institutions, their constituents and society.

The first chapter, *Rules: The Influence of Laws and Regulations*, looks at the legal and regulatory drivers facilitating, impeding and shaping the spread of new technologies on U.S. college campuses. For taxonomic purposes, the analysis considers five categories of laws, regulations and policies: institutional policies, local ordinances, state legislation,
federal laws, and accreditation rules. The thesis shows why colleges and universities adopt and use technologies in certain ways to comply with current laws and regulations.

The second chapter, *Norms: Diffusion of Innovation Models*, examines how technologies spread on campus according to Everett Rogers’s model for the diffusion of innovations\(^3\) and those of Geoffrey Moore and Malcom Gladwell. Rogers claims that the diffusion of innovation is a specialized type of communication between those who have adopted an innovation and those who are candidates to adopt it. Moore tells vendors, and sometimes in-house technology organizations, how to market information technologies on campus. Moore builds on Rogers’ work by identifying gaps in the adoption of innovation curve and by providing advice on how to bridge those gaps to ensure that customers adopt new technologies.\(^4\) Gladwell compares the diffusion of new ideas, e.g., the use of a given technology, with the propagation of disease during epidemics by considering three factors: the idea or disease itself, the actors who spread it, and the environment in which the contagion takes place.\(^5\)

The third chapter, *Prices: Economic and Market Forces*, analyzes the economic and financial aspects of adopting information and communication technologies in higher education environments. An examination of industry statistics reveals that colleges and universities in the United States spend significant resources in information and communication technologies.\(^6\) Economic transactions are necessary prerequisites for the

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\(^6\) Pam Arroway, Eric Davenport, Guangning Xu, and Dan Updegrove, *Educause Core Data Service Fiscal Year 2009 Summary Report*. 

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adoption of technology. In other words, organizations and individuals must spend scarce resources, time and/or money, to adopt new technologies. This is the case for economic markets, for the institutions that are part of those markets, e.g., colleges and universities, and for their populations of faculty, staff, and students.

To understand better how the decisions to allocate economic resources are made in the technology adoption process, the chapter explores the use of financial metrics like return on investment, total cost of ownership, and risk assessment. The analysis takes into account how human beings are influenced in their institutional technology decisions by risk and uncertainty, the principal-agent problem, and the conflicting values of control vs. autonomy of individuals and organizational units.

The fourth chapter, *Architecture: The Technology Ecosystem*, studies how the characteristics of candidate technologies, and their interaction with technologies already in use, shape the adoption of information and communication technologies on campus. The more information systems an institution has in place, the harder it is to modify them, integrate them or add new ones. Candidate technologies must interact with other pre-existing technologies as elements of an ecosystem.

The fifth chapter, *An Integrated Model for Technology Adoption*, is the synthesis of the preceding expositions. After gaining a multi-faceted understanding of why technology adoption happens the way it happens on campus, I propose an integrated model exploiting the interrelationships of the four drivers -legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements-, the four factors –rules, norms, prices and architecture- and the four actors –faculty, staff,

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students and administrators- to improve the adoption of information and communication technologies in academic settings.

In the model, actors and factors are laid out in rows and columns of a matrix to examine their complex interrelationships. At each intersection point, the matrix identifies whether a specific driver –legal and policy instruments, diffusion of innovation dynamics, economics incentives and technology elements- would result in a negative, neutral or positive predisposition towards the adoption of a given technology initiative. Each cell contains qualitative annotations to explain the gravity of each driver.

The model is used in three stages: valuation, deliberation and execution. The fundamental application of the model is to evaluate the impact on campus of a new technology initiative before launching it. In the context of the model, a technology initiative is any combination of drivers--legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technology elements--devised to change the factors that shape technology behavior on campus.

After valuation comes deliberation. In the deliberation stage, a set of model matrices are prepared to compare the candidate technologies, as supported by the corresponding drivers. The model matrices provide a multi-dimensional overview of each candidate technology, including advantages and disadvantages in terms of rules, norms, prices and architecture for each of the constituent groups affected: faculty, staff, students and administrators.

Once a candidate technology has been selected, it is time to execute. The execution stage is an interrogative and interactive process. Is there a roadblock? If so, remove it or at least make it less disruptive to adoption. Does the removal create new
challenges and opportunities? If so, actors can address the challenges and harness the opportunities.

The model helps to identify and resolve vertical conflicts among the four factors: rules, norms, prices and architecture. For example, the model prescribes that to resolve a conflict between rules and norms, it is important to explain the rules to the community or to find alternative technology initiatives, as highlighted in the cases of classroom recordings and cloud email. In the case of classroom recordings, rules like the American with Disabilities Act made it mandatory to accommodate students with disabilities regardless of the norms embraced by some faculty members who prefer not to be recorded. Therefore, administrators sometimes had to overrule the preferences of faculty members and explain to them the legal rationale behind their actions. In the case of cloud email, for example, a solution to address faculty concerns about law enforcement access to data in the cloud is to keep sensitive email accounts in a local system.

The model also helps to identify horizontal conflicts among the four actors: faculty, staff, students and administrators. In the case of classroom recordings, faculty and student preferences for the availability of classroom recordings are often in conflict. The model helps resolve the conflict by identifying that crafting a policy and communicating it widely makes a difference in the adoption of the technology.

The conclusion summarizes the findings, suggests further directions for research, and discusses the practical implications of the model. It states that by applying the model to improve the adoption of information technologies, colleges and universities can achieve more efficiency, which leads to more affordability, which translates into more opportunity. Institutions of higher education can educate students better and spread more
knowledge to more people, therefore benefitting society. Adopting technology better is pressingly important because of the arrival of new technologies like tablets, cloud computing, big data and analytics, and because of the online tsunami prompting many traditional academic institutions and for-profit higher education companies to offer more distance learning programs.
CHAPTER 1

RULES: THE INFLUENCE OF LAWS AND REGULATIONS

Several factors influence the adoption of information and communication technologies in higher education in the United States. This chapter explores how the legal and regulatory framework shapes the diffusion of ICTs in colleges and universities. When Lessig looks at ways to regulate the behavior of people in cyberspace, he looks at the most obvious way to regulate: “law regulates behavior in cyberspace.”

For taxonomic purposes, the analysis in this chapter considers five categories of laws, regulations, and policies: institutional policies, local ordinances, state legislation, federal laws, and accreditation rules. The idea for this chapter comes from Georgetown University Professor Judith Areen, whose textbook, *Higher Education and the Law, Cases and Materials,* discusses the impact of legal issues on virtually every facet of academia, including the adoption of information and communication technologies.

An interesting case study to explore the influence of the combination of these laws, regulations, and policies is the adoption of distance learning technologies and practices in higher education. There are many factors pushing and pulling academic actors to engage in distance learning activities, including laws, social conventions, economic incentives, and technical constraints. The legal and regulatory framework is key among the factors shaping the adoption of distance learning in higher education.

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1 Lessig, *Code,* 124.

Regulating both organizational and employee behavior, including technology use, with policy and legislation is not new. For example, in the 1990s and 2000s many new compliance regulations altered the corporate landscape in the United States. Federal acts like the Graham Leach Biley Act enacted in 1999 and the Sarbanes Oxley Act enacted in 2002 focused mainly on regulating corporate behavior. However, they also inspired federal and state legislation and regulation applicable to educational institutions.

The Health Insurance Portability and Accountability Act of 1996 is another example of regulation, albeit one that applied only to the health sector. By extension, however, it also applied to educational institutions with hospitals, medical and nursing programs, and with clinical research programs. For example, on July 7, 2011, the University of California at Los Angeles Health System reached an $865,000 settlement with the Office for Civil Rights of the Department of Health and Human Services for HIPPA violations in the form of repeated unauthorized employee access to records. The complaints of two celebrity patients whose medical records were leaked prompted the investigation.

A similar case is that of copyright legislation, which impacts society at large but has unique implications for colleges and universities. Examples of this legislation would be the Digital Millennium Copyright Act of 1998, also known as the DMCA Act, and the unique provisions of the Technology, Education and Copyright Harmonization Act of 2002, also known as the TEACH Act. As Lessig puts it, “copyright law, defamation law, and obscenity laws all continue to threaten ex post sanction for the violation of legal rights.”

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3 Lessig, Code, 124.
Finally, the most focussed law of the land is the Higher Education Opportunity Act of 2008, which reauthorized and amended the Higher Education Act of 1965. It is a body of ad hoc federal legislation, with the corresponding regulations issued by the Department of Education, which applies to tertiary education institutions. The penalties for non-compliance could be as stiff as not participating in federal financial aid programs.

In addition to legislation, organizations rely on their own self-regulation and that of their business and academic partners. For example, the Payment Card Industry Data Security Standard rules are not laws but rules developed by the credit card companies to ensure that merchants process credit card payments safely. Colleges and universities accepting credit card payments for tuition, bookstore purchases and electronic commerce have to comply with these rules. If they do not, they may be banned from accepting credit card payments. Stiffer penalties await those institutions not following the rules of their accrediting bodies, e.g., the American Bar Association (ABA) in the case of law schools. Graduates from non-accredited law schools cannot sit for the bar and practice law in most jurisdictions.

**The Application of the Legal Framework in Adoption Decisions**

When most, but not all, faculty and staff members consider candidate technologies for adoption, they anticipate whether or not their intended use of those technologies comply with institutional policies, local ordinances, state legislation, federal laws, and accreditation rules. The legal and regulatory framework shapes the adoption of information technologies both as new technologies become available and as new regulations become applicable.
For example, some technologies are discarded altogether because they do not fit the practices of the campus as coded in its policies, or the applicable laws and regulations. An example of this type of technology would be the use of monitoring software used to inspect and block the electronic communications of cyberspace users. It is uncommon for these technologies, in place in many financial corporations, to find their way into private higher education institutions in the United States. Faculty expectations of academic freedom and privacy would clash with the institution’s desire to control the online activities of its constituents.

Sometimes the influence of the legal and regulatory framework is found not in whether or not new technologies are adopted by an institution or its members, but in how they are adopted. An example would be the way in which colleges and universities choose to install student, human resources, and financial information systems. These complex systems, known as Enterprise Resource Planning systems, are deployed with painstaking granularity of user rights and privileges. The institutional goal is to ensure that only authorized users can access confidential information like social security numbers or birth dates of community members. Privacy laws like the Family Educational Rights and Privacy Act of 1974, also known as the FERPA Act or the Buckley Amendment, and their interpretation justify these behaviors.

Sometimes the influence of the legal framework is found not in whether or not new technologies are adopted by an institution or its members, or in how they are adopted, but in when they are adopted. The legal framework affects the adoption of innovation in colleges and universities in the United States by pacing the acquisition and deployment of new technologies. Most institutionally sponsored technologies require
contracts for their acquisition and deployment. These contracts must be reviewed by a number of institutional departments for approval. Each department evaluates the contract against the policies of the institution and the applicable legal and regulatory framework.

The personnel in financial affairs evaluate the financial terms of the transaction. Purchasing evaluates the vendor and its situation. Risk management considers the risks associated with the service or product, and with the actual contract. The office of compliance assesses whether or not the overall transaction and the use of the service or technology comply with the regulatory framework. In some instances, specialized groups like an institutional review board must evaluate a technology service or product before its use in experimenting with human subjects or animals. Often, outside parties like funding partners in the government, foundations or corporations become involved in the contract review process. Finally, the in-house legal counsel department carefully reviews the terms and conditions of the contract. Occasionally, the technologies and contracts under evaluation are so novel, complex and specialized that retaining outside legal expertise becomes necessary.

**The Case of Voice over IP Technology Adoption at Georgetown Law**

Georgetown University Law Center installed a Voice-over-Internet Protocol, also known as VoIP, telephone system in its two new campus buildings in 2004. VoIP telephone systems are an evolution of traditional telephone systems: they work on top of the existing Internet infrastructure and usually are more efficient and cost-effective than older telephone technologies. In 2006, the Georgetown University Law Center technology department requested funding from the Finance Committee to upgrade the
other three buildings on campus from expensive-to-maintain legacy phones to the new VoIP phone and voice mail systems.

The funds were approved in the winter of 2007 and the Law Center administration started the contract review process immediately afterwards. During the ensuing approval process, the contract had to pass a barrage of university financial and project management evaluations. Contract signing required many layers of approvals and reviews, from authorizations at the school and university level to approval by the Board of Directors of the University.

An interesting change in the regulatory framework of the telecommunications sector came into play at that time. In 2005 and 2006, the Federal Communications Commission (FCC) offered an expanded regulatory interpretation of the Communications Assistance for Law Enforcement Act, also known as the CALEA Act. CALEA is a 1994 wiretapping law intended to guarantee that telecommunication providers cooperate with law enforcement agencies in electronic surveillance.

The new interpretation by the FCC sought to ensure that law enforcement agencies would be able to conduct electronic monitoring on new communication networks, particularly data and Voice-over-IP networks. Interpreting the intent of the FCC was not straightforward for industry experts, technology executives, and in-house lawyers in organizations in the United States. The difficulty resided in determining how adopting new network technologies, like Voice-over-IP, would affect CALEA compliance issues.

Some colleges and universities retained outside legal counsel to evaluate the new FCC directive, either by themselves or through the associations and organizations to
which they belonged like EDUCAUSE. According to its web site, EDUCAUSE is a “nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology.” For example, Georgetown University retained a specialized law firm to obtain a legal opinion about the CALEA impact of the projected Voice-over-IP project. After careful review and analysis of the available information at the time, the lawyers concluded that the new project had no impact on the CALEA obligations of the University.

After that, the Board of Directors of the University reviewed the project and issued its approval to proceed. The purchasing, financial affairs, compliance, risk management, and in-house legal counsel departments of the University also reviewed the contract documents. As Georgetown is a Jesuit University, it felt as if both the Superior General of the Society of Jesus, unofficially referred to as the Black Pope, and the actual Pope of the Catholic Church had to review the contract. Fortunately, the initial set of contract documents did not require significant changes or modifications.

The entire review process took about eighteen months to complete. Once the contract was approved, the technology project itself was completed in approximately three months. The complex legal and regulatory framework, combined with the application of local policies and practices, delayed the technology adoption of Voice-over-IP at Georgetown Law by almost two years, after the decision to adopt was made.

As a result, approximately 60% of the people on campus were years behind in having access to those telephony innovations that the other 40% of community members could use since 2004 in the new buildings. Innovation was arrested because it was

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necessary to commit financial and technical resources to support both the new and the old systems. The overall technology progress of the campus was delayed because technology adoption is often a stochastic process, that is, one by which prior outcomes affect future outcomes. Without a campus-wide Voice-over-IP system, new services like automated directory services, call trees, and phone attendants could not be deployed efficiently and effectively.

Colleges and universities must consider that the legal and regulatory framework, as well as its interpretation and application within a given institutional environment, shape technology adoption in three ways: what technologies are adopted, how they are adopted, and when they are adopted. The next step is to examine the actual policies and regulations.

**Institutional Policies**

All colleges and universities have institutional policies covering a wide range of activities. At a minimum, an academic institution in the United States has human resources policies covering employment relations. Most likely, it also has a set of policies governing financial transactions like purchases, expense reimbursements, and employee travel. In general, most colleges and universities have many institutional policies, including some governing research with human subjects, the use of information technology, advertising, electronic communications, political activities, privacy, confidentiality, copyright, academic honesty, and student conduct.

University committees primarily composed of faculty and staff members craft these policies. In some cases, student representatives are invited to participate in the policy making process with a variety of roles, from consultative to fully participative.
Depending on the governing bylaws and practices of the institution, some policies may require approval by senior administrators, the faculty senate, and even the Board of Directors, Governors or Regents of the institution.

Sources of information for the policies are local, state and federal laws and regulations, preexisting institutional policies, and model policies from other colleges and universities. Interpreting and applying some of these policies may be both difficult and challenging over time. This is particularly true when new technologies are involved. The fast pace of technology evolution and the corresponding “policy vacuum” present institutions with tremendous opportunities and challenges. A policy vacuum refers to the absence of rules and regulations applicable to a technology and its applications. “A typical problem in computer ethics arises because there is a policy vacuum about how technology should be used,” as James Moor put it.

For example, Georgetown University has an Acceptable Computer Use policy detailing how members of the University ought to use information technology. By virtue of the policy, supervisors who would like to examine the information contained in the computer of an employee without explicit permission of the employee can do so only by following a stringent set of rules and procedures, sanctioned by the appropriate University officials.

This policy was followed after the death of some faculty members, when family members requested access to the documents and intellectual work in progress of the deceased. It was also followed when employees suffered unexpected and incapacitating health problems. For example, when the project manager of a major campus construction

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6 Ibid.
project at Georgetown University suffered a heart attack in 2003, administrators gained access to the information on his computer and in other data storage locations like his email account and network drive by following the policy.

In some cases, Georgetown University administrators denied requests by supervisors to access employee computers. In those instances, the University administrators weighted the merits of the requests against the existing policies governing such access, the legal ramifications, and the employees’ expectations of privacy. Then, they made the appropriate determinations.

Unlike the corresponding policies in place at many corporations, the Acceptable Computer Use policy of Georgetown University lacked an explicit statement indicating that the employer could review employee workplace communications and electronic records. In the cases when access was denied, University officials chose privacy over intrusiveness. Many of these cases involved labor disputes in which supervisors claimed that their subordinates exhibited poor productivity, that is, supervisors suspected employees of browsing the web for personal reasons instead of working.

Acceptable use policies contain unique elements in religious institutions in which core values permeate every activity of the college or university, including the use of information technologies. Chancellor Jerry Falwell Jr. of Liberty University in Lynchburg, Virginia, describes the code of conduct of his institution in the following terms: ”our code of conduct teaches discipline and promotes a lifestyle of Biblical morality but is well-balanced to allow students the freedom to enjoy their college
experience.” In line with this code of conduct, the University has an acceptable computer use policy and even a policy for pornography.

The policy included a definition of what pornography is: “pornography is any material (i.e. pictures, photos, or writing) that is obscene,” accompanied by a detailed description of the meaning of the word obscene. It contained a reference to the subordination of the policy to other laws: “computing resource users are subject to federal and state obscenity laws and the penalties that follow violation of those laws.” It stated a clear intent for the policy: “Liberty University prohibits accessing, downloading, receiving, distributing, transmitting, storing, displaying, viewing, printing, or producing pornography.” Finally, it listed the mechanism for dealing with offenses and their corresponding penalties. For example, the policy stated the following penalties after the first offense: “the offender must meet with Student Development. Twelve reprimands will be applied to the offender file. A $10 fine will be charged directly to the offender's business account.”

When policies like this one are put in place, colleges and universities often install the necessary technology to monitor the electronic activities of community members and to enforce the policy. Some of these technologies are network content monitoring and filtering systems designed to scan, intercept and even divert the Internet traffic of computers used on campus. In 2004, for example, students at the ITESO Universidad Jesuita de Guadalajara in Mexico who attempted to access an adult-entertainment website like Playboy found their web browsers diverted instead to the Disney Channel web

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site. Similarly, students who attempted to download copyright-protected songs from the Internet without authorization discovered afterwards that they had downloaded instead the same ranchera, a typical Mexican song, over and over again.

Sometimes university policies shape the adoption of technology even when they do not address technology issues directly. For example, novel technology services using non-standard distribution channels or payment methods often have a difficult time penetrating the higher education market due to institutional administrative policies. This was the case when software products were first offered as on-line downloads, instead of packaged as physical disks and manuals in boxes. Purchasing departments refused to authorize these transactions because they could not inventory physically the goods acquired.

This was also the case when some telecommunication service providers refused to use the purchase order administrative model preferred by higher education institutions in the United States. The established business model involved a college or university issuing purchase orders to vendors, using the vendor services, receiving invoices, and making payments within a reasonable time. However, some technology vendors chose to sell and deliver their products and services in exchange for credit card pre-payments or payments. The practices of these vendors clashed with the financial policies of colleges and universities prohibiting the payment of telecommunication services with corporate credit cards.

An example of this was the adoption of Apple iPhones for mobile communications and of Skype for Internet telephony services at Georgetown University, which were much slower at the institutional level than at the personal one. One of the
main reasons for the slow adoption was that Apple, its iPhone telecommunications partner carrier AT&T, and Skype did not accept purchase orders to provide their services and instead required credit cards for the pre-payment of services. The financial policies of Georgetown University did not allow employees to use corporate credit cards to pay for these services.

At first, a handful of University employees were able to use these services and pay for them with organizational funds only by bending the rules, either by requesting exceptions or by taking advantage of lax administrative oversight. Due to pressure from community members eager to benefit from these technologies, the administrative policies of the University evolved over time, sometimes years, to recognize the new business and technology models.

**Local Ordinances**

The number of local laws affecting the use of information technologies on campus is limited. However, most acceptable computer use policies in colleges and universities still recognize their influence in general terms. For example, the University of Iowa Acceptable Use of Information Technology Resources policy states that “by using University information technology facilities and resources, users agree to abide by all related University policies and procedures, as well as applicable federal, state, and local law.”

One of the ways in which local ordinances influence how technologies are used on campus is evident in the case of the University of the District of Columbia because the local government of the District of Columbia provides Internet connectivity services for

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the University. On the one hand, faculty members expect to access any web site on the Internet, presumably under the auspices of academic freedom, without restrictions or oversight. On the other hand, the policies of the District of Columbia establish that local government employees should not access pornographic web sites from their place of work.

News pieces in media outfits made it clear that the technology department in DC was monitoring the computers used by employees on its communications network. For example, on January 28, 2008, Jaikumar Vijayan reported on ComputerWorld that “the city purchased 20,000 licenses of a web content management tool designed to prevent users from accessing pornographic sites.”

Because the computers of the University of the District of Columbia (UDC) run on the network of the DC government, faculty and staff members had to assume that their web visits were under electronic surveillance. Whether or not UDC faculty and staff members should have been subjected to technology monitoring due to their unique employment relationship with the local government was controversial.

In November of 2010, I interviewed Hakeem Fahm, interim CIO of the University of the District of Columbia, who mentioned that the city government had given a monitoring exemption to UDC faculty members and academic professionals on the network. Regular staff members, however, were still subject to monitoring.

In general, these situations lead to the adoption of Internet content filtering and monitoring services in some institutions. Internet content filtering tools are designed to restrict access to certain web sites. Internet content monitoring tools are meant to keep...

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track what web sites a computer user visits. For example, the Georgetown University Information Security Office purchased monitoring products by Solera Networks to perform deep network packet inspections in 2008. That is, it bought products designed to monitor and to examine the contents of the data traffic between faculty, staff and students’ computers and the Internet. However, authorizing the use of the Solera products, in place at the time in many corporations, did not even reach a public discussion stage within the University. Influential administrators and members of the faculty senate who were alerted about this initiative expressed their privacy concerns about this technology.

On the other side of the problem, users who insist on visiting web sites restricted by policy in a monitored environment may adopt privacy enhancing technologies. These technologies, known as anonymizing software programs or proxy services, prevent the monitoring of Internet activities by third parties. Perhaps the best-known anonymizing software is Tor, a “free software and an open network that helps you defend against a form of network surveillance.” These technologies disguise the identity of Internet users and are popular among those who use technology in totalitarian regimes or within organizations with limited freedom of Internet access.

It is interesting to note that some faculty members, librarians, staff members and students may find the use of these tools necessary when using technology on their campus networks. There is tension between individual privacy and the institutional interests in monitoring the electronic activities of faculty, staff and students. There is also tension between intellectual property protection and freedom of information. These

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tensions spread the adoption of competing information and communication technologies for institutional enforcement and for individual evasion, to avoid control.

An interesting case of local legislation affecting higher education institutions applies to colleges and universities in the District of Columbia. The District of Columbia Consumer Personal Information Security Breach Notification Act of 2006 is a local data breach law that applies to any person or entity conducting business in Washington, DC and maintaining personally identifiable information on electronic media. This includes colleges and universities like American University, Catholic University of America, Gallaudet University, Georgetown University, George Washington University, Howard University, University of the District of Columbia and others. The issue of data breach legislation and its impact on technology adoption in higher education is covered under the section on state legislation that follows this one. In the absence of comprehensive federal privacy legislation in the United States as of 2012, other than the Privacy Act of 1974, state laws provide the fundamental legal framework for privacy.

State Legislation

State legislation affects technology adoption in universities and colleges in many ways. Some of the state laws with the greatest influence on technology use in colleges and universities are state privacy laws. The legal notification requirements associated with data leaks or breaches of personally identifiable information prompt colleges and universities to report missing data from their systems, whether stolen, misplaced or lost. In the absence of federal legislation as of the end of 2012, state legislation prescribes what organizations should do when there are incidents like data leaks or breaches.
According to a December 11, 2008, PC World article by Joan Goodchild, “since California's historic 2003 passage of a data breach law, most other states in the U.S. have followed suit. 44 states now have laws that lay out requirements for companies in the event that sensitive information is compromised.”12 To expand on Goodchild’s comments, the so-called data breach laws apply not only to corporations but also to non-profit organizations, including colleges and universities.

Data breaches, together with the reporting requirements outlined in the applicable legislation, motivate colleges and universities to implement new information and communication technologies for prevention and remediation. When data is lost, one of the first steps is to communicate with the affected individuals, as well as with the general public. Communication campaigns require ad hoc databases of potentially affected people, reporting systems, email broadcasts, ad hoc web sites, and advanced phone services to address the affected people and to respond to their concerns. After leaking personally identifiable information, colleges and universities often contract and provide technology-based remedial services like credit monitoring and credit freeze services for affected individuals.

After an egregious data breach, officers and board members in colleges and universities make it a priority, albeit usually for a short period of time, not to be in the news again for the same reason. Executives and technology personnel then develop new policies and processes to improve the custody and transfer of confidential and personally identifiable information. Institutions hire flocks of consultants who fly in and out of the campus to provide advice, write plans, make presentations, manage projects, install

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products, configure services, and document efforts with the aim of mitigating the risk of future data losses. Colleges and universities engage in training and awareness campaigns so that faculty and staff members can do their part to prevent more data breach incidents.

In the specific case of data loss prevention technologies, adoption accelerates according to two parameters: the strictness of the legislation and the notoriety of the last data breach incident. In general, the stricter the applicable data breach legislation, the more data loss prevention technologies and services will be in place in a given college or university. Similarly, the more notorious a recent data breach incident was at an institution, the more data loss prevention technologies and services will be in place in that college or university.

Frequently, scolded educational institutions implement information classification systems, scanning tools, content filtering, network traffic recording, data leak prevention systems, fingerprint identification, encrypted media, and other information security devices for data loss prevention. Institutions without a history of major data loss incidents do not use many of these data loss prevention technologies. Or, if they do, they do so more judiciously and at a smaller scale.

Georgetown University, for example, reported two data breach incidents in the years 2006 and 2007. On two different occasions during those years, University officers reported that hackers penetrated Medical Center and Main campus computers, which contained legally protected personally identifiable information like social security numbers and health records information.

In a separate incident in 2008, Georgetown University officials also reported that a hard disk containing confidential information of thousands of people affiliated with the
University disappeared from an office, possibly stolen, during the 2007 to 2008 winter school break. University officials interpreted that under the District of Columbia Consumer Personal Information Security Breach Notification Act of 2006, the appropriate course of action was to notify the affected people and the media. In all three of these incidents, one of the University newspapers, The Hoya, carried the story. In two of the three incidents, the one for the Medical School and the lost hard disk drive at the Main campus, The Washington Post and other mass media outlets carried the stories too.

After disclosing the incidents, the institution engaged in an all-out communications campaign. University officials held town meetings, notified the potentially affected people, set up phone banks, and even offered credit monitoring services to reduce the risk of identity theft. At the same time, the University hired a bevy of information security consultants, revised its internal administrative processes, and assessed the security of its information systems. It also introduced several new technologies with the idea of reducing the likelihood of having another incident.

For example, some University departments temporarily mandated that travelling University employees had to use laptops with fingerprint recognition systems and encrypted hard disk drives. In many departments, employees were instructed to discontinue their use of flash drives, also known as pen or USB drives, regardless of their popularity worldwide and their usefulness for information storage. In other University units with some degree of autonomy and no record of data leaks, like the Law Center campus, employees received training to store data securely on their existing network drives. They also learned to use encrypted and password-protected flash drives at times when working off-line with confidential information was absolutely necessary.
An interesting wrinkle in the Data Security Task Force initiative, as this overarching effort was called, was the deployment of scanning software to look for confidential information in University-owned computers. Georgetown University contracted a combination of consulting services, software licenses, and products to scan the computers of many employees. The objective was to discover personally identifiable information, e.g., social security numbers, susceptible to data breaches and to move that information to safer storage locations. These sophisticated scanning systems were programmed with algorithms to search for social security numbers, birth dates, passport numbers, and other information judged confidential by University officers. Hundreds of computers were searched in this fashion in all campuses of the University on at least two different occasions in 2008.

An interesting conflict of interest arose when the Data Security Task Force requested a scan of the computers of several Law Center campus employees. Law Center campus administrators notified the Data Security Task Force project leaders that the computers of faculty and staff members working on legal cases, e.g., those used in legal clinics, could not be scanned on account of attorney-client confidentiality. In this particular instance of technology adoption for information scanning, there was a conflict between the information security and privacy mandates of the larger University and the interpretation in one of the University campuses of the District of Columbia Bar Association rules of professional conduct for lawyers.

It is obvious that adequate training and business process reengineering can help higher education institutions achieve compliance with existing privacy regulations and to protect better the confidential information of their constituents. It is also clear that the
appropriate use of information technology can help achieve this compliance. In this particular incident, however, it was difficult to quantify the effectiveness of some of the information security and privacy initiatives implemented, including fingerprint recognition and scanning for confidential information.

Of note is that after the first University-wide campaign to scan computers and remove sensitive information from unsecured computers, a second scanning operation performed three months later revealed that many of the unsecured computers once again contained confidential information. In the spring semester of 2010, another data breach occurred. A Georgetown University Information Services employee lost a flash drive with confidential information about University applicants. The technician, in his zeal to solve a technical problem as quickly as possible, did not follow the processes and practices outlined by the Data Protection Task Force and the University Information Services department.

State sunshine laws, the laws that govern public access in each state to government records, sometimes clash with privacy laws and other laws. In 2003, Buffalo Ventures made a freedom of information act request to obtain the email addresses of the University of Texas at Austin faculty, staff and students. At the time, Buffalo Ventures operated a web site called Longhorningles.com. After obtaining the email addresses, Longhorn singles sent numerous emails promoting its service. In response to campus community complaints, the University directed its anti-spam barrier to block the emails. Buffalo Ventures sued. On August 2nd, the U.S. Court of Appeals for the Fifth Circuit decided on the White Buffalo Ventures, Inc. v. University of Texas at Austin case that the University didn't violate the freedom of speech constitutional rights of the online dating
service when it applied the University’s general anti-solicitation policy and blocked the unsolicited emails.

On March 17, 2011, the Wisconsin Republican Party filed a state open records request to gain access to University of Wisconsin Professor Bill Cronon's personal emails. Party members wanted to examine the email communications and everything else that he used to write about anti-union movements in Wisconsin. A similar case took place from 2009 to 2011 at the University of Virginia when climate change advocates and antagonists invoked the Freedom of Information Act to request the emails of Professor Michael Mann, a member of the faculty at the University’s environmental sciences department in the College and Graduate School of Arts & Sciences from 1999 to 2005. In both cases, the universities produced the information requested.

The conflicts between state sunshine laws regarding freedom of information and privacy laws are challenging. In 1991, a case came before the United States District Court for the Western District of Missouri, Southern Division. The editor of the Missouri University newspaper wanted to inspect and copy campus incident reports. The University claimed that those were educational records and could not be disclosed under FERPA, the Family Educational Rights and Privacy Act, also known as the Buckley Amendment. The editor sued and the court ruled that the incident reports were not educational records but public records that had to be disclosed under Missouri’s Sunshine Law.

In the spring of 1995, the Miami University newspaper requested student disciplinary records from the University Disciplinary Board to track crime trends on campus. The newspaper claimed that such records were not educational records under the
Ohio Public Records Act. After a tortuous legal process, the Department of Education brought the case to the United States Court of Appeals for the Sixth Circuit. In 2002, the Court ruled in favor of the United States Department of Education, therefore preventing the University “from releasing student disciplinary records or any “personally identifiable information” contained therein, except as otherwise expressly permitted under the FERPA.”\(^{13}\)

Institutional actors must balance freedom of information access requests and FERPA. Depending on the specific laws of the state and the facts of each case, state and federal courts have reached different conclusions. The preceding examples illustrated how state legislation shapes the adoption of information and communication technologies in colleges and universities in the United States. It is now time to consider how federal legislation influences technology adoption in higher education.

**Federal Laws**

Many federal laws affect life in academia. The latest piece of applicable legislation is the Higher Education Opportunity Act, also known as HEOA, which was signed into law on August 14, 2008. The Department of Education issued its final regulations about how to comply with the Act on October 29, 2009, with a starting date for compliance of July 1, 2010. These regulations affect many aspects of how colleges and universities conduct their businesses, from disclosing the total cost of receiving an education to respecting copyright laws on campus networks.

One of the most influential laws shaping the adoption of information and communication technologies in academia is the Digital Millennium Copyright Act of

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1998. When campus networks became faster and ubiquitous in the late 1990s, when peer-to-peer file-sharing services became powerful and popular, many college and university students took advantage of the new technologies to download copyright-protected music, movies and software without paying directly for them.

These practices moved universities and colleges into action in the early 2000s. Virtually all schools had to write policies addressing these practices. Some of them opted for educating their students regularly, following the advice of their in-house legal departments. Others chose to implement expensive and cumbersome technologies like networking bandwidth management systems to make it more difficult for students to engage in these activities. Others decided to make legal music downloading services available to students by signing up for an institutional subscription. The Pennsylvania State University did this in 2004 by enrolling all students in the Napster 2.0 service, in the hopes that students would stay out of trouble if they had a legal alternative to download music.

The enactment of the Higher Education Opportunity Act and the corresponding regulations issued by the Department of Education made it mandatory for all colleges and universities to follow a three-prong approach to reduce illegal downloading as of July 1, 2010. First, institutions had to inform students annually about copyright laws and pertinent campus policies. Second, they had to use technology-based deterrents. Third, they had to offer alternatives to illegal downloading or peer-to-peer distribution of intellectual property. The requirement is “that, as a part of an institution's plans for combating the unauthorized distribution of copyrighted material, the institution must include the use of one or more technology-based deterrents is statutory (see
Since 2000, students have been receiving copyright wake-up calls by agents working on behalf of the Recording Industry Association of America, the Motion Picture of America, and the Business Software Alliance. Representatives from these organizations contacted the legal departments of many colleges and universities requesting that the schools identify those campus users who downloaded copyright-protected materials. Institutions complied and some students settled when confronted by the RIAA, the MPA or the BSA.

One of the students who chose not to settle was Boston University graduate student Joel Tenenbaum. In 2009, after a long legal battle, the music companies were awarded $675,000, that is, $22,500 per song for the illegal downloading and sharing of 30 songs by Joel Tenenbaum. The award was reduced to $67,500 on a motion for remittitur by Boston District Court judge Nancy Gertner on July 9, 2011. The case is not over because both parties appealed the decision within a few days. The companies still want a notorious victory to set an example. The defendant wants to pay nothing.

Of great importance in the technology adoption process in colleges and universities is FERPA. The Department of Education web site states that “the Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99) is a Federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education.”

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Officials and technologists in higher education institutions must consider FERPA when building and installing information systems in the United States. University directories, online face books, and electronic classroom seating charts are examples of systems which programming and use are influenced heavily by how academic administrators and staff members interpret FERPA guidelines.

Of interest is to appreciate that FERPA is not privately enforceable, as the United States Supreme Court ruled in Gonzaga v. Doe on June 20, 2002. In other words, an individual cannot bring legal actions forward due to FERPA violations. Only the Department of Education may address FERPA violations by an institution by withholding federal funding. Occasionally, lawyers will test the waters with creative legal strategies, like the filing of a class action lawsuit in January of 2010 against the University of Hawaii. The claimants alleged that the University posted online the social security numbers and other personally identifiable information of faculty, staff, student and alumni for months in 2010. A faculty member published the information on what he thought was a secured server, shielded from Internet visitors. It was not. “In July, the system acknowledged that hackers had gained access to private records of 53,000 students and employees at its Manoa campus.”

An interesting case precipitating and shaping technology adoption comes from an interpretation of the Higher Education Opportunity Act of 2008. Regarding campus safety, for instance, the text of the bill states that higher education institutions must have procedures to "immediately notify the campus community upon the confirmation of a significant emergency or dangerous situation involving an immediate threat to the health

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or safety of students or staff occurring on the campus, among other provisions. Many technology companies and university officers understand that this provision of the federal law is a de facto mandate to deploy an emergency notification system on campus. Known as emergency, mass or alert notification systems, these systems are a set of information and communication technologies allowing one party to disseminate information quickly to many people using traditional phones, mobile phones, text messages, email broadcasts, web pages, social networks, radio signals, and other means of communication.

Sad events inspired this piece of legislation. “On April 16, 2007, Seung Hui Cho, an angry and disturbed student, shot to death 32 students and faculty of Virginia Tech, wounded 17 more, and then killed himself” is the opening statement of the *Summary of Key Findings of the Virginia Tech Shootings Panel Report*, as presented to the Governor of Virginia, Tim Kaine in August of 2007. The document concluded with the following words: “As reflected in the body of the report, the panel has made more than 70 recommendations directed to colleges, universities, mental health providers, law makers, and other public officials in Virginia and elsewhere.” Chief among those recommendations were those regarding the adoption of emergency notification systems.

These systems, relying mostly on phone notifications, were used in kindergarten through twelfth grade school systems, like the District of Columbia Public School system, for years. They were used to notify parents about school closings, opening delays, and even social events. Higher education institutions in the United States began to

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19 Ibid.
adopt these systems after the Virginia Tech shootings in April 16, 2007. Shortly after that date, many colleges and universities rushed to implement these systems voluntarily. Georgetown University, for example, adopted an emergency notification system in the summer of 2007. University administrators used this system to alert community members of hazards on campus like gas leaks or criminal activity, and to inform faculty, students and staff about natural disasters like earthquakes, hurricanes and snowstorms.

Higher education officials want to do the right thing and protect their community members for moral, public relations, economic, and compliance and legal reasons. With pressing needs for technologists to offer new services and for officers to allocate scarce economic resources among competing priorities, suddenly deploying emergency notification systems became an emergency in and of itself. A possible interpretation of the new Higher Education Opportunity Act, together with the potential liability of being one of the few institutions without an emergency notification system in case of an incident, prompted most higher education institutions in the United States to adopt emergency notification systems.

Up until the enactment of the Higher Education Opportunity Act of 2008, the fundamental piece of legislation regarding campus safety was the 1990 Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act, known simply as the Clery Act. It is a federal statute with corresponding regulations. The Act requires higher education institutions participating in federal financial aid programs to keep and disclose information about crime on and near their respective campuses.

The Department of Education monitors compliance and can impose civil penalties of up $27,500 per violation. Most importantly, the Department can bar institutions from
participating in federal financial aid programs, therefore making it impossible for many students to pay tuition. To comply with the Act, higher education administrators must adopt the necessary information and communications technologies, e.g., databases, to record and report relevant campus safety incidents.

Another example of regulations with an impact on the technology adoption process is the set of regulations issued by the United States Department of Education covering student assistance or financial aid. The Department of Education sets the rules and procedures each year for the processing of federal financial aid transactions. Its main communication channel is the Information for Financial Aid Professionals web site. “The Information for Financial Aid Professionals (IFAP) Web site consolidates guidance, resources, and information related to the administration and processing of Title IV federal student aid.”

One of the postings illustrating the influence of regulation on technology adoption is the Application Processing System Specifications for Software Developers page published annually on that web site. After the posting is published, commercial software developers, financial aid professionals, and higher education technologists rush to modify and test their information systems as fast as possible in order to implement the specifications. The Department of Education presumes that the only reasonable way for higher education institutions to follow the regulations is by using information technology in the manner suggested by the posting.

Of interest also is the set of technology requirements resulting from the switch to direct lending by many colleges and universities starting in the 2008-2009 academic year,

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as a consequence of the collapse of the financial markets in 2008. “The Education Department's direct-lending program has seen a 43-percent jump in business already this academic year, after a series of private lenders stopped offering government-backed student loans.”\textsuperscript{21}

The Higher Education Opportunity Act of 2008 showed the concerns of rule makers about the escalating costs of higher education. For example, the Department of Education stated on its web site about the Higher Education Opportunity Act that “by October 29, 2011, each postsecondary institution in the United States that participates in Title IV student aid programs must post a net price calculator on its web site that uses institutional data to provide estimated net price information to current and prospective students and their families based on a student’s individual circumstances.”\textsuperscript{22} Software vendors immediately seized this opportunity to market new products and services, while school officials and technologists immediately planned for the adoption of these technologies.

Starting in 2010, the Act specifically mandated that course descriptions included the cost to students of the educational materials prescribed by faculty members for courses, particularly the prices of books. This mandate required technical changes on university and collegiate bookstore web sites, in student information systems, on online course catalogs, and in learning management systems.

Complying with federal mandates may be both onerous and difficult. However, it may also have unanticipated positive consequences. Due to the mandates for costs


disclosures of the Higher Education Opportunity Act of 2008, many faculty members became aware suddenly of the escalating prices of their class materials. Then, many of them explored more affordable options for students without compromising the educational value.

Even non-higher education specific laws and regulations, like immigration laws, shaped technology adoption in higher education institutions. For example, the Department of Homeland Security and its Immigration and Naturalization Service (INS) announced a foreign student tracking system in 2002, with an implementation deadline of January 30, 2003. The rule called for the implementation of a Student and Exchange Visitor Information System (SEVIS) with authority emanating from the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, the USA Patriot Act of 2001, and the Enhanced Border Security and Visa Reform Act of 2002. Colleges and universities in the United States rushed to modify their student administration systems and to install new ad hoc systems for tracking foreign students and reporting to the INS.

Most institutions implemented a system known as fsaAtlas, and modified their student information systems to tie both into fsaAtlas and into the INS SEVIS system. At the time, there were other technical solutions to comply with the regulation but there were no satisfactory manual approaches to the task. The regulation stated that colleges and universities had to transfer the information electronically to the Department of Homeland Security servers, therefore requiring an information technology system to store and manage the information. The risk of non-compliance was the refusal by the INS to issue visas to students attending that particular institution. The inability to obtain visas would prevent foreign students from attending the institution and foreign scholars from
working at the institution. These penalties would have devastating financial and academic consequences for many schools.

In 2011, for example, the Immigrations and Customs Enforcement’s Student and Exchange Visitor Program notified the University of Northern Virginia in Annandale of its intent to “to withdraw UNVA’s authorization to admit foreign students.”23 The University served about 2,000 students, most of them Indian, whose stay in the United States depended on their student status. Without visa issuing authorization, the school had to close its doors or find enough domestic students to replace its international student population.

Accreditation Rules and Professional Associations

The bylaws and guidelines of membership and accreditation organizations in different academic disciplines and geographical areas shape the adoption of information and communication technologies. Accreditation bodies are notoriously powerful in this regard. Institutions failing to meet the standards of their accrediting bodies may be cited either publicly or within academic community forums, with the corresponding erosion of their institutional reputations. In grave cases, institutions may even lose their accreditation. Losing a significant accreditation may drive faculty, staff, and students away. It may also prevent alumni from joining professional bodies, test the commitment of donors, prompt isolation from peer schools, and ban the institution from receiving federal funding.

For example, only medical schools accredited by the Liaison Committee on Medical Education (LCME) can receive federal grants for medical education and

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participate in federal loan programs. U.S. medical students can participate in residency programs or access the profession in most states only if they are graduates of LCME accredited schools. On December 2006, the LCME published a set of core instruments guiding the integration of distance learning technologies in the curriculum, emphasizing the need for course objectives, assessments, face-to-face contact, collaboration, experiential learning, practice, and integration of research and practice. Since then, the core principles and accompanying published guidelines have exerted a tremendous influence over the type of distance learning programs and supporting technologies suitable for medical education.

Accreditation can happen at the institutional level, at the school level, and at the program level. For example, the Middle States Commission on Higher Education accredits Georgetown University as an institution. Some of the University schools and programs are also accredited by the following organizations: the American Bar Association, the American Association of Nurse Anesthetists, the American College of Nurse-Midwives, the Commission on Collegiate Nursing Education, the Liaison Committee on Medical Education of the American Medical Association, and the Liaison Committee on Medical Education of the Association of American Medical Colleges.

Other actors influence the adoption of information and communication technologies in distance learning. In 1999, the American Association of University Professors issued the following statement on technology and distance learning in higher education:

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As with all other curricular matters, the faculty should have primary responsibility for determining the policies and practices of the institution in regard to distance education. The rules governing distance education and its technologies should be approved by vote of the faculty concerned or of a representative faculty body, officially adopted by the appropriate authority, and published and distributed to all concerned.\footnote{American Association of University Professors, "Sample Distance Education Policy and Contract Language," www(aaup.org/AAUP/issues/DE/sampleDE.htm (accessed August 2, 2011).}

Each of these accrediting bodies and groups issues its own recommendations regarding technology issues, particularly in distance learning. The next pages examine the unique case of distance learning in legal education, which is influenced strongly by the American Bar Association, the accreditation body for law schools in the United States.

**Distance Learning in Legal Education in the United States**

One of the main reasons accounting for the comparative slowness of the legal education sector in adopting distance learning technologies was the conservative stance of the accreditation body for law schools, the American Bar Association (ABA,) about the use of these technologies. The ABA regulates the practice of law and by extension many of its facets, including access to the profession, through its Section on Legal Education and Admissions to the Bar. From the late 1990s onwards, the ABA and its delegates concerned themselves with distance learning in legal education. The ABA delegates wrestled with the issue of how much distance learning should be allowed in preparing students for the practice of law under the auspices of the organization.

For years, the ABA took a cautious and conservative approach to the use of distance learning in law school courses. To avoid the risk of jeopardizing their ABA accreditation, few law schools considered making distance learning available to law
school students pursuing the quintessential law degree: the Juris Doctor. Instead, they focused their distance learning initiatives on their continuing legal education programs, their not-for-credit programs, and their non-core academic programs like masters and certificates. The ABA regulates much more lightly non-JD law programs than JD ones.

This state of affairs also gave rise to non-accredited online law schools, those choosing to operate outside the oversight of the ABA, like the Concord Law School. As of 2011 and with a few exceptions, graduates from non-accredited law schools could not take the bar to practice law. On November 20, 2008, the Supreme Judicial Court of Massachusetts waived the requirement that all state bar examinees had to have a law degree from an institution accredited by the American Bar Association. The exception was made for Ross Mitchell, a licensed California attorney who received his law degree from the online, non-ABA accredited Concord Law School in 2004. The opinion stated that the ABA was revising its accreditation standards for law schools. It also signaled that the court anticipated the impact of the impending changes, unknown at the time of the writing of the opinion, on the case.\textsuperscript{26} Below is the relevant part of the opinion.

\textbf{As has been mentioned, the ABA, through its Section of Legal Education and Admissions to the Bar, has recently announced that it is undertaking a comprehensive review of its approval standards. Information supplied by the ABA indicates that the comprehensive review will include consideration of schools and programs using online distance learning, an issue that has concerned this court. As the comprehensive review begins, we have no way of knowing or predicting what recommendations, if any, will be forthcoming in relation to online legal education programs or methodologies.\textsuperscript{27}}


\textsuperscript{27} Ross E. Mitchell vs. Board of Bar Examiners, 452 Mass. 582, (2008).
The accreditation requirements and the legal framework slow down the participation of well-established institutions in distance learning and therefore the widespread adoption of many suitable technologies for this purpose: video streaming, podcasting, webcasting, web conferencing, video conferencing, and electronic commerce.

I examined the distance learning activities of the top academically ranked law schools in the United States, the United Kingdom and Australia from 2007 until 2010. I conducted online email surveys and recorded the responses of their chief information officers or lead technologists. I edited their comments and summarized them in the following table.

<table>
<thead>
<tr>
<th>School Name</th>
<th>Distance Learning Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge Law</td>
<td>We do not currently offer any distance courses, nor do we anticipate doing so in any current plans.</td>
</tr>
<tr>
<td>Columbia Law</td>
<td>There’s no broad plan for distance learning at CLS, professors are already concerned about some of the problems and challenges Phoenix U presents.</td>
</tr>
<tr>
<td>Cornell Law</td>
<td>Prof. Peter Martin has been teaching a Social Security Law course online for years. The course is open to students from other schools. In 2008, Georgetown Law allowed its students to enroll in the course for credit and a handful of them did. However, all students dropped out of the course after a couple of sessions without stating their reasons for dropping.</td>
</tr>
<tr>
<td>Duke Law</td>
<td>In 2007-2008, we currently have no plans regarding distance education online courses. We continue to do a lot of ad hoc instruction-related videoconferencing, but have of late done no courses where an instructor has consistently been remote. With Duke moving to have a global reach, I suspect that we may be involved in either distance education or telepresence to connect remote locations with the law school proper, but nothing has happened on that front yet. In 2009-2010, we're involved this semester in a course on interviewing being taught by Larry Farmer at BYU. He will be virtually here at the law school over a high-definition videoconferencing link. Students there and here will interview each other online.</td>
</tr>
<tr>
<td>Georgetown Law</td>
<td>Between 2007 and 2010, most Law Center conferences, lectures, and events were recorded and made available open to the Internet public in the form of live webcasts, streaming video, and podcasts. We continue to offer on-line CLE programs via the West</td>
</tr>
<tr>
<td>Institution</td>
<td>Description</td>
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<tr>
<td>LegalEdCenter</td>
<td>We continue with a joint-venture agreement to offer CLE distance learning programs in Latin America, most notably, Argentina, Brazil, Colombia and Mexico with courses in English, Spanish, and Portuguese since 2008. Over the years, our faculty members have co-taught a number of courses via videoconference and web conference with faculty members at other institutions. We offer free videoconferencing services to bring prominent speakers in the Washington, DC area to the classrooms of sister schools in other parts of the country or the world. The Teaching Committee and the Technology Committee continue to explore distance learning.</td>
</tr>
<tr>
<td>Harvard Law</td>
<td>I’m not aware of any distance learning initiatives with the exception of one of our classes that is taught in conjunction with the Extension School and is open to anyone who cares to participate (for no credit) via Second Life.</td>
</tr>
<tr>
<td>Melbourne Law</td>
<td>Melbourne Law School has no plans to broaden distance learning as far as I know - our new dean starts in Feb. So there could be a change but I doubt it. One of our key marketing messages is around class size, participation, access to teaching staff etc. If we had a distance learning program this would be lost.</td>
</tr>
<tr>
<td>Northwestern Law</td>
<td>In 2008-2009, we offered our first online course last summer, Insurance Law. We plan on repeating it during the summer. We are exploring classroom capture systems and are looking into distance learning opportunities. In 2009-2010: we have added another online class last summer and will be adding another this summer. I expect that we will be growing these online classes next year as well from my discussions with faculty and our curriculum group. We are exploring some distance/online components for our Executive LLM courses, but nothing has been defined at this time.</td>
</tr>
<tr>
<td>NYU Law</td>
<td>2007-2008: The institution is considering distance learning initiatives but has not made any official announcements. 2008-2009: Starting in the Fall of 2008, NYU School of Law has launched an e-LLM Program in Tax Law. 60 students were admitted into the inaugural program class. We have been taping and streaming classes for four years, and now we are offering a full program. Details of the program can be found at <a href="http://www.nyulawtaxllm.org/index.html">http://www.nyulawtaxllm.org/index.html</a></td>
</tr>
<tr>
<td>Oxford Law</td>
<td>No distance learning.</td>
</tr>
<tr>
<td>Stanford Law</td>
<td>We have no online courses and there are no plans for any.</td>
</tr>
<tr>
<td>UC Berkeley Boalt Law</td>
<td>Between 2007 and 2009, we received frequent requests for videoconferencing services for courses co-taught between faculty here and at other universities. In 2009-2010, my dean is actively pushing the UC system to explore the idea of a Cybercampus to increase access. His work in that area has led him to want the law school to consider the option of online and/or distance learning.</td>
</tr>
</tbody>
</table>
University of Chicago Law

No current plans for, or previous experience with, distance education here. We’re still on the pure classroom lecture. Pretty much the same here as last year. No long-term/comprehensive plans for distance education. We do present or receive and occasional lecture to/from another institution for a guest lecture but there are no courses which rely on that mode exclusively or even heavily.

U of Michigan Law

Between 2007 and 2010, Michigan Law did not contemplate distance education online courses. We have quite a few video conference classes throughout the semester. My take on distance learning is that it has worked well for us as a complement to our regular teaching.

U of Penn Law

Penn Law has no plans for online courses.

U of Texas at Austin

We frequently use distance learning technology for one-time sessions to “bring in” distinguished speakers and faculty from other institutions. We do have two faculty members who each teach a recurring online course. Next spring at least one of our faculty members will be participating in a pilot to podcast classroom lectures. While I am not aware of any other distance learning initiatives, we continually evaluate the technology and pedagogy.

University of Virginia Law

We do not currently offer any distance courses, nor do with anticipate doing so in any current plans

Yale Law

We do not teach any courses online.

Table 2. Distance learning at top US, UK and Australian law schools, 2007 to 2010.

What the table shows is that there was minimal adoption of distance learning technologies among the schools surveyed between 2007 and 2010. Except for the New York University School of Law and its Master’s degree in Taxation online program and a few online courses offered by Northwestern Law School, no other academically prestigious law school surveyed runs an academic program with a significant distance learning component.

Most law schools embracing distance learning do so in the context of continuing legal education, conferences and symposia, as well as co-teaching when one or more of the participants is not present physically on campus. This can be explained partially by
the strong influence of the accreditation body for law schools in the United States, the American Bar Association, which resisted online education in Juris Doctor degree programs. However, other restrictions are cultural. Melbourne Law, for example, clearly stated that engaging in distance learning would not be aligned with its institutional values.

Easing the American Bar Association accreditation rules for distance learning increases law school engagement in distance learning initiatives. To facilitate the process, three other concurrent elements are necessary: norms, prices and architecture. Norms help because faculty, staff, students and practicing lawyers must embrace the idea of distance learning. Prices help because new business models need to provide economic incentives for all actors involved in online education. Architecture helps because law schools must adapt their technology infrastructure to support distance learning.

In 2011, Georgetown Law won a distance learning contract to provide continuous legal education to employees of the Internal Revenue Service. Winning this contract provided the economic incentives for Georgetown Law to embrace distance learning more by adapting its technology infrastructure, modifying the institutional policies and practices, and motivating the faculty and staff members involved. In 2012, both Georgetown Law and Washington University in Saint Louis School of Law signed agreements with for-profit distance learning providers to offer online masters in laws.

**Legal Risks and the Challenges of Compliance**

The technologies that are not compliant with existing laws and regulations are simply not adopted. Those technologies that are perceived at risk of non-being compliant are scrutinized and their adoption severely curtailed and delayed until the decision
makers can see the issue with more clarity. Those technologies without a compliance burden have an easier path to adoption.

Compliance is a must but challenging. Legislation and regulation evolve quickly. Most academic officials have their hearts in the right place but are confused often by the complex legal and regulatory framework. Of great debate within academia, for example, is how to comply with copyright issues in distance learning, in light of both the interpretation of the Digital Millennium Copyright Act and the Technology, Education, and Copyright Harmonization Act (TEACH) of 2002.

A fundamental question is whether or not lecture notes, and most importantly lecture performances, can be protected by copyright. Once decided, a case involving two wildlife issues courses taught by University of Florida professor Michael Moulton, his publisher Faulkner Press, and a class notes publishing service known as Einstein’s notes may bring some light into the copyright of lecture notes. The case of Faulkner Press v. Case Notes started with the filing of a lawsuit in Florida Northern District Court on April 1, 2008. On June 16, 2011, the Court ruled on several cross motions for partial summary judgment by the plaintiff and the defendant, but stated that the question remained as to whether or not the use of the classroom lecture recordings by the vendor represented fair use. In this particular case, the professor audio recorded his own class lectures but the facts of the case clearly stated that the defendant did not have access to those recordings. Instead, the defendant hired student note takers to record the class lectures. The case was still pending as of March of 2012.
Litigation risks are high at the intersection of law, technology and higher education. For example, the co-marketing agreements by which colleges and universities promote the sale of computers among their constituents may present legal risks. Many of these agreements contained non-disclosure clauses with institutional reward terms that are seldom made public. In a guest lecture for Professor Judith Areen’s Higher Education Law and Policy course at Georgetown Law on October 3, 2007, Johns Hopkins University Vice President and General Counsel, Stephen Dunham suggested that the lack of transparency of these arrangements could expose colleges and universities to litigation under state consumer protection laws.
The notoriously complex patent laws and uncertain patent litigation landscape of the United States also shaped technology adoption in higher education. The main actors are known as patent trolls, which are companies specializing in holding patents, licensing patents, and pursuing patent litigation. In 2004, Acacia Media Technologies contacted many U.S. colleges and universities claiming patent infringement and offering a licensing alternative to costly patent litigation. “The use of certain methods for transmitting and receiving digital audio and/or video content via the Internet is covered by patents owned by Acacia, and thus, under U.S. Patent Law, such use requires a license from Acacia.”

A plausible interpretation of this statement suggested that online distance learning activities, as well as other educational activities like the webcasting of a commencement speech, could fall this patent. The company offered several annual licensing agreements to colleges and universities to avoid the prospect of expensive and uncertain patent litigation. Many paid for these licenses to make the problem go away. Others, organized around the National Association of College and University Attorneys, worked together to explore other strategies: forming a joint legal defense group, negotiating group licenses, obtaining non-infringement letters from vendors, securing patent invalidity opinions, or preparing for individual litigation.

Georgetown University did not pay and was not sued. It collaborated with other schools but did not form a joint legal defense group. Several institutions, mostly for profit universities, paid up. Most did not. As of March of 2012, Acacia Media Technologies had not brought up a lawsuit against any college or university.

Over the years, other patent litigation cases impacted higher education institutions. Some were unique to education, like the Blackboard’s patent lawsuit against Desire2Learn regarding learning management systems. After tortuous litigation, both companies settled the case on December 15, 2009 by signing a cross patent licensing agreement. Other patent lawsuits were universal across economic sectors, like the notorious case of NTP vs. Research in Motion, the maker of Blackberry devices. In 2006, RIM agreed to pay U.S. $612.5 million to NTP to settle all claims. In higher education institutions, like in many other organizations, executives relying on Blackberry devices demanded that technologists came up with mobile communication alternatives in case of a legal disruption of Blackberry services.

Starting on December 1, 2005, an important source of anxiety among in-house lawyers and technologists in academic institutions was electronic discovery. On that date, the amendments to the Federal Rules of Civil Procedure regarding electronic discovery went into effect. Electronic discovery referred to the production of electronic data to be used as evidence in legal proceedings. For example, in the case of a labor dispute, an electronic discovery request may seek to produce as evidence the relevant email exchanges between an employee and a supervisor. In general, judges are not sympathetic to the parties in a legal proceeding unable to produce electronic evidence, particularly if their stated data retention practices affirm that they should be able to do so. The dog-ate-my-homework excuse, in its modern version of the-computer-ate-my-data, brought about default judgments with monetary damages in many cases.

Judge Paul W. Grimm of the U.S. District Court for the District of Maryland upped the penalty for non-compliance with electronic discovery requests on September 9,
2010. In his landmark opinion about electronic discovery, the judge sanctioned the President of Creative Pipe Inc., Mark Pappas in a copyright infringement battle and threatened him with prison unless he paid his opponent’s legal fees. The reason, as stated by Judge Grimm in the ruling was that Pappas’ actions “constitute the single most egregious example of spoliation that I have encountered in any case that I have handled or in any case described in the legion of spoliation cases I have read in nearly fourteen years on the bench.”

This is one of the reasons why some in-house lawyers vehemently oppose the move of information services from servers in data centers owned by the college or university to outside data centers or to cloud service providers. The in-house lawyers are afraid that the outside vendors would not be able to fulfill electronic discovery requests, therefore damaging the litigation chances of the institution. Over time, however, the efficiency of moving these services to the cloud, e.g., providing email services for students with Google Gmail services for free instead of spending millions of dollars maintaining internal systems, persuaded many legal officers to approve these contracts, if not for faculty and staff, at least for students. Technology solutions, like the contracting of email archival services for faculty and staff members, also assuaged the concerns of the in-house counsel.

Legislation and regulation move institutions towards a path of technology adoption that may or not be aligned with their strategic goals. Institutional policies, local ordinances, state legislation, federal laws and regulations, and accreditation rules influence not only what technologies will be adopted, but also how and when. Society,

through federal and state legislative bodies and the executive branches of the federal
government and the states, can influence the behavior both of public and private higher
education institutions in many realms, including technology adoption. There is even more
influence over public institutions due to the control of the state legislatures over their
budgets and to the unique regulations applicable to state employees and to state
institutions. Public universities are considered state institutions. Their employees are
considered state employees.

Legislation and regulation may have unintended consequences, sometimes
negative ones, distracting colleges and universities from fulfilling their mission of
creating, disseminating and preserving knowledge, and of preparing the next generations
of knowledge workers. Excessive oversight may arrest innovation and the ability of
institutions of higher learning to adapt to emerging social trends and to meet the demands
of non-traditional students and of new generations of students. Lax oversight may expose
college and university constituents, and society at large, to wasteful misspending of
scarce economic resources. Lax oversight may even lead to fraud and abuse by
unscrupulous officers.

The Carrot and the Stick: State and Federal Governments

Government policies and regulations are primary means to shape the behavior of
individuals and organizations in society. Coupled with fines and other punitive actions,
governments have an arsenal of diverse weapons to ensure that the subjects under their
control behave in certain ways.

In the case of colleges and universities, the Federal Government uses more sticks
than carrots. Higher education institutions that violate FERPA regulations find
themselves at risk of losing their sources of federal funding, from research grants to financial aid services. Very few institutions in the United States could be successful without this funding while competing with schools that receive it. Higher education technology environments are designed and operated in compliance with federal regulations like FERPA to avoid these risks.

The same applies to other bodies of regulation like the section 508-compliance of the American with Disabilities Act, also known as the ADA Act. Colleges and universities strive to make their web sites more useful to people with disabilities, in spite of the cost of making those sites compliant. Schools also embrace technologies like closed captioning, lecture transcriptions, and class recordings to ensure that there they are compliant with ADA requirements. On the one hand, academic officers genuinely believe that it is the right thing to do. On the other hand, challenging economic times and tight budgets make compliance burdensome. The stick of federal funding withdrawals, administrative penalties and lawsuits made ADA-compliance jump to the foreground in finance and technology discussions in colleges and universities.

For example, the National Federation of the Blind filed a complaint with the United States Department of Justice, Civil Rights Division on May 5, 2010. They asked the department to investigate the admissions practices of nine prominent law schools for violating the civil rights of blind and other print-disabled law school applicants. The law schools named in the complaint, as well as most of other law schools in the United States, required applicants who preferred to apply online to do so through a web-based system hosted by the Law School Admissions Council (LSAC). The LSAC online system did not work well for blind law school applicants using screen voice readers at the time of the
filing. On April 26, 2011, the NFB and the LSAC settled the matter when they agreed that the LSAC would make its web site fully compliant by September 1, 2011. It did.

There are many other regulations applying to colleges and universities enforced in a similar fashion. For example, colleges and universities with medical schools, nursing schools, health clinics and hospitals must adhere to the Health Insurance Portability and Accountability Act (HIPPA) regulations or risk being cut-off from federal funding. The entire institution, and not just the non-HIPPA-compliant medical school, could be cut off. HIPPA forced colleges and universities to improve significantly the privacy and information security of their technology systems. By increasing the potential negative consequences of non-compliance, legislators and federal authorities ensured that colleges and university officers would pay attention to these matters even when academic administrators in the health sciences departments did not.

Federal and state government agencies also shape higher technology adoption by offering carrots. For example, to facilitate the build-up of the Internet, the federal government subsidized Internet connectivity for universities for years, as long as the institutions met certain requirements.

The Federal Government also publishes many documents that are useful to higher education institutions. This know-how helps consultants, technology vendors and university officials improve operations and practices on campus. An example of a document of these characteristics is the National Education Technology Plan, published on November 2010. It covers the entire education sector in the United States, including higher education institutions. The web site of the Department of Education presents the plan in the following terms:
The National Education Technology Plan, *Transforming American Education: Learning Powered by Technology*, calls for applying the advanced technologies used in our daily personal and professional lives to our entire education system to improve student learning, accelerate and scale up the adoption of effective practices, and use data and information for continuous improvement. It presents five goals with recommendations for states, districts, the federal government, and other stakeholders. Each goal addresses one of the five essential components of learning powered by technology: Learning, Assessment, Teaching, Infrastructure, and Productivity.\(^{30}\)

These policies, penalties and incentives influence the adoption of information and communication technologies on campus.

**Policy Changes and Wishful Thinking**

Congress passed and President Bush signed the No Child Left Behind Act of 2001 for primary and secondary education, as well as the Higher Education Opportunity Act of 2008 for tertiary education. Both pieces of legislation aimed at demanding more accountability from the educational system. Under the No Child Left Behind Act, students are measured with standardized tests. Teachers must adhere to very detailed skills development schedules in critical areas like math and language. The effectiveness of the teachers is measured by the success or failure of the students in the standardized tests. To close the circle, underperforming schools are penalized financially. Underperforming teachers face grave employment consequences, including termination.

Accountability and learning outcomes are social mandates for educational institutions. It was logical to see an ideological extension of the No Child Left Behind Act into higher education. The push into tertiary education came with the Higher

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Education Opportunity Act. The federal government, through the Department of Education, wanted to regulate tertiary institutions more, particularly for profit vocational schools. There is demand in society for more transparency and accountability in educational institutions, as evidenced in that piece of legislation. There was also demand in society for more efficient higher education institutions.

To do this, society needs good laws with appropriate enforcement. For example, federal legislation about privacy with an all-or-nothing approach to providing federal funds is equivalent to using a nuclear weapon in conventional warfare. This measure would destroy an institution and force its students to find other colleges and universities to finish their education. It lacks proportionality between the offenses and the penalties and cannot be used in most cases. Instead, a more sensible approach could be to issue fines to the offending institutions or to set upper limits to the amount of federal funding that misbehaving colleges and universities can tap. For example, the Department of Education could impose a financial aid cap reduction of 5% per major incident per year to institutions that leak personally identifiable student information due to the careless use of technology.

**Driving Technology Adoption with Legal Instruments and Policies**

What drivers can higher institutions and their constituents use to change the rules factor? Higher education constituents, particularly administrators, must ask themselves whether or not technologies are legal before adopting them. They must consider the rules factor, that is, they must be reasonably sure that adopting a given technology complies with institutional policies, with local, state and federal laws, and with accreditation rules. Therefore, higher education institutions and their constituents can use legal and policy
instruments to change the rules factor, which in turn shapes technology adoption on campus.

Higher education faculty, staff, students and administrators can participate in the legislative and regulatory process to push for local, state and federal laws and regulations that support the adoption of technology on campus. Ideally, institutions and their constituents should pursue effective laws and regulations and push to abolish those that are contrary to their technology interests. They must consult with experts, most notably lawyers and technologists, to understand the potential impact of proposed laws and regulations and how best to comply with them while using technology to fulfill their mission.

At the institutional level, crafting better polices and enforcing them is critical to succeed in adopting technology on campus effectively. For example, in most of the data leak cases in higher education to date, neither the employees directly responsible nor the administrators suffered any consequences other than receiving reprimands. Perhaps technology and goodwill are not sufficient to encourage the responsible use of information and communication technologies by knowledge workers in colleges and universities. Writing and enforcing policies with teeth, that is, policies with defined penalties outlined in them is necessary to ensure a responsible use of information technologies in higher education.

Faculty, staff, students and administrators can participate in creating and updating useful policies to promote technology adoption. However, the effectiveness of written policies is limited. People may not follow institutional policies out of ignorance, their
belief that it is unlikely that they may get caught, or their willingness to accept the anticipated penalties if caught.

Finally, higher education institutions and their constituents can work within the realm and processes of their accreditation bodies to update the rules of the game, that is, to reduce barriers to technology adoption. For example, this is particularly important when organizations like the American Bar Association oversee distance learning initiatives in legal academic programs.

The implication for the integrated model is that colleges and universities can use legal and policy instruments to drive how the rules factor influences the technology adoption behavior of faculty, staff, students and administrators.

<table>
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<tr>
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<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
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<td>Rules</td>
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<td>Academic policies</td>
<td>Human resources policies</td>
<td>Higher education laws</td>
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<td>Norms</td>
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<td>Student handbook</td>
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<td>Architecture</td>
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Table 3. Sample legal and policy instruments in the technology adoption model.

However, approving new campus policies may take a long time and demand significant political capital. The same is true about passing new local, state and federal laws and regulations, and about modifying accreditation rules. Because of the fast pace of technology evolution, higher education institutions cannot rely exclusively on legal and policy instruments to promote technology adoption. Instead, they must also use other drivers to shape technology adoption on campus. The next chapter looks at how faculty,
staff, student and administrators are influenced by norms in their technology decisions and how they can use diffusion of innovation dynamics to drive technology adoption.
CHAPTER 2
NORMS: DIFFUSION OF INNOVATION

This chapter analyzes a second factor influencing the adoption of information and communication technologies in higher education in the United States: the diffusion of innovation. As Lessig considers the four modalities that shape the behavior of people in cyberspace, he claims that “norms also regulate behavior in cyberspace.” So do they when people use technology in colleges and universities.

By norms, Lessig means the code of conduct that is socially accepted in a community, both a virtual community such as a social networking group and a physical one such as a group of philosophy students on campus. In cyberspace, norms refer to what technology behaviors are acceptable, that is, to what technologies people use and how they use them. When innovations diffuse, people learn from others what technologies are appropriate for certain uses and how to use them. In other words, diffusion of innovation dynamics shapes the norms of technology use in campus communities.

The focus of the chapter is the study of some of the best-known diffusion of innovation models, as they happen and are applied on campus. To illustrate how the models work in practice, the chapter showcases select experiences in the adoption of information technologies on campus, specifically the adoption of Windows Vista and Windows 7 at the Georgetown University Law Center.

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Lessig, Code, 124.
Everett Roger’s Model for the Diffusion of Innovation

In his book *The Diffusion of Innovations*, Everett Rogers defines the diffusion of an innovation as a special type of communication between people who use the innovation and those who consider using it. “The four main elements of the model are the innovation, communication channels, time, and the social system.”

Rogers defines an innovation as an “idea, practice or object that is perceived as new by an individual or other unit of adoption.” The terms innovation and technology are often used interchangeably because “most of the new ideas whose diffusion has been analyzed are technological innovations.” In the context of this research, the practice of using a given information and communication technology is the innovation. Examples of such technology innovations include hardware, software, and services; for example, Apple laptop computers, Windows 7 operating systems, and Google Gmail services.

A communications channel in Rogers’ model is “the mean by which messages get from one individual to another.” This happens to be a widely accepted definition in communications theory. Communication channels in this research are the personal discussions about technology among faculty, staff, and students within an institution and across institutions, and with others outside of academia, from vendors to neighbors. They also include mass media communications like newspaper articles, online blogs, and web sites.

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2 Rogers, *Diffusion of Innovations*, 11.
3 Ibid., 12.
5 Ibid., 18.
Time is of the essence when studying the diffusion of innovations. Time refers to how long it takes for an individual to go from “first knowledge of an innovation through its adoption or rejection.” How many individuals have adopted an innovation at a given point in time? And, most importantly, how do we categorize the individuals based on their rate of adoption of an innovation?

Rogers answers the last question by identifying five different adopter categories, starting with the ones who take the least time to adopt an innovation and finishing with those who take the longest. The five categories are: “(1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards.” The following figure plots the adopter categories on a standard diffusion of innovation curve over time. The x-axis represents units of time while the y-axis represents the percentage of new adopters within the population at any point in time.

Figure 3. Adopters over time in Rogers’ diffusion of innovation model.

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6 Ibid., 20.
7 Ibid., 22.
A social system in Rogers’ diffusion of innovation model is “a set of interrelated units that are engaged in joint problem solving to accomplish a common goal.” This definition encompasses not only the individuals but also the organizations for which they work. In the context of this research about U.S. higher education, the individual members of the social system are the faculty, staff, students and administrators. Examples of joint problems in which they may be involved could be how to teach with multimedia materials, how to collaborate with each other remotely, how to take notes in class, how to register students for classes, and how to process payroll payments for employees. The organizational members of the social system are the academic departments, campuses, and colleges and universities.

Two important players that Rogers identifies in his research are “opinion leaders” and “change agents.” Opinion leaders are members of the system who exert influence over the adoption decisions of other members of the system. An example of an opinion leader would be a faculty member who tells a colleague to try a Windows 7 computer for research. Change agents are people outside the community with a mandate to influence others in the adoption process. An example would be a Microsoft account representative who tells a professor to use a Windows 7 computer for research. Opinion leaders and change agents may promote the diffusion of some innovations and delay the diffusion of others. Both the opinion leader and the change agent in the previous Windows 7 examples may convince faculty members not to try a competing product, e.g., an Apple computer, for a variety of reasons.

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8 Ibid., 23.
9 Ibid., 26.
Over-My-Dead-Body Adopters

Perhaps the greatest gap in Everett Rogers’ diffusion of innovation model, as applied to the study of the adoption of information and communication technologies in higher education, is the over-my-dead-body adopter category. Everett Rogers categorizes adopters based on the timing of their adoption of an innovation with respect to the rest of the adopters. He identified five categories: innovators, early adopters, early majority, late majority, and laggards. Yet, he missed one more category to the far right of the adoption curve: over-my-dead-body adopters.

Higher education institutions are, particularly when it comes to work methods and traditions, risk-averse organizations populated with many change-averse individuals. Once a faculty or staff member has mastered a given technology, e.g., WordPerfect to write research articles with sophisticated footnotes or a mainframe student information system to manage academic records, that person will entrench in a position of comfort and knowledge. Many will resist change to a newer or different technology to accomplish the same set of tasks, regardless of utilitarian considerations.

They are no-change agents. These people exert a negative pressure against the diffusion of an innovation. They not only resist the adoption but they speak adamantly to peers and others about the values and virtues of the old methods and technologies. I coined the term over-my-dead-body adopters, as an onomatopoeic term alluding to these individuals’ frequent comment when faced with a technology change or upgrade. As a new technology becomes ubiquitous, e.g., Microsoft Word for word processing, the over-my-dead-body adopters become fewer and more isolated in their use of an old
technology. They present challenges when demanding technical support from vendors and technologists. They find obstacles when collaborating electronically with others.

Due to their influence and to their employment stability within the organization, they often require expensive and institutionally inefficient support resources and technology accommodations. The trade-off is that over-my-dead-body adopters usually achieve remarkable productivity levels for a fixed set of tasks with the technologies with which they are familiar. They prefer not to innovate in their work methods or to adopt new technologies for their work processes. These situations present many challenges in collaborative work environments; for example, in those cases when over-my-dead body faculty members must work with research assistants who use newer technologies to edit documents.

Over-my-dead-body adopters are common in higher education institutions partially because of the tenure system for faculty members. Once a faculty member has tenure, many organizational disincentives, e.g., disciplinary actions or administrative mandates, to modify their behavior become ineffective. In 2001, the President of the Massachusetts Institute of Technology, Charles Vest joked about it: “the difference between terrorists and faculty members is that it is easier to negotiate with terrorists.” These jocular remarks illustrate the unique employment relationship of tenured faculty members.

For example, some faculty members embraced a popular word processing software package in the late 1980s and 1990s called WordPerfect. In the 2000s, WordPerfect software fell out of favor worldwide. As of 2012, some professors refuse to give up the use of WordPerfect in exchange for a more widespread software option like
Microsoft Word or Google Docs. This is the case regardless of the difficulties of keeping WordPerfect running in modern computers and of the collaboration challenges that it presents when working with other word processing users.

Staff members are not generally protected by the tenure system. However, they also work in a risk-averse collegiate environment in which human resources and in-house legal departments fear litigation and potential reputational damage. Hence, staff members enjoy de facto employment stability, much more so than in corporate America. When they choose to stick to older technologies and work methods, institutions find it difficult to promote change, innovation, and organizational development.

Few students, if any, belong to the over-my-dead-body adopter category. Students tend not to resist technological change as much as some faculty and staff members do. Even if they did, it would be hard to notice because students change every few years. The number of years usually depends on the length of the student’s specific academic program, e.g., three to five years for those pursuing a bachelor’s degree, one to three years for a master’s degree, and three to ten years for a doctoral degree.

Geoffrey Moore’s Model for the Marketing of Innovations

A pointed practical application of Everett Roger’s model is Geoffrey Moore’s supply-side diffusion model. In Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers, Moore uses Rogers’ technology adoption curve with adopter categories over time to build his “High-Tech Marketing model.”

According to this marketing model, “the way to develop a high-tech market is to work the curve from the left to the right, focusing first on the innovators, growing that market, then moving on.

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10 Moore, Crossing the Chasm, 13.
to the early adopters, growing that market, and so on, to the early majority, late majority, and even to the laggards.”¹¹ In this marketing model, every group of customers forms the base to attract the next one.

In this evolution of Rogers’ model, Moore coins new terms for each one of the adopter categories: innovators are technology enthusiasts, early adopters are visionaries, early majority are pragmatists, late majority are conservatives, and laggards are skeptics.¹² The following figure depicts a new version of the adoption of innovation curve with the contributions and terminology of Moore’s high-tech marketing model.

Figure 4. Moore’s high-tech marketing model.

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¹¹ Ibid., 14.
¹² Ibid., 30-55.
Moore posits that the curve does not flow uninterrupted. Instead, he identifies two small cracks and a big one, which he calls a chasm. There is a small crack between the innovators and the early adopters. This crack happens because innovators love the innovation for its technical merits but it is hard for others to figure out its applications. There is a second crack between the early majority and the late majority. The reason for this is that people in the early majority are willing to make significant efforts to learn how to use the technology. People in the late majority, however, are less inclined to make sacrifices for the sake of adopting the technology.

The salient component of the model is what he identifies as a “deep and diving chasm that separates the early adopters from the early majority.” This chasm is critical because technology vendors and organizations may miss it. In the chasm, adoption numbers continue to grow as predicted by the technology adoption curve, but there are differences in the reasons for adoption. Early adopters acquire technology products or services as change agents. They are seeking a competitive advantage or new ways of doing things. Early majority adopters, on the other hand, are looking for productivity enhancements, that is, they want innovations to improve the efficiency of their existing operations.

At this critical junction, the innovating technology organization has barely introduced a new product or service to the market. The innovators, early adopters, experts and observers anticipate several potential uses and applications for the new invention. If the technology organization does not focus its efforts, it will most likely misspend its scarce marketing resources and fail to disseminate the innovation. Instead, the

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13 Ibid., 19.
organization must focus its efforts on a primary application or use. At the same time, however, it must record and revisit the ideas generated during this phase of the product or service introduction. Once the majority adopters embrace the innovation for its primary purpose, it is possible to get a second wind for the diffusion by focusing on some of the other purposes and applications envisioned early on.

**Malcom Gladwell’s Epidemics Model**

A popular way to learn more about diffusion of innovation dynamics is by reading a collection of case studies in *The Tipping Point* by Malcom Gladwell. In his book, Gladwell posits a new way to understand how fads, fashion trends or crime waves take place. “Think of them as epidemics. Ideas and products and messages and behaviors spread just like viruses do.”

When considering epidemic transmission of ideas and practices, Gladwell establishes three rules: “the Law of the Few, the Stickiness Factor, the Power of Context.” In epidemiology, these rules would correspond to those who are the carriers of the epidemic, what is the actual nature of the epidemic, and in what population the infection takes place. If we think in terms of message communication, these rules would correspond to the messengers, the message, and the channel, respectively.

The Law of the Few states that “the success of any kind of social epidemic is heavily dependent on the involvement of people with a particular and rare set of social gifts.” He identifies three critical players in the diffusion model: Mavens, Connectors,

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15 Ibid., 29.
16 Ibid., 33.
and Salesmen. These people “play a critical role in the word-of-mouth epidemics that dictate our trends and tastes and fashions.” 17

Connectors are critical in introducing new products and ideas in a community. Connectors are influential people, shapers of public opinion and tastes, in the community where the diffusion of innovation takes place. They know lots of people at many different levels within the community. “They are people whom all of us can reach in only a few steps because, for one reason or another, they manage to occupy many different worlds and cultures and niches.” 18

In higher education, connectors may be in any department. They could be faculty, academic leaders, administrators and staff members. Some students are connectors. I was a connector for technology at Georgetown University in 2012. In professional circles, I was a chief information officer for the Law Center Campus in Washington, DC and for the Center for Transnational Legal Studies in London, United Kingdom. I was an associate vice president of information technology for the University with a mandate to identify and adopt emerging technologies. I was an adjunct professor in the Master in Technology Management and the Master in Communication, Culture and Technology programs. I was a doctoral student in the Liberal Studies department. I served on several technical and academic University committees.

In less formal circles, I was an active member of the Chess Club. I was a prominent member of the Spanish community of the University. I played golf and tennis with faculty and staff members from all three campuses. I took business trips, and shared lunches and dinners with University peers. I run into campus colleagues in DC but also in

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17 Ibid., 14.
18 Ibid., 48.
far away places like London, Vilnius or Jerusalem, while travelling on University business. In all of these social and professional circles, I introduced people to technologies that I thought would benefit them, e.g., web conferencing services like Cisco Webex.

Mavens are also key players in the transmission of ideas within a population. “The word Maven comes from the Yiddish, and it means one who accumulates knowledge.” Mavens are very knowledgeable about the markets, services and products in which they are interested. They pay attention to product developments, price evolution, and special offers. And they are very generous with the information that they gather. Once they learn something useful about a product or service, they will tell others within the population. Their aim is not to persuade others but to inform them of potential opportunities.

There is one stereotype of higher education employees that fits well within Gladwell’s model. Many librarians make wonderful mavens. These are not necessarily the librarians who specialize in electronic services, who manage computer science collections or who run computer labs in libraries. No, these are the librarians who read widely about new technologies, like emerging web tools and smartphones, and who share their knowledge with campus constituents in person and electronically. These are the librarians who read and write blogs, the librarians who attend esoteric conferences like South by Southwest in Austin, Texas.

The persuading role in Gladwell’s model rests with the Salesmen. They are very effective people in convincing others to embrace new ideas and practices. What

\[19\] Ibid., 60.
characterizes Salesmen is some kind of “indefinable trait, something powerful and contagious and irresistible.” These people exude energy, enthusiasm, charm and likability.

The true salesmen in academia may or not work for higher education institutions. Most salesmen work for technology vendors who promote their products and services within the campus. They are the customer service representatives and evangelists of companies like LexisNexis, Apple, Dell, Microsoft, Google and Blackboard. They work at all levels of the organization to push their offerings. They work with executives, technologists, faculty, staff and students. Occasionally, they partner with members of the technology team or the bookstore to entice the members of the community into adopting new products and services. Some times in-house technologists behave like salesmen to persuade others on campus to adopt a given technology.

**Communication Channels: Exposure to New Technologies**

In the Rogers, Gladwell and Moore models, we can divide the population within a social system into two groups at any point in time during the life cycle of an innovation. On the one side, we have the technology users and the parties whose intention is to promote the use of the technology innovation. On the other side, we have those who consider adopting after being exposed to the new technology. In higher education, faculty, staff, and students are exposed to new technologies through many communication channels. The following paragraphs explore these channels.

Higher education constituents gain exposure and learn about new technologies in many ways. Many watch, listen to and read the mass media mainstream technology

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20 Ibid., 73.
stories, e.g., the release of the iPad. They also consume the pieces in the technology sections of major newspapers, like Walt Mossberg’s Personal Technology column in the Wall Street Journal or David Pogue’s column and video blog in the New York Times. Others read articles dealing with technology in publications focused on their field of expertise, like the Chronicle of Higher Education, University Business, EDUCAUSE Review, or the American Bar Association Journal, to name a few.

Some are exposed to new technologies by collaborating with colleagues from the same department, from other academic units, campuses, and institutions. Other constituents have friends, partners and family who work in other academic institutions, corporations, government agencies and non-profit organizations telling them about new technologies.

Some faculty members and students are exposed to new information and communication technologies when they do academic work at other institutions as part of study away programs and scholar exchanges. Some learn about new technologies at academic conferences and trade shows, either in presentations or in more informal settings. Some learn over drinks and food with peers during the social events of trade conferences and meetings. Yet, others are exposed to new technologies through their work in editorial, corporate, non-profit and professional boards.

Technology departments offer in-house training courses in new technologies for faculty, staff and students. At the most basic levels, the courses raise awareness about new technologies by demonstration. As the sophistication of the training programs increases, course attendees also develop competencies, from novice to advanced, in using
the technologies. Some campus constituents attend ad hoc training sessions offered by technology companies and their business partners.

Technology retreats or special technology days for faculty, staff and students also contribute to spread new technologies on campus. In these sessions it is common to encourage participation with giveaways, white papers, and presentations by technology evangelists and influential technology adopters from the same institution and from sister schools. It is common to encourage participation with food, usually in the form of working breakfasts and lunches.

On campus speaking events by technology evangelists like Apple’s Barry Adams are common ways to introduce new technologies and to influence technology adoption rates in higher education. Barry Adams is a Doctor of Education and a faculty member and dean emeritus of the School of Education at Georgia College and at Georgia State University. From 1990 until 2008, he travelled extensively to college campuses in the United States to promote Apple products and technologies. During a December 2008 visit to celebrate the opening of an Apple campus store at Georgetown University, Dr. Adams gave talks to faculty and staff members. He shared tricks and tips about how to use Apple products to prepare class lecture materials. He showcased Apple technology services like the iTunes University service for podcasting academic programs.

Multi-channel marketing campaigns target faculty, staff and students, sometimes with institutional endorsement. Most higher education institutions enter into co-marketing agreements with information technology companies like Apple and Dell. The institutions embrace these contracts to promote technology adoption on campus. They also do it to obtain additional technology resources. In general, these contracts stipulate that for every
computer purchased by a person affiliated with the institution like faculty, staff, students and alumni, the college or university receives in-kind or monetary incentives. These agreements also motivated buyer consumption with economic incentives in the form of discounts and special offers.

Students learn about new technologies in all of these ways. They also tell each other about new technologies, on campus and across campuses, both in person and online in social networking platforms and other electronic forums. Additionally, faculty members expose students to new technologies through class materials like web sites, electronic books, simulations, software, and electronic research services.

Students also learn about new technologies by browsing admissions materials, by attending student orientation sessions, and by reading newsletters and other communications like blogs and correspondence, mostly in electronic format. At Georgetown University, for example, students regularly receive email broadcasts about technology services and products from multiple campus organizations like the technology departments, the academic units, the libraries, and the student groups.

Many staff members are exposed to new technologies when they attend higher education events. Most of these events have technology tracks and sessions. Some sessions cover generic technologies and issues, like social networking. Others focus on specific technology issues for supporting functions like career services or financial aid management. Some events revolve around a single company and its offerings, like Blackboard World, an annual conference organized by Blackboard and its business partners. College and university technologists participate in their community conferences, like the EDUCAUSE and the New Media Consortium annual meetings.
Due to the increasing maturity of web conferencing technologies and due to the difficult economic situation in the United States between 2008 and 2012, many college and university employees did not travel and attended webinars instead. In other words, they learned about new technologies via online sessions.

**Institutional Decision Making in Technology**

College and university CIOs, as well as other campus technology-decision makers, often times turn to industry research to make decisions about technology options. Pay-per-use business intelligence services like Gartner are particularly useful because their simple and easy-to-understand graphical tools help customers compare technology options. This is true both for the primary readers, that is, those technology experts who subscribe to the research service, and for the secondary readers, that is, the non-technology executives, staff members and others involved in the technology adoption process.

The quintessential Gartner tool to assist executives in choosing a particular product or service is the magic quadrant. The magic quadrant takes the form of a two-axis graph dividing a square into four quadrants: Niche Players, Visionaries, Challengers and Leaders. The X-axis refers to the Completeness of Vision and the Y-axis measures the Ability to Execute. The magic quadrant plots some of the most popular product lines in a given technology market as dots in one of the quadrants. The higher and the more to the right the position of a dot representing the product line, the more attractive and the safer
it is for higher education technology decision-makers to justify embracing it. The following figure illustrates the conceptual elements of the Gartner magic quadrant.

![The Gartner magic quadrant.](image)

Figure 5. The Gartner magic quadrant.

It is relevant to note that the quadrant does not examine the virtues and the shortcomings of the different products or services under comparison. Instead, the quadrant considers how likely it is that vendors will meet market expectations for their product lines in the Ability to Execute dimension. Similarly, the magic quadrant shows how accurately vendors understand the market demand for their product lines in the Completeness of Vision dimension. These are non-traditional metrics to make technology
evaluations, particularly when compared with more established economic measurements like market share or product development investments.

College and university technology executives consider studies like these ones good proxy indicators of the potential success of a product or service. After all, there is safety in numbers. CIOs and others in higher education committees facing technology decisions appreciate having an objective, third party document comparing several technology options, instead of relying exclusively on vendor claims. Logically, the credibility and the impartiality of vendor representatives, who are motivated by economic incentives like sales commissions, are questionable. Business analyses and reports, like those from Gartner, complement hearsay from colleagues at other institutions, advice from ad hoc consultants, and vendor testimonials.

For example, Mario David Smith’s Gartner Magic Quadrant for Web Conferencing published on July 29, 2009 played a critical role when the Georgetown University Law Center campus adopted web conferencing services to be prepared for the possible consequences of a swine flu pandemic. The Law Center opted to contract Cisco WebEx services for web conferencing. At the time, the decision-makers did not have access to objective knowledge about the performance and the scalability of the best-known products and services in the market in case of a national emergency. They lacked first-hand experience using these products and services.

The lack of information prolonged the discussions, therefore threatening to delay the acquisition of the technology and the training of the community members on time for swine flu preparedness. The technology executives achieved consensus among the academic administrators to acquire Cisco WebEx over other services thanks to Mario
David Smith’s report. The report presented Cisco Webex in very favorable terms compared to other web conferencing products and services.

To adopt or not to adopt at the personal level can be a painful and protracted decision. At the institutional level, it is more so because a few must make decisions that will affect many based on incomplete information. Even when the decision to adopt is clear, deciding the best timing for the adoption can be challenging. One of the thriving research areas for business intelligence services like Gartner is to help organizations time the adoption of innovations. Gartner does this with an analytical tool called the hype cycle. The hype cycle is a curve showing the maturity, adoption and social application of technologies.\(^{21}\) The following figure shows the conceptual framework of the Gartner hype cycle.

Figure 6. The Gartner hype cycle.

Besides Gartner, university officials use reports from other per-pay consulting services like Forrester Research, an independent market and technology research company. They also rely on reports from the EDUCAUSE Center for Applied Research, ECAR. ECAR has an outstanding reputation for rigorous, non-biased analyses, but the scope and quantity of its research is limited to academic environments, without the benefit of considering other economic sectors. Other sources of business intelligence for technology decisions come from the mass media. Faculty, staff, students, and even board members read the technology pieces by Walt Mossberg on the Wall Street Journal or by David Pogue on the New York Times. These technology columnists enjoy great credibility among academic community members, who often demand to use on campus the technologies covered in their news pieces. Because of their credibility, technology
decision makers also use those pieces to gain consensus about some technology initiatives.

Technology decision makers also use specialized web sites and magazines, like ZDNET, PC Magazine, or Consumer Reports to validate technology recommendations and decisions. In academia, a trusted source is the Chronicle of Higher Education, a specialized publication covering the lives of colleges and universities and their constituents. White papers by vendors feed the decision making process, particularly in the technical realm, but they are suspect due to their perceived lack of objectivity. The implication is that what could be possibly the most authoritative information is trusted only partially in the decision making process.

**Applying the Models: Windows at the Georgetown University Law Center**

The Georgetown University Law Center was featured in Mark Henricks’s article Destination Vista on *ED Tech* on October 2007, as an early adopter of the at-the-time newly released Microsoft operating system, Windows Vista. As Associate Vice President of Information Technology for Georgetown University from 2007 until 2012 and Chief Information Officer of its Law Center Campus from 2000 until 2012, my job was to facilitate the use of technology to achieve the educational mission of the institution. Therefore, my team members and I were committed to ensure that potentially useful technologies like Windows Vista became available to faculty, staff and students on campus as soon as possible after their market release.

By all accounts our migration to Vista went extremely well. In January of 2009, mid-way through the second year of the implementation, approximately 50% of the computers on campus were running Vista. In some academic units like the law library,
practically 100% of the computers operated on Vista. Most of the first year students who run Windows followed the institution’s advice to use Windows Vista instead of XP. An increasing number of faculty and staff members upgraded their home computers to Vista to run the same version of the software both in their homes and at work.

I attributed the success of the adoption process to the outstanding qualifications and experience of the team members in charge of information technology at the institution. The other success factor was a formal approach to spreading technologies on campus based on Everett Rogers’ model for the diffusion of innovations, augmented with Malcom Gladwell’s connectors model, and Geoffrey Moore’s targeted marketing model. The practical application of these models for the intended diffusion process and its resulting campus-wide adoption was built on the following components.

**Planning.** In wide consultation with the community members that the technology department served, the technology team and the Technology Users Committee wrote a five-year strategic plan for technology. The technology team, with help from others, expanded the strategic plan by elaborating detailed annual plans for critical projects like the web presence of the institution. The technology team also prepared and defended in front of the Finance Committee the annual budget proposals for the necessary expenditures to carry out the plan. The technology plan at the time of the Vista rollout covered the period from 2006 to 2011. The plan contemplated the full adoption of Windows Vista in synchronization with a four-year replacement cycle for computers. The mission, vision, objectives, goals, and list of impact projects of the plan were publicized widely among community members, as well as displayed prominently on the technology web site for the campus.
Communication. The diffusion of a new technology like Vista was faster and its adoption rate was higher because most people knew about it, including new team members, other departments, and business partners. Community members were aware of what the technology department planned for the campus. Internal marketing via web pages, emails, group briefings, one-on-one interviews, and electronic newsletters was used to get everybody on board with the plan and its initiatives. The technology team used marketing techniques to tell other departments, schools, campuses, organizations and vendors how important the plan and its initiatives were to the institution and how necessary their support and commitment was to succeed.

Throughout the implementation of the plan, concepts were explained clearly and in non-technical terms. For example, shortly after Microsoft’s release of Windows Vista there was great confusion among community members in distinguishing between Microsoft Windows Vista and Microsoft Office. Many in the community did not know that these Microsoft upgrades were independent of each other; that is, a user could upgrade to Windows Vista or to a new version of Microsoft Office, or to both.

The technology department published web pages with frequently asked questions, do-it-yourself guides, and recommendations both for institutionally-owned computers and for personally-owned ones. Technology team members wrote and sent electronic newsletters and ad hoc broadcast emails. As the CIO for the campus, I wrote about our efforts to diffuse Windows Vista in my official blog, the one that I started in 2004 to communicate better with my constituents. Technology team members cultivated their presence on social networks like LinkedIn and Facebook. They posted relevant
information about this initiative, including links to technical pieces and to news in the
genral media covering the advantages and disadvantages of Windows Vista.

Technologists had one-on-one meetings with influential community members. They cultivated interpersonal relationships with faculty, staff, students and administrators. They took advantage of these contacts to keep people informed and to hear their concerns. The technology department celebrated a campus technology day in 2007 with key technology business partners like Dell and Microsoft. The goal was to showcase new technologies available to students, e.g., Windows Vista. To encourage student attendance, the vendors sponsored a pizza meal. That day the organizers learned never to stand between the food and the students, who stampeded towards the pizza boxes upon their arrival.

Food brings people together on college campuses, so the department organized technology sessions for faculty and staff, around breakfast or lunch. During the sessions, some of the faculty and the staff members volunteered to talk to their peers about the pros and cons of using a given technology, e.g., Windows Vista, at work and at home. Their candid comments, both positive and negative, aided in the diffusion.

The technology team members took advantage of the mandatory orientation programs for students at the beginning of the academic year to spread the word about Windows Vista and other useful technologies. They also spoke during the orientation sessions for new employees of the campus. Thus, they introduced new faculty, staff, and students to Windows Vista and other technologies upon their arrival on campus.

To communicate the news of a new technology initiative to the community, in this case the adoption of Windows Vista on campus, few things proved as effective as
appearing on the cover of a technology publication. The CIO’s appearance on the cover of *ED Tech* magazine in the summer of 2007 was forwarded by the at-the-time Executive Vice President and Dean of the Georgetown University Law Center, Alex Aleinikoff, by electronic means to all faculty and staff members with a humorous introduction. After that, few on campus were unaware of the efforts to diffuse Windows Vista.

**Training.** Those who were apprehensive about adopting Windows Vista benefitted particularly from training. The department offered a variety of training programs taking into account the different learning styles of individuals. The technologists trained large groups in sessions with multiple departments, as well as small affinity groups in offices or computer labs. Team members even offered one-on-one coaching upon request.

Of special importance was the preliminary training of the technology team members, so that they could build the expertise necessary to succeed in supporting the new technology. The key support and implementation technology personnel attended training for Windows Vista before most community members were exposed to the new technology. This way they embraced the new technology with pride and showcased their mastery of it in their interventions. Technology team members also received subscriptions to on-demand electronic resources for support, so that they could escalate and solve the most complicated problems when adopting the new technology.

**Feedback.** The brilliant faculty, staff, and students on campus gladly volunteered some of their time and efforts to make the University a better place. Their suggestions, however colorfully expressed at times, improved the technology adoption process. Because not everybody is equally outspoken, the technology department conducted an
annual technology satisfaction survey among students. Another survey, an annual
campus-wide survey run among graduating students, allowed the team to compare
technology services with other campus services, e.g., the quality of teaching or parking,
and to observe trends over time.

Similarly, the CIO requested direct feedback from faculty, staff and
administrators by email, by phone, and in person. It was not until 2011 that faculty and
staff participated in the annual technology surveys. These feedback mechanisms helped
the technology team members gauge to what extent they were meeting the expectations
of the community. They also uncover unusual quirks and patterns regarding the
integration of Windows Vista with other technologies already in use on campus.

**Flexibility.** Faculty and staff members work under pressing deadlines in seasonal
cycles that are sometimes unique to their activities. The technology team worked with
department heads and with other influential members of the community, e.g., faculty
members perceived as technology savvy by their peers, to conduct upgrades on the dates
that were most convenient to them. The technologists negotiated the timing of the
upgrades so that they would be both reasonable and resource efficient.

The team did not neglect a unique category of technology adopters beyond those
identified in Everett Rogers’ diffusion of innovation model. The technologists worked
closely with the over-my-dead-body adopters, those who refuse to give up older
technologies with which they are familiar. The team engaged the over-my-dead-body
adopters in an ongoing dialogue to understand why they rejected Windows Vista. They
devised creative ways to address their problems and objections. Then, the technologists
partnered with peer faculty and staff members of the over-my-dead-body adopters to facilitate their adoption of Windows Vista.

Although Windows Vista was easier to use than Windows XP, although it was more secure and less labor-intensive to manage technically, it was not a marketing success. This was due partially to technical flaws, including compatibility problems with device drivers and long-term system instability. In December of 2008, Microsoft announced that it would release the new version of its flagship Windows operating system, version 7, at the end of 2009. In October of 2009, less than three years after the release of Windows Vista, customers would be able to purchase Windows 7.

The announcement meant that many people and organizations discarded their plans to upgrade to Windows Vista and instead waited for the release of Windows 7. The Georgetown University Law Center campus, however, continued to upgrade computers and systems to Vista, following the original plan and its disciplined four-year replacement cycle. The moment that the Windows 7 Beta version became available for testing, the technology personnel started to use it. Once again, their goal was to ensure that community members had access to the latest technologies useful to them as soon as they were available and suitable. When Windows 7 was finally released, the technology team started its technology diffusion and adoption.

Once again, the institution planned and established processes for Windows 7 deployment similar to those used for the Vista rollout. The maturity of these practices, the additional experience gained by the technologists, and the familiarity of the community members with Windows Vista, made the campus diffusion of Windows 7 even easier and faster than that of Windows Vista. With this mature technology adoption process mostly
based on diffusion of innovation dynamics, Georgetown Law was prepared for the eventual adoption of Windows 8, scheduled for release in October of 2012.

As of January of 2010, of the almost one thousand institutionally-owned computers on campus, 512 run Windows 7, 290 had Windows Vista, 84 operated with Windows XP, and 52 were Apple Macs. As of June of 2011, of the almost one thousand institutionally-owned computers on campus, 606 run Windows 7, 235 had Windows Vista, 53 operated with Windows XP, and 62 were Apple Macs. The Windows XP computers remained on campus for backward compatibility with obsolete University applications and databases.

The case illustrates how an understanding of the diffusion models and their application in campus settings can accelerate and facilitate the adoption of innovation. In turn, this adoption allows colleges and universities to become more efficient by improving the productivity of faculty, staff and students with information technologies. A necessary premise in this argument is that new versions of existing technologies, and new technologies, contribute to productivity gains. There is, however, another lesson to be learned. Sometimes new technologies like Windows Vista do not bring about in the expected productivity and efficiency gains, even when the adoption process itself is efficient.

**Student Technology Adoption at the Georgetown University Law Center**

From 2001 to 2012, the Information Systems and Technology department at the Georgetown University Law Center partnered with the Technology Users Committee to conduct a survey among current students about technology services. Five faculty
members, two students, and two ex officio senior administrators, including the campus
Chief Information Officer, served on the Technology Users Committee.

It is important to note that these surveys were not statistically valid because
students were not sampled randomly. Instead, approximately 2,500 current students were
asked by email to participate in the survey. A variable number of them, anywhere from
5% to 15% approximately, responded each academic year. Some years survey
participants were entered into a raffle for iTunes music cards as an incentive to respond.
Other years no incentives were offered. Student participation did not change significantly
with or without incentives.

Starting in 2008 the survey incorporated a new set of questions about the
approximate timing for the student adoption of several technologies including Facebook
and other social networking services, Mac computers, Windows Vista, Office software
2007 for Windows, Office 2008 for Macs, Blackberries, and iPhones. The questions
were included also in the 2009 survey. The summary results for both years follow.

Of interest is the fact that the percentage of respondents who reported adopting
Macs in 2008 was slightly higher (49%) than those who reported owning a Mac in the
same year (44%). This may be explained due to the fact that they used Macs at work, and
in places like the campus computer labs, but did not actually own them. Also, they may
have borrowed Mac computers from friends or relatives.

In 2008, the percentage of Mac adopters on campus included more than half of
the student body, approximately 51%, and increased to 55% in 2009. Also, the
percentage of Windows Vista adopters increased from 30% in 2008 to 39% in 2009. The
label of adopter was applied to those who indicated adoption of a given technology
before 2007, in 2007, in 2008, after 2008, or who were not sure about when they adopted it. Non-adopters, on the other hand, were those who chose the option “Never” as the timing of their adoption.

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Table 4. Adoption of new technologies by Georgetown Law students in 2008.

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Table 5. Adoption of new technologies by Georgetown Law students in 2009.
These numbers suggest that, at least for the technologies in the survey, the Georgetown Law students who responded fell either in the innovators, early adopters, and early majority categories of the adoption curve, or in the over-my-dead-body adopter category. In other words, they embraced new technologies early once they became

Figure 7. Adoption curves for select new technologies by Georgetown Law students in 2008 and 2009.
available in the marketplace or did not adopt them at all. A comparison of the two graphs shows how the adoption of technologies which were very new in 2008, e.g., Office 2008 or the iPhone, started to gain momentum in 2009. Office 2008 was released in January of 2008, whereas the first iPhone reached the shelves in June of 2007. This is why the 2009 curves look more like the bell-shaped curve in Everett Rogers’ diffusion of innovation model.

Students embraced innovation fast for Facebook and other social networking services. These services were free, at least in monetary terms, required minimal learning, and were ideal to connect with other people. Because they enabled communication among students, these tools diffused like one of Gladwell’s epidemics upon their introduction.

Students adopted Windows Vista in small numbers. In spite of institutional support and recommendations, most of them chose to not adopt Vista because they either preferred Macs or other Windows versions. From the survey comments, it was clear that those students who adopted Vista were not that excited about their adoption and may have communicated their disappointment with fellow students. This, together with the lukewarm and negative reviews of the mass media and specialized information outlets, kept new adopters on the far right of the adoption curve.

The adoption rates were polarized for Mac computers. Most students either adopted Macs before 2007, perhaps during their undergraduate years, or never adopted Macs at all. The switch from Mac to Windows, or the unlikely change in the opposite direction, required a significant financial commitment and investment of personal time and energy to learn new skills. In the middle of a demanding and competitive academic
program, e.g., a Juris Doctor or a Masters in Laws program, few students were willing to make the change.

Students were much eager to adopt Microsoft Office version 2007 for Windows and version 2008 for Macs. First, the cost was reasonable for the population under study. For example, Microsoft announced on September 12, 2007 that the price of the Microsoft Office 2007 Ultimate edition for students, if purchased over the web, was $59.95. Second, adopting required some effort and time to learn the new version but neither of them was significant. Finally, enthusiasm from early adopters and media hype helped with its diffusion among Georgetown University Law Center students. The diffusion of innovation models explained the pattern of adoption of Macs and Office software on campus. However, the economic driver played an important role, particularly when the adoption required significant financial resources and personal effort.

Driving Campus Technology Adoption with Diffusion of Innovation Dynamics

What drivers can higher institutions and their constituents use to change the norms factor? Higher education constituents must ask themselves whether or not a given technology will fit within the prevailing norms, that is, whether or not that technology will fit within the existing social conventions on campus. In particular, administrators and technologists whose job is to make technology available must consider whether or not the potential adopters on campus will embrace a candidate technology. In other words, will they use it?

Higher education institutions and their constituents can use diffusion of innovation dynamics to change the norms factor, which in turn shapes technology adoption on campus. Faculty, staff and students adopt technologies not only based on the
merits and demerits of the technology and its potential uses. Due to insufficient information and imperfect decision making, sometimes higher education constituents adopt technologies as the result of a specialized type of communication: diffusion of innovation, as identified by Rogers. They follow fashions and trends led by others, both individuals and corporations, as stated by Gladwell and Moore.

Fashion or trend is one of the strongest factors behind the adoption of many technologies in higher education. As Rogers’ diffusion model predicts, faculty, staff and students adopt technologies because others adopt those technologies before them: the laggards follow the late majority, the late majority follow the early majority, the early majority follow the early adopters, and the early adopters follow the innovators. Incidentally, the over-my-dead-body adopters do not follow anybody but themselves.

When institutions or groups of people are interested in promoting the adoption of a candidate technology on campus, they can use Rogers’ model to do so, using strategies and tactics suited for each adopter category.

As Gladwell’s epidemic model predicts, campus constituents adopt technologies because people influence them as connectors, inform them as mavens, and persuade them as salesmen. When campus leaders want to promote the adoption of a given technology, they can work with the connectors, the mavens and the salesmen on campus to do so. Faculty, staff and students can play any of these roles, depending on the specific technology and the unique campus environment where the diffusion takes place.

As Moore’s high-tech marketing model posits, administrators and technologists can partner with vendors to work the high-tech market curve from left to right and to entice users to adopt new technologies. That is, administrators and technologists can
work with vendors to identify the gaps challenging the adoption of a given technology and to find ways to jump over those gaps. A word of caution is in order. Some vendors have very aggressive marketing tactics, tactics capable of distorting the diffusion of innovation. To sell, some vendors will promise anything.

An obvious way to regulate technology use is through legal and policy instruments and associated enforcement mechanisms. However, norms are also critical in explaining how people adopt technology. Most of us do not shoplift not only because it is against the law but also because we believe that it may not be the moral thing to do, because of the shame associated with being caught, or simply because it is not customary for us to shoplift.

Organizational policies are suitable instruments to prevent certain behaviors but much less effective tools to promote others. Instead, faculty, staff and students follow acceptable norms and customs to adopt information technology on campus. For example, most faculty, staff and students in the United States have embraced certain social networking platforms in vast numbers without institutional involvement or policies dictating that they had to do so.

Norms and customs may also prevent the adoption of new technologies. For example, once Facebook became the quasi-official way for students to communicate with each other, promoting the adoption of another service was difficult. Many colleges and universities, like the University of Virginia, discovered this the hard way after unsuccessfully launching their internal and exclusive social networking platforms.

The cases and examples discussed in this chapter prove that norms, that is, socially acceptable behaviors shape how faculty, staff and students adopt information
technologies. Understanding how norms shape technology adoption gives us a powerful mechanism to influence technology adoption on campus. By using diffusion of innovation dynamics, we can facilitate or impede technology adoption. For example, faculty can pepper their courses with pedagogical uses of technology, therefore spreading the use of those technologies to students.

The implication for the integrated model is that colleges and universities can use diffusion of innovation dynamics to drive how the norms factor influences the technology adoption behavior of faculty, staff, students and administrators.

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Table 6. Sample diffusion of innovation dynamics in the technology adoption model.

The next chapter looks at how faculty, staff, student and administrators are influenced by prices in their technology decisions and how they can use economic incentives to drive technology adoption on campus.
CHAPTER 3

PRICES: ECONOMIC AND MARKET FORCES

This chapter analyzes the economic and financial elements of using information and communication technologies in higher education in the United States. Within Lessig’s framework of the four modalities shaping the behavior of people in cyberspace, he states: “Markets regulate behavior in cyberspace. Pricing structures constrain access, and if they do not, busy signals do.”1 In other words, economic transactions and the availability of scarce technology resources associated with those transactions affect how people use technology on the Internet. So do they when people adopt technology in colleges and universities.

I assess the economic and financial aspects of the technology adoption process in colleges and universities by analyzing industry statistics. I consider the issues surrounding the use of financial metrics like return on investment, total cost of ownership, and risk assessments in the technology evaluation process. In this context, I consider the principal-agent problem and the position of control vs. autonomy of individuals and organizational units. Finally, I use these concepts and examples of economic incentives to drive the adoption of information technology on campus.

Higher education is an important sector of economic activity in the United States. It was worth $320 billion dollars per year in 2010, in the words of Dr. Anthony Carnevale, director of Georgetown University’s Center on Education and the Workforce,

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1 Lessig, Code, 124.
as reported by Anya Kamenetz in the book *DIY U*.\(^2\) As of June of 2010, it was also an important component of the financial activity of the country on account of the cumulative amount of outstanding student loans, estimated at $833 billion. This number was made of about $665 billion in federal education loans and $168 billion in private student loans, as reported by Mark Kantrovitz in *Fastweb* on August 11, 2010.\(^3\)

Of the money that colleges and universities spend to provide their services, a significant part goes towards information technology products and services. Judging by the financial commitments, information and communication technologies are critical to colleges and universities in the United States. Higher education institutions, particularly large ones, spend heavily on information and communication technologies.

Even during difficult economic times like the 2008-2010 period, higher education institutions spent much on information and communication technologies. ECAR’s Philip Goldstein elaborates on the reasons why in these terms: “IT is a significant area of expenditure at most institutions, and we expected that IT organizations would be asked to absorb at least a share of institutional budget cuts. IT is also an area of investment that can be used to fuel productivity gains, create cost savings, or enable strategies to increase revenues. In this vein, we thought institutions might increase their level of investment in technology to help cope with changed financial circumstances.”\(^4\)


The Delta Cost Project tracks tuition and expenditures in higher education in the United States. After instruction, mostly composed of faculty salaries, the highest percentage of expenditures in colleges and universities in the United States is the category of academic and institutional support, including information technology. The Delta Project Trends in College Spending report summarizes the situation in these terms: “Over the 1998 to 2008 period, the share of instruction spending declined against increased spending for academic support (libraries and computing), institutional support (administration), and student services.”

However, what looks like excessive spending in information technology may be over, at least temporarily. The Campus Computing Project, self-described as the longest running longitudinal study on the impact of new technologies on U.S. higher education reported that IT central budgets slowed their growth starting in 2007, continuing in 2008 and showing reductions in more than half of them in 2009. The 2008 Campus Computing Project Survey results reported that “more than two-fifths of public universities (45.4 percent) report cuts in the central IT budget for fall 2008, up from just 16.3 percent in 2007. Similarly, 44.4 percent of public four-year colleges report central IT budget cuts this fall, compared to 16.7 per-cent last year. Other sectors also report reduced IT funding from last year to this, but the numbers are smaller: 22.8 per-cent for private universities, 23.5 percent for private four- year colleges, and 24.6 for community colleges.”

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The reduction in technology expenditures continued for several years. The 2010 Campus Computing Project Survey revealed that “the budget cuts that have wrecked havoc on college and university IT units and resources in recent years may be abating. New data from institutions participating in the 21st annual Campus Computing Survey reveal that two-fifths (41.6 percent) of colleges and universities experienced a budget cut in central IT services for the current academic year (2010-11), down from fully half (50.0 percent) last year.”

There are, however, conflicting reports about technology spending in higher education. Information and communication technologies are so necessary to colleges and universities in the United States that they spent an average of $9.3M or 5.3% of all campus expenses in central IT services, plus an additional $4.5M on average in decentralized IT services in 2007, as reported by the *EDUCAUSE Core Data Survey Summary Report 2007.* A caveat of the report is that many institutions could not even report technology expenditures outside of the central IT funding scheme, that is, those expenditures directly made by schools and departments. They could not find out how much they spent in technology across the board, which is a sign of economic mismanagement.

Two years later, the *EDUCAUSE Core Data Survey Summary Report 2009* listed median annual expenditures in central IT services in institutions in the Doctoral/Research Universities–Extensive Carnegie Classification category of between $25 million and $30

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million. Median annual expenditures in central IT services in institutions in the Doctoral/Research Universities–Intensive Carnegie Classification category were slightly over $10 million. The median central IT expenditures were between $2 million and $5 million at institutions offering masters as the highest degrees. The same was true for institutions offering bachelor degrees as their highest degrees, and for those offering associate degrees only.

“After adjusting for inflation, most Carnegie classes show an increase in median IT funding over the past five years. Increases in funding have roughly kept pace with enrollment, even out- pacing enrollment in 2009.”¹⁰ The Carnegie Classification includes all colleges and universities in the United States that are degree–granting and accredited by an agency recognized by the U.S. Secretary of Education.

Technomics is an unofficial term that refers to the economics of technology. In other words, it considers the economic and financial aspects of the adoption lifecycle for new technologies, from exploration to abandonment. Behind technology diffusion and adoption, both at the macroeconomics and at the microeconomics level, there are financial transactions. Carlota Perez’s makes this point in her book Technological Revolutions and Financial Capital: the Dynamics of Bubbles and Golden Ages.¹⁰

Individuals, both for personal and for organizational reasons, acquire products and services when it makes economic sense to them, that is, because they derive certain benefits from using them that outweigh the disadvantages of purchasing them. In other words, we embrace a new product or service when we perceive that the utility, an economic term referring to relative happiness, outweighs the relative costs. This is true

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¹⁰ Arroway, Educause Core Data Service Fiscal Year 2009 Summary Report.
¹⁰ Perez, Technological Revolutions and Financial Capital.
both when people gain ownership of a product or service or when they simply have the right to use that product or service. This is the economic dimension of behaviors for the adoption of new technologies, both in general and in higher education institutions in the United States.

In most cases, particularly in higher education settings, there is less available information to evaluate a new technology than to make other organizational decisions, like tax planning or course scheduling. For example, the upfront costs of a new technology may be known. However, the long term costs of a new product or service may be unknown precisely because it is new and lacks a track record.

Cost is a critical factor when considering incorporating a new technology into one’s life. The easiest cost to calculate is to estimate the cash outflow required to pay for something. To the initial acquisition cost, we must add the associated costs for maintenance, support, and accessory products and services over a period of time. Calculating these figures, it is easy to compare the costs of two similarly configured laptops, one made by Dell and the other one made by Sony, with three-year comparable warranties of service.

More difficult costs to quantify are the intangible ones: reliability, temporary loss of productivity, support and techno-anxiety when problems arise, training time and effort, etc. It is harder to predict whether a Dell laptop or an Apple laptop will work better or last longer for a particular student.

For each of the inputs in the economic decision process, individuals collect information directly, e.g., the price and the terms of the warranty, as well as from others, like peers and other people perceived as knowledgeable in the matter. Technology
adopters often seek advice from campus technology professionals, consultants, and technology vendors.

**Cost-Benefit Analysis**

The cost-benefit analysis made by an individual user greatly influences the acquisition and adoption of new technologies. If an individual perceives that the costs are greater than the benefits, the individual will not venture into adopting a new technology. On the other hand, if the benefits seem to outweigh the costs, there is a strong economic case toward adopting the new products or services. Individuals can make these decisions for themselves or on behalf of others, when they act as organizational agents.

Measuring the benefits of adopting a new technology is both challenging and complex. Not all economic metrics are equally valid and credible. How much money can one save by switching from one service, product or provider to another? How much can one increase the quantity or the quality of one’s output with a new technology? What other benefits, like risk or anxiety reduction, reliability or peace of mind does one achieve with a new technology?

Both in the benefits and in the costs baskets, individuals must combine criteria measured in different units: money, risk, happiness, satisfaction, productivity and even aesthetics. In the case of cash disbursements and inflows over time, it is common practice to adjust the value of the payments for time; in other words, one dollar in 2000 is not worth the same for an organization or a person as one dollar in 2010. To compare monetary flows over time, organizations may use the present value of the payments, that is, the equivalent value of those payments in today’s dollars. Similarly, organizations may opt for using the future value of the payments, that is, how much would all the
payments be valued at a given point in time in the future, most likely at the end of the expected life of a given technology initiative. In these calculations, organizations and individuals must estimate the time value of money, that is, the prevailing interest rate.

Some of the costs and benefits are difficult to quantify. In the case of costs, measuring the opportunity cost is particularly complicated. For example, devoting $20 million dollars for a new student information system means that there are $20 million dollars less to retrofit classrooms with audiovisual equipment or to purchase subscriptions for the library. In the case of the benefits, network externalities are difficult to quantify. Network externalities, also known as the network effect, is a concept in economics referring to the additional value that one user of a good or service brings to the other users. For example, the more people who use email on campus, the more value the email system has to all on campus.

It is the mixing of the units, the difficulty of comparing apples to apples, what makes so challenging the economic evaluation of new technologies, either adoption versus non-adoption or the use of one technology versus another. Because some of these criteria tend to be measured emotionally as opposed to rationally, the technology adoption process has an emotional component. An organizational culture like the one found in higher education institutions promotes, at prima facie, rationality and economic accountability. However, there is a certain tension between the real technology evaluation processes, as they happen actually, and the nominal processes, as they are described by college and university officers, faculty, staff and students. This discrepancy often surprises technology vendors, consultants and observers.
When institutions spend considerable resources, i.e., labor and funding, in new technologies without solid economic justifications and things go wrong, media outlets pick up the stories. Institutions and their overseeing bodies form commissions and panels to investigate. When possible, they attempt to recoup some of their losses through negotiation and litigation. In U.S. higher education, some of the most notable examples were the many failed multi-million dollar implementation projects of enterprise resource planning systems, also known as ERPs, in the early 2000s.

A case in point was that of Cleveland State University (CSU) in 2004. The failed attempt to implement ERP technologies at CSU resulted in scandal and litigation against the software corporation and the consulting companies involved. Marc. L Songini wrote in *Computerworld* on March 26, 2004: “Ohio's attorney general has filed a lawsuit against PeopleSoft Inc. seeking $510 million in damages stemming from an allegedly faulty installation of the company's ERP and student administration applications at Cleveland State University.”

**Measuring Costs: Total Cost of Ownership**

Economic theory tells us that both organizations and their agents strive to be efficient, that is, to maximize the outcomes of their efforts while minimizing the resources necessary to achieve those results. This explains why in choosing its new enterprise resource planning system for student records in 2005, Georgetown University compared the projected costs of the two leading vendor proposals, one by Sungard SCT and one by Oracle. This was one of the most important steps in the selection process.

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Organizations examine two important financial metrics when considering technology initiatives: the Total Cost of Ownership and the Return on Investment. The Total Cost of Ownership, also known as TCO, is calculated by taking into account all of the costs associated with a new technology initiative. This includes the one-time initial expenditures, ongoing maintenance and upgrades, financial costs, and quantifiable opportunity costs like the labor costs necessary to backfill the functions of those who will devote their efforts to the new project temporarily.

One-time initial expenditures typically cover software licenses, hardware, training, consulting, temporary workers, overtime labor, project management, and preparatory work like facilities, electrical, and HVAC, that is, heating, ventilating and air conditioning. They often include the costs of prerequisite legal and compliance work for which outside parties can bill the institution or for which one office of the University can bill other departments. For example, this would be the case when the in-house lawyers of the institution retain outside counsel for a consultation, e.g., a privacy assessment, and then bill the technology department.

Ongoing maintenance refers to the continuing costs of operating the system including software and hardware maintenance fees levied by the manufacturers and by third parties, consulting fees for preventive and required maintenance, labor costs associated with keeping the system in operation, and other fees like patent charges not included in the maintenance agreements. The overall maintenance figures also include periodic system upgrades and personnel upscale costs, including training services when required.
Projects requiring financing in the form of loans or equipment leases must also include the costs of servicing the debt in a category of financial costs. To finance significant technology acquisitions, colleges and universities often rely on the favorable leasing terms of vendors aggressively marketing their products, e.g., Cisco or EMC. Sometimes, organizational units within an institution lend money to other units for large technology projects and assess financial charges accordingly.

Opportunity costs are assessed by estimating the labor costs of those employees involved with the project, those who otherwise would be doing other work at the institution. The opportunity costs are most often calculated by using the salary figures of the diverted employees or, in some cases, the wages of temporary employees who backfill the positions of those devoted to the project. For example, during the Georgetown University student ERP project previously mentioned, the evaluation team assessed the salaries of employees in the Technology, Registrar’s, Financial Aid, Student Accounts, and Institutional Research offices devoted mostly to the project.

**The Limitations of Cost Analyses**

Colleges and universities often make decisions based on incomplete cost analyses. When financial and labor resources are scarce, a comprehensive cost analysis should include the opportunity costs for institutions of investing in a particular technology, instead of devoting those resources to other purposes like books or scholarships. In many cases, institutions should examine the costs of preserving the status quo, that is, of not investing in a particular technology. This would represent any losses from missing on the chance of being more efficient, more attractive to current and potential faculty and students, or more competitive in the educational marketplace.
One endemic problem in performing this type of financial analyses is the lack of rigor. For example, moving project expenditures from operational to capital funds and vice versa are common practices in higher education, particularly when projects are politically charged, or when their execution is over the initial budget estimates. It is very common in higher education to use different budget processes for operational costs and for capital costs, that is, to distinguish between the ongoing expenses of the institution annually and the capital investments to be amortized over several fiscal years. Often, there is different accountability for the operational and for the capital funding sources, a situation offering incentives to move charges from one of the sources to the other, regardless of the true nature of the costs.

For example, university executives may be tempted to favor technology initiatives with high one-time capital costs and low ongoing operational maintenance, or vice versa, regardless of the total cost of ownership analysis. Smart technology vendors recognize this funding dilemma and provide many of their offerings either mostly as a product, in exchange for a significant cash disbursement and reduced maintenance fees, or as a service, with minimal implementation costs but higher ongoing maintenance costs.

Cost analyses in higher education are also incomplete because they often consider a myopic view of a technology initiative. For example, a technology executive whose budget does not cover utility bills, e.g. electricity, may be less inclined to acquire technologies which are more expensive at first but offer long-term energy savings. Similarly, a university officer facing space allocation issues may push the technology infrastructure to off-campus locations to keep other administrative personnel on campus, regardless of cost or efficiency considerations.
Another example of a myopic view results from the tension between autonomy and control in colleges and universities. In general terms, the officers of higher education institutions would like to exercise more control over all of their campuses, schools, academic units and departments in governance, finance and technology. Greater central control could arguably lead to better performance, more efficient resource allocation through planning and economies of scale, and better risk management. On the other hand, campuses, schools, academic units and departments seek out more autonomy. More autonomy arguably promotes innovation, organizational agility, and the ability to react to challenges, opportunities and threats in specialized markets, e.g., distance learning in legal education, more swiftly.

The control versus autonomy question happens at all levels of the organization. Administrative units, like departments and institutes, have love-hate, control-autonomy relationships with their schools. The schools, e.g., business and law schools, also have control-autonomy relationships with their campuses. The campuses have a similar relationship with their central governing bodies, as in the case of the campuses of the University of Maryland in several geographic locations under a central university governing body. This tension between autonomy and control adds a significant level of complexity to technology decision-making in higher education environments.

Because individual campuses, schools, academic units and departments traditionally enjoy some financial autonomy in U.S. higher education institutions, often they opt to implement their own information and communication systems. The decision to adopt different technology systems than those used by the institution at large grows from the perception that these unique systems may be more cost-effective for the
individual academic units and more suitable for their operations. In other words, from the narrow point of view of the executives in a department, a departmental system may seem to have a lower total cost of ownership and provide more efficiency to the department than a university-wide system.

It is very common for a central body of the university to charge individual departments for services rendered to them, including information technology services. The cost accounting and charge-back mechanisms among departments of the institution may contaminate the cost-benefit analyses. The pricing for charge-back services from some units to others within higher education institutions tends to be opaque, difficult to evaluate, and subject to wide variability depending on the negotiators sitting at the table.

The local executives may attempt to maximize the cost-benefit ratio for their units or departments first, and for the institution later. The greater the difference between the cost-benefit analysis of a department-based technology initiative and an institutional one, the greater the likelihood of adopting two different technologies. This is one of the reasons explaining why many colleges and universities use several learning management and admissions systems.

The problem, however, is that this myopic view may translate into higher costs for other parts of the institution. When the numbers of new and continuing users of a technology platform is reduced, those who remain active users are still responsible for the costs of supporting the entire system. While variable costs may be reduced proportionally to the reduction in the number of users, fixed costs usually remain constant. In most cases, this situation translates into higher maintenance costs per capita. For example, schools supporting several learning management systems must support all of them,
including the hardware, software, maintenance, training and personnel costs of each platform, regardless of the number of user licenses for each system.

**Measuring Benefits against Costs: Return on Investment**

Another metric frequently used in business organizations but hardly in higher education institutions is the return on investment, also known as ROI. The return of investment is a financial metric obtained by dividing the expected benefits, both savings and additional revenue, by the implementation resources, mostly cash disbursements and labor costs, of a new technology initiative.

For example, between 2005 and 2012, many organizations including colleges and universities decided to virtualize their servers in their data centers. Server virtualization is a technology trend by which the functions of delivering data and running applications on several computer servers are consolidated into one physical computer server. Instead of running each service on its own physical server, virtualization technologies enable the consolidation of services in a reduced number of servers. Server virtualization projects required funding for new hardware, for consulting services, for software licenses, for maintenance agreements, and for training to update the skills of the technology staff. The benefits, however, were many and could be measured in hard dollars, like savings from purchasing fewer computer servers or from spending less on electricity to power and to cool the computer servers in the data center. The return could also be measured in soft dollars, like productivity gains for network administration staff members or more agility to deploy new technology services, e.g., a custom research database, for the community.

It is this complex calculation of inputs and outputs that makes the return on investment analysis. Calculated over the expected life of a technology initiative or some
other widely accepted period of time, e.g., 4 or 5 years in the case of a server
virtualization project, a return on investment analysis helps executives facing a
technology decision understand what are the most likely financial consequences.

**The Problem with Measuring Benefits**

Assessing the benefits of any technical initiative is both elusive and controversial.
Can a part of the success of the students in completing their education be attributed to the
success of a student information system for registration, financial aid, student accounts
and academic records? If so, how much, what percentage of their tuition payments should
be devoted to such a system? Without a student information system it is no longer
possible to conduct business efficiently in modern colleges and universities. Neither
administrators nor students know how to negotiate their academic activities without
technology support. What is its value? Similarly, is it possible to quantify how much a
learning management system contributes to the academic process, what percentage of
tuition revenue does it account for?

One of the thorniest conversations in higher education in general, and in
associated technology adoption decisions in particular, revolves around the issue of
productivity, that is, the increase in performance and output balanced by inputs. Are
colleges and universities efficient in what they do: the creation, use, preservation and
dissemination of knowledge? Do they use resources efficiently to train the next
generations of knowledge workers per the mandate of society? Will new technologies
allow faculty members to teach better or students to learn more, better or both? Will new
technologies allow investigators to expand their research interests, to deepen the scope of
their research projects, or to produce research output of better quality and quantity? Can
technology help staff members and administrators make their colleges and universities run more efficiently?

**The Problem with Measuring Risk**

Risk is very difficult to quantify when it comes to these economic analyses. Not all projects go according to plan and not all technology initiatives perform as expected. To reflect risk in the financial analyses, often through the use of contingency plans and funds, is controversial and debatable. Higher education institutions are notoriously risk-averse organizations. There are severe professional penalties for errors and mistakes, including layoffs, and not many rewards, certainly not financial, for innovative thinking in academic administration or technology leadership, other than peer and industry recognition.

Risk comes in many forms. There are many risks when implementing a technology project, from total failure to cost overruns and delays. The more complex the project is, and the laxer the project management of the organization running it, the higher the likelihood that the risks will escalate. Traditionally, organizations identify project risks and try to quantify them; for example, they identify risks associated with personnel turnover, shortage of critical project components, delays in completing preparatory tasks, and unanticipated technical obstacles. In addition to describing the risk, they identify the impact on the project when something goes wrong, e.g., the cost of running an old system if there is a one-month delay, as well as the likelihood of something going wrong, e.g., thirty per cent. Using statistical techniques, project managers and their organizations may assign financial values to the risks.
However, the lack of historical project implementation data and of actuarial information makes these risk assessments highly speculative. This is why many higher education organizations use a contingency estimate of ten per cent of the overall project budget to account for risks with an economic impact. This was the case for the implementation of a new student information system at Georgetown University. To the overall project budget of approximately $16 million, the planners added an extra $1.6 million for contingency planning. In this particular case at Georgetown University, the project steering committee members used all of the contingency funds to solve unanticipated technical problems, e.g., sluggish servers, and functional shortcomings, e.g., unexpected software modifications.

Once a technology is in place and in use, many other risks pop up: functional, technical, business continuity, disaster recovery, information security, privacy, compliance and legal. These risks are usually identified in the narrative or in the footnotes of the financial analyses but are seldom quantified and incorporated into the numerical analyses.

The technology may not perform as expected, either due to functional shortcomings, e.g., not being able to do what it was supposed to do, or to scalability issues, e.g., not being able to keep up with increasing user demands. Unforeseen interoperability problems among system components may reduce the efficiency of the entire system or render it useless altogether. The overall system may not be reliable because some of its hardware or software components are not reliable, e.g., the application crashes when importing incorrectly formatted information from other sources.
Business continuity and disaster recovery risks are intrinsic to most technology solutions but are hardly considered in financial terms during the evaluation stage. When a server fails, when a data center catches fire, or when an academic institution experiences an electrical outage, e.g. during the Northeast blackout of 2003, organizations must find a way to continue to operate, that is, to achieve business continuity. Similarly, they must find ways to provide services when disaster strikes, as was the case for Tulane University in New Orleans after hurricane Katrina hit in 2005.

Information security, privacy, legal and compliance issues are also intrinsic to most technology platforms used in higher education. Cyber criminals and hackers can exploit the information technology systems. For example, John Escalera and Gustavo Razo were prosecuted in 2005 and sentenced to 36 months on felony probation in 2008 for hacking the California State University student information system to change grades. As discussed in the chapter dealing with the legal framework, lost or stolen laptops, and poorly configured servers, often compromise the privacy of campus constituents by exposing their personally identifiable information to unauthorized parties.

Technology may expose institutions to litigation and hurt their litigation chances. For example, poorly configured information systems may be unable to produce the information requested in subpoenas issued under the electronic discovery amendments of the Federal Rules of Civil Procedure. Finally, systems that do not run well may result in institutions falling out of compliance with local, state or federal regulations. For example, incorrect algorithms in a student management system may void the right of the institution to participate in federal financial aid programs.
In the summer of 2010, I asked Dr. Spiros Dimolitsas, then Senior Vice President and Chief Administrative Officer at Georgetown University, and to whom the University CIO reported, about the nature of his job. His response was straightforward: “I am in the business of managing high-risk projects.”

**The Cost-Benefit Analysis Case of the Electronic Law Journals**

For many colleges and universities, academic journals are the principal outlets to publish original research and to disseminate knowledge. Technology systems make it possible to move most of the journal production and readership from print versions to online versions. In 2008, a group of law librarians and technology executives prepared and signed the Durham manifesto, in which they made a commitment to publish more journal materials online, available for free to the general public. I was one of the early signatories of the manifesto at the request of the originator, Duke Law Senior Associate Dean for Information Resources and Professor Richard Danner.

The main advantage of publishing journals in electronic format is to increase the accessibility of other researchers and learners to those materials, therefore increasing the diffusion of knowledge. Online publishing allow journals to make their contents available at a much lower cost, by significantly reducing the publication and distribution costs for the delivery of the materials. The underlying assumption is that both producers and consumers already have Internet access for other purposes and they would not incur incremental costs for using the Internet to access journal materials.

The savings resulting from online publishing versus paper publishing were quantified in many law schools with financial analyses. On the paper side, institutions had to account for the costs to journal producers for printing, delivery, and subscription
management activities. Another set of paper-publishing costs hit the law libraries, which had to pay for the subscriptions to the paper versions of the journals, in addition to the storage space costs in their facilities and the labor costs associated with handling physical publications. On the paperless side, institutions had to account for additional technology resources like online journal subscriptions and web sites with online document repositories. In all cases, paper subscription rates had to be necessarily higher than online subscription rates due to the higher production costs of the former.

Another reason to switch was the environment; it was environmentally more sensible to publish less print copies in favor of online copies. Less consumption of paper and other raw materials, less energy waste in production and delivery, and a smaller carbon footprint were some of the ecological gains of publishing more journal materials online, instead of printing them on paper.

From 2008 to 2012, there were also strong market forces and economic incentives prompting the move from print to electronic materials. Print production costs for law schools and print subscription costs for law libraries were increasing. In the same period of time, school revenues from publishing print journals were decreasing.

On the opposite side of this technology adoption process, there were both technical and emotional reactions to this move. Technically, the Bluebook, the widely accepted citation rules for legal academia and the law profession, instructed journal editors to check cites by relying primarily on print materials instead of online repositories. The main reason behind this recommendation was to minimize errors resulting from format transformations, versioning inaccuracies, and different paginations.
Emotionally, vanity played a significant role. Unlike journals in other academic disciplines, legal journals are not peer reviewed but student reviewed. Hard working students and faculty members want to have tangible copies of their intellectual work and circulate reprints to colleagues and acquaintances. The opposition by both law faculty authors and student editors was one of the arresting forces against the move from print journals to electronic journals.

Another opposing force grew out of the fierce competitive environment in legal education. More citations of a given journal translate into a better reputation for the journal and the school publishing it. A better institutional reputation attracts better students and better faculty members. If all of the schools in the same academic cluster agreed to move from paper to bytes, overall citation numbers should not have been affected by the move and libraries could have stopped subscribing to many paper journals. If some of the schools in the cluster preferred to offer both electronic and print formats, citation numbers could have improved over those who only offered online versions.

In the end, some law schools like Duke Law moved most of their journals online but many others did not follow suit. The University of Michigan Law School was one of the top law schools not supporting this initiative publicly, perhaps in response to faculty pressure. Interestingly, the University of Michigan entered into a partnership with the Google Corporation to digitize the entire print collection of the University Library in 2004. According to the Michigan Digitization Project web site, “the digitized collection, which comprises a significant portion of the HathiTrust Digital Library, is searchable in
Mirlyn, the HathiTrust catalog, and Google Book Search. Full-text of works that are out of copyright or in the public domain are available.”\textsuperscript{12}

The move from paper to electronic format was not an all or nothing proposition. Thanks to on-demand printing technologies and services, interested schools or third-party vendors could produce and ship printed journals or individual articles, including offprints for wide distribution. Because of the disincentive of paying per copy, including the waste of unused copies, on-demand printing is an enabler to move some content online and reduce paper consumption and production costs, albeit slightly.

The case of the shift from print to electronic journals in legal education illustrates that financial analyses are critical yet insufficient to justify the adoption of technology in U.S. higher education institutions. Political, organizational, cultural and emotional issues also play significant roles in the technology adoption process. The old adage that 10 to 2 is a tie in higher education still holds true in many instances.

Tim Eye, a Dell executive in higher education sales, helped me understand the difference between the academic and the corporate mindset during a technology briefing on January 6, 2010: “I like my company and I am a good corporate citizen. I like the fact that the stock price and my compensation are going up over time. I want to make money and save money. If I am told that there is a cheaper way to do something, I will do it for the good of the corporation, as long as it does not involve a cumbersome, counterproductive set of steps.”

By contrast, I cannot find a similar disposition in higher education. Often, faculty and staff members would favor committing wasteful resources to technology instead of

sacrificing their time to learn other ways of doing things. In the words of Georgetown University Tax Law Professor Charles Gustafson in an interview on August 17, 2010: “the problem with higher education is that there is no bottom line.”

**The Economic Benefits of Technology Adoption: Banner Project**

In 2010, after years of planning and two years of actual implementation work, Georgetown University declared victory on its most ambitious technology project to date: the replacement of its student information system. The student information system is the collection of software programs used to manage student records, course listings, financial aid, and student accounts. After spending $17 million dollars, after University employees and consultants devoted thousands of hours to the project, the University was able to move its processing of student information from an old mainframe system to a newer technology platform.

The old system was a mainframe application originally built by a company called SCT and heavily customized over 30 years of use at Georgetown University. Every year, new compliance regulations, mostly in the financial aid sector but sometimes in other areas like immigration or privacy, required modifications to the system. So did new technology developments, like the World Wide Web. However, the pool of talented employees and consultants able to make modifications to the software running on the obsolete technology platform dwindled over time. The risk of not having qualified support personnel was one of the risks that the University decided to mitigate by tackling the project.

The two most popular student information systems in use among United States doctoral universities are Sungard Banner Student and Oracle Peoplesoft Enterprise
Student Administration. After years of difficult internal negotiations among administrative units of the University, wide consensus was reached to replace the old system with Banner. While Banner was built with newer technology than the mainframe system that it replaced, it was still an obsolete collection of software products demanding expensive and esoteric consulting support in short supply in the marketplace. For example, in addition to software licensing fees and engineering fees, the project included an initial charge of $3 million dollars to modify Banner so that the software could support the business processes of the University. This allocation proved insufficient and went up by several million dollars throughout the life of the project.

Basically, each of the approximately 12,000 students at Georgetown University contributed about $1,400 of their tuition between 2008 and 2009 to pay for the Banner system. What did they get in exchange? Did the University overpay? Were the education outcomes of the students improved in any way after this expensive technology investment? Did those students become better lawyers, doctors or economists because the behind-the-scenes technology platform to process their records was newer? Could they have been better off if the institution had spent that money hiring prominent visiting faculty or improving library services?

The criteria to measure the success for the project were modest. The project was considered a resounding success because the University was able to continue to operate with minor disruptions. The institution did not achieve significant improvements in its operations, was not able to support new business processes, and did not acquire new reporting capabilities. These enhancements could arrive years later, after additional multi-million dollar investments in labor costs, software licenses, and consulting fees.
Georgetown University missed a great opportunity, the same opportunity that many other institutions engaged in similar projects missed: business process engineering. In other words, instead of using technology from the 1980s to support business processes developed in the 1950s, colleges and universities could revise how they conduct their business. Georgetown University could have positioned itself better to serve its constituents and to fulfill its educational mission by revising how it operated. Instead of bending the technology to do business the Georgetown way, the University could have taken a critical look at itself and searched for efficiencies in the way it conducted its operations.

This happens on college campuses because of the lack of economic incentives to do it. Frightened by the risk of changing their existing knowledge and processes, many on campus opt to continue with the operational status quo. In other words, they choose to do the same with newer technologies. In the absence of rewards for improved efficiencies and in the presence of a risk-averse administrative culture, campus constituents often lack incentives to harness the transformative power of new technologies.

The drawbacks of not having done so go beyond the millions of dollars spent in software customizations. It goes beyond the thousands of hours required to train new employees of the University to follow arcane, complex, and difficult-to-understand processes. It has to do with the loss of flexibility in current and future uses of the technology. It has to do with less agility in the way that Georgetown and other institutions can adapt to industry trends, like the new generations of students favoring blended learning or the demand for innovative academic programs.

CIOs and executives have a love-hate relationship with their enterprise resource
planning systems. On the one hand, these behemoth software applications provide integrated technology support and reporting for the core processes of their businesses. On the other hand, they are so complex and inflexible that they may arrest change and innovation. In other words, by providing structure to the business, ERP systems reduce agility.

Every year, new compliance regulations, mostly in the financial aid sector, and new technology developments, e.g., new versions of web browsers, require modifications to the student enterprise resource planning systems. The more heavily modified a student information system is, the more expensive and complicated upgrading it becomes. Every time an upgrade becomes available, Georgetown University must spend significant resources analyzing the impact of the upgrade on the existing modifications, and even programming again some of those modifications after the upgrade.

Having deployed a new student information system in 2010, Georgetown University embarked later that year in transforming its enterprise resource planning systems for human resources and finance. Taking advantage of early adopter discounts, the University partnered for this complex project with Workday, a company founded by the former CEO of Peoplesoft, Dave Duffield. Workday offers finance and human resources information processing services in the cloud, that is, on servers located in the company’s data centers. Regrettably, the University once again paid little attention to business process reengineering, staff training or improved reporting to derive strategic value from the project. Instead, the main driver for this multi-million dollar project was to mitigate the risk of using obsolete systems.
The Agency Problem

Donors, foundations, local, state and federal governments contribute financially to their institutions of higher learning, both in kind and in cash. Students must pay more tuition because of the annual increases in their nominal tuition and fees, because of the reduction in available scholarship funds available to them, or both. Furthermore, financial resources committed to technology are no longer available for research initiatives, books, conferences, writing centers, tutors, and other supporting components of the academic mission. Misspent financial resources come out of the pockets of society and arrest the mission of the university to train new generations of workers and to acquire, use, disseminate and preserve knowledge.

Agent theory states that organizational agents may not always act in the best interest of their organizations, as they may promote their own self-interests over those of their employers. This problem is known as the principal-agent dilemma or the agency dilemma. In technology decision making in higher education, there could be dissonance between the desired outcomes of organizations and those of their agents. The interests of society and of the board members of the institution may not be duly represented when the technology decision-makers act to further their own interests over the advancement of the core mission of their institutions. The organization has to set up the appropriate incentives to minimize principal-agent problems.

Executives in colleges and universities normally enjoy a fixed compensation, that is, their annual compensation does not depend on performance. In fact, performance evaluations in higher education, particularly for executives, are notoriously undefined both quantitatively and qualitatively, At most, the pay increase of an executive in
academia may be slightly influenced, by one or two percentage points per year, by his or her performance in a given academic year. At best, an academic executive who does a good job may enjoy career advancement opportunities, promotional or lateral hiring offers from other organizations, consulting engagements on the side, and industry recognition. In this regard, vendors who are notorious for their perks -technology donations, lavish conferences, and glamorous sales approaches- are likely to gain the ear of and to influence the academic executives debating among competing technology options.

With this in mind, there are few incentives for academic CIOs at the apex or in the downhill part of their careers to embrace any risks. The rewards, if any, appear insignificant compared with the risks. Instead, these CIOs become masterful at reducing technology risks. Sometimes they arrest innovation and refuse to adopt new technology initiatives until they become widely accepted standards and best practices. In this framework, institutions find themselves in a very conservative risk management strategy while missing out on the possibility of deriving benefits from emerging and cost-efficient technologies. An apropos aphorism is that the most reactionary and conservative department when it comes to new technologies is an organization is the technology department. The late Apple CEO, Steve Jobs made it clear during a public interview with The Wall Street Journal’s Walt Mossberg and Kara Swisher at the D: All Things Digital Conference on June 1, 2010:

What I love about the consumer market, that I always hated about the enterprise market, is that we come up with a product, we try to tell everybody about it, and every person votes for themselves. They go ‘yes’ or ‘no,’ and if enough of them say ‘yes,’ we get to come to work tomorrow. That’s how it works. It’s really simple. With the enterprise market, it’s not so simple. The people that use the products don’t decide for themselves, and the people that make those decisions sometimes
are confused. We love just trying to make the best products in the world for people and having them tell us by how they vote with their wallets whether we’re on track or not.

It is conceivable that a reward system for executives resembling those of corporations would make the financial analyses of technology initiatives more meaningful in colleges and universities. By linking the financial success of technology initiatives to bonuses impacting the pay of academic executives, return on investment analyses gain relevance. Critical measures like student recruitment and retention, faculty hiring, market rankings and overall financial performance are objective measures that can provide useful information to executives deciding among competing technology initiatives.

One of the mantras in the information technology field is the need to align business and technology. In other words, it is common wisdom that to be effective, technology executives need to ensure that their investment and efforts support the core mission of their enterprises. If this alignment is elusive in the corporate world, it is even more elusive in higher education. While in corporations the base pay and incentives of the technology decision-makers are somehow tied to the performance of the business, in higher education it is not. In other words, corporate technology executives have strong economic incentives to ensure that their businesses do well. Higher education technology executives, and their supervisors, want to do the right thing for their organizations for moral reasons, not economic ones. They often do not have the appropriate economic incentives to succeed or disincentives if they fail.

This is one of the reasons explaining the financial success of for-profit higher education institutions. In these organizations, hardly any of the tuition revenue is
allocated to research. Instead, most of the tuition is allocated to marketing, to compensate the executives, and to pay off the stockholders. The quality of the education and some of the practices in for-profit U.S. higher education institutions are under scrutiny but their decision making process, particularly technology decision making, is more business-like than in their non-profit counterparts. This is something that I discovered in 2009 while consulting for the for-profit Infilaw consortium of three independent law schools: Florida Coastal School of Law, Phoenix School of Law and the Charlotte School of Law.

**The Economic Value of Information Technology in Higher Education**

There should be a more balanced and objective way to study the economic implications of adopting technology in higher education. It is hard to prove the value of technology investments in any industry, and it is even harder in higher education. It is true that many colleges and universities are driven to implement certain technologies to keep up with peer schools with which they compete for the best available students and faculty members. Yet, an understanding of the economics of these projects would go a long way to ensure that schools are investing their limited resources in the right technology mix to advance their mission. It would also shed some clarity and transparency over the budgets and expenses of colleges and universities. And transparency could bring better fiscal discipline and more accountability to academic institutions.

Is technology use worse in education than in other economic sectors? To answer the question, I interviewed Cris Conde in New York City in the summer of 2011. He was at the time the Chief Executive Office of Sungard, a 20,000-employee company
producing leading software both for the financial services industry and higher education. His unequivocal answer: yes.

**Driving Campus Technology Adoption with Economic Incentives**

What drivers can higher institutions and their constituents use to change the prices factor? Higher education constituents, particularly administrators, must ask themselves whether or not technologies make economic sense before adopting them. Therefore, higher education institutions and their constituents can use economic incentives to change the prices factor, which in turn shapes technology adoption on campus.

Deans and provosts know that a good way to entice faculty members to take on additional work is to offer them additional money. Colleges and universities usually pay their faculty members more when they teach more courses, particularly in the summer and in programs abroad. For example, Georgetown University regularly offers grants for faculty members to develop experiential courses, and to engage professors in new academic initiatives like those that the University promotes in Qatar, China and India. Similarly, the pedagogical department of Georgetown University, the Center for New Designs, Learning and Scholarship led by Associate Provost Randall Bass, regularly offers grants and extra support for faculty members willing to incorporate certain technologies into their teaching and research.

Prices can be used also to restrict technology adoption. For example, charging a fee for network connectivity and support for each device that one brings to campus serves as an economic disincentive for faculty members willing to experiment with tablet devices in their teaching. Similarly, requiring faculty members to pay for statistical
software, instead of providing the software to them at no direct cost under a campus-wide license, may slow adoption of this technology.

The cases and examples discussed in this chapter prove that prices, that is, economic incentives and disincentives strongly influence how faculty, staff and students adopt information technologies. A critical caveat is the difficulty for faculty, staff, students and administrators of assessing the economic value (benefits versus costs) and the risks in complex technology adoption decisions. Understanding how economic issues shape technology adoption gives us a powerful mechanism to influence technology adoption on campus.

The implication for the integrated model is that colleges and universities can use economic incentives to drive how the prices factor influences the technology adoption behavior of faculty, staff, students and administrators.

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Table 7. Sample economic incentives in the technology adoption model.

Yet, there is one more factor to consider in technology adoption on campus. The next chapter looks at how faculty, staff, students and administrators are influenced by architecture in their technology decisions and practices and how they can use technology elements to drive technology adoption on campus.
CHAPTER 4
ARCHITECTURE: THE TECHNOLOGY ECOSYSTEM

This chapter explores how architecture, that is, the technology ecosystem shapes the adoption of information and communication technologies in colleges and universities.

When Lessig describes his four modalities to regulate the behavior of people in cyberspace, he recognizes that some rules are not written laws or policies but de facto rules, resulting from the architecture of information and communication systems. “A rule is defined, not through a statute, but through the code that governs the space.”1 In the context of this thesis, the space is the technology space in U.S. higher education.

Lessig refers to architecture as the functional structure of the technology ecosystem, that is, the code. “Finally, an analog for architecture regulates behavior in cyberspace—code. The software and hardware that make cyberspace what it is constitute a set of constraints on how you can behave.”2 By code, Lessig means the sets of instructions programmed in information systems that determine how those systems operate and respond to users’ instructions.

What regulates cyberspace in general, regulates cyberspace in colleges and universities. “There is regulation of behavior on the Internet and in cyberspace, but that regulation is imposed primarily through code.”3 Architecture is one of the four primary factors that influence the adoption of technology in U.S. higher education. By facilitating the implementation of certain technologies or erecting barriers against them on campus,

1 Lessig, Code, 24.
2 Ibid., 124.
3 Ibid., 24.
institutions and their constituents shape technology adoption. By tweaking how the technologies are implemented, they determine what users can and cannot do with those technologies.

**Complexity and Integration: Technology Adoption within an Ecosystem**

The more information systems an institution has in place, the harder it is to enhance them, modify them, integrate them or add new ones. Decision-makers cannot evaluate candidate technologies in isolation, out of their intended context of operation. Instead, candidate technologies should be viewed as elements of a technological ecosystem.

Apple Computer Corporation took advantage of this concept with its revolutionary iPod technology. iPods became one of the most successful consumer technology products in the first decade of the 21st century because Apple realized that these appealing devices to play back music, that the hardware and the software of the iPods, were only components of a larger technology ecosystem. Apple cleverly coupled the iPods with user-friendly software for computers called iTunes, which made it easier than ever before to manage one’s music. To take the ecosystem one step further, Apple tightly coupled the iPods and the iTunes software with the online iTunes Store, a web service where consumers could download songs, movies, TV shows, applications and podcasts for their iPod devices. The entire ecosystem offered an easy, rewarding experience to its users, which placed Apple Computer as the market leader.

The technology ecosystems in colleges and universities are more complex and sloppier than Apple’s technology ecosystem for consumers. Let us consider, for example, the case of Enterprise Resource Planning systems, known as ERPs. These convoluted software products and services are meant to support the administrative processes of
higher education institutions in three major categories: student information, finance and human resources.

A student information system ERP, for example, consists traditionally of software programs to manage student records, registration, financial aid, and student accounts. However, the student information system ERP is only a part, although the most complex and expensive one, of the technological ecosystem required to process student information. Within that ecosystem, technology teams must install, configure and interconnect systems for admissions, financial aid self-help, pre-registration, room scheduling, student counseling, credit card payments, data warehousing, reporting, document management, emergency notification, learning management, assessment, library, web portals, alumni and development, and foreign student management, to name the most common ones.

As colleges and universities evolve in their adoption of information technologies, they find that the number of systems that they have in place grows over time. For example, the Georgetown University Law Center campus in Washington, DC went from 30 systems in the year 2000 to over 70 in the year 2012. The deployment of a new University-wide student information ERP system required modifications and interfaces in about half of those 70 systems. This integration added an additional layer of complexity, requirements and challenges to the overall University project.

**Processes and Technology Ecosystems**

On campus, technology is used to manage processes and to provide information about processes. A process is a discrete set of organizational activities. Examples of processes would be the posting of class materials or the running of the payroll. In general, the
complexity of the processes to automate has a direct and positive relationship with the complexity of the technology ecosystem requirements to support it.

Regardless of how many other institutions have done similar projects before, regardless of the advice of talented and experienced consultants, every college or university facing a major technology initiative jumps into the unknown. When evaluating complex enterprise resource planning systems like those used to support academic activities, financial operations or human resources and payroll functions, colleges and universities can only guess how well those systems will match their existing organizational processes.

Conducting a gap analysis between the out-of-the-box functionality of a system and the existing processes and requirements of an institution helps reduce the uncertainty associated with the most complex technology offerings. However, language and conceptual misunderstandings are common among college and university administrators, software representatives and third-party consultants.

For example, the concept of registration seems simple enough for everybody to agree on what it is. It is the process by which students sign up for courses to fulfill the requirements of their chosen academic degrees. It is one of the more established and understood processes in higher education institutions. However, many colleges and universities, as well as their schools and departments, have their own versions of this process requiring unique technologies to support it.

In many institutions, the supply of seats available to students for some courses falls short of the student demand due to a variety of factors, e.g., the position of the course in the curriculum, the subject matter, the popularity of the professor, or the
convenience of the schedule of classes. This is a fairly common occurrence in some of
the top graduate schools, particularly in law and business schools.

For these schools, registration includes a complex student bidding process to
allocate available course openings to students based on their academic requirements and
stated preferences. Students register for courses by participating in auction-like processes
in which they can bid points or state their preferences in other ways. The systems then
digest all of the student requests, apply a set of rules and algorithms, and then enroll
students in the appropriate courses. Throughout the process, the system must deal with
complex issues like course pre-requisites, incompatible courses, minimum enrolment
mandates, or wait-list management.

In the middle of its student information systems project implementation,
Georgetown University discovered that the basic registration functionality of its new
Sungard SCT Banner system could not fulfill its needs for pre-registration. The
University had to commit significant economic resources to contract a third-party
software developing company to write a bidding subsystem, also known as a pre-
registration system, for its law school. A year after the pre-registration and the student
information systems went live, the McDonough School of Business at Georgetown
University realized that it also needed its own pre-registration system, therefore
committing additional resources to modify the system again.

**Barriers to Integration**

Some companies have limited success in their marketing efforts because of their
misunderstanding of the technology ecosystems in higher education institutions. For
example, Appointlink is a small software vendor located in Clayton, Missouri. The
company specializes in writing and marketing software for law schools. Its product and service offerings are tailored for legal education and could be of great value to most law schools. In spite of years of conversations between Appointlink representatives and the Georgetown University Law Center, no business relationship matured.

There was dissonance between the Appointlink’s marketing model and Georgetown Law. Between 2005 and 2012, Georgetown Law considered several Appointlink applications to support academic processes: exam management, library room reservations, curriculum database, seating charts, and identity management. During each evaluation process, the school considered the individual product, its costs, and the complexities of integrating the product with the existing technology infrastructure and systems.

Considering each product individually, it did not make sense to choose a particular solution because the technical entry costs, the barriers to integration within the existing technology ecosystem, were much higher than developing custom solutions with consultants or in-house personnel. Regrettably, the timing of the evaluations did not allow Georgetown Law to consider a joint project with two or three of the Appointlink solutions at once, e.g., a combined acquisition of products by the Georgetown Law Library for study group room reservations and by the Registrar’s Office for exam management.

What Appointlink could have done to succeed was to designate a fundamental, entry-level product as a loss leader in their portfolio to gain market share. To be more persuasive, the company could have offered some straightforward and affordable consulting services for integration. Such an attractive offering could have enticed most
law schools to use one of the Appointlink technologies.

Once one of the Appointlink products had been integrated within the existing technology ecosystem of the school, integrating other Appointlink systems would have been much easier. An attractive and widespread implementation of such a product in law schools, including Georgetown Law, would have lowered significantly the technology integration barriers for the adoption of the Appointlink family of products and services. Beyond law schools, those products and services could become critical components of many graduate school technology ecosystems.

**Canals and Barriers**

There is an implicit tension between the need for control of U.S. higher education institutions and the desire of autonomy by its members. On the one hand, officers in the administration attempt to manage risks and observe compliance while creating a work environment supportive of the mission of the school. On the other hand, many faculty and staff members, as well as students, find that some academic rules and administrative processes restrict their creativity and arrest their productivity. Information technologies are often found in the eye of the storm. How systems are configured and deployed, and how their business rules are implemented, shape the work environment and the operations of the institution.

For example, when networks are configured to prevent the use of peer-to-peer software to reduce copyright infringement risks or to preserve network bandwidth, neither students nor faculty members can use those technologies on campus. They cannot use peer-to-peer technologies to exchange music or movies, either legally or illegally, or even for the lawful exchange of academic materials, like documents or databases.
University officials promote the use of those technologies that they believe will benefit their organizations. They take a neutral position towards information technologies when they are ambivalent about their adoption, that is, when they do not perceive benefits or demerits. And finally, they do their best to discourage the use of information technologies that they find threatening to their interests. Sometimes they do this by crafting new policies against their use, but mostly by erecting technical barriers.

As an example of positive adoption, schools promote the use of email communications as a faster, cheaper, and more environmentally friendly method to reach all of their constituents than mailing letters. As an example of a neutral stance, many schools have been ambivalent about the use of iPods by community members because their use does not seem connected to the educational mission of the institution. On the opposing side, many institutions have blocked student use of peer-to-peer file sharing services. That is, the technologists either on their own or as instructed by campus leaders have configured the devices on the network in such a way that those devices do not carry any peer-to-peer data traffic.

An interesting method to quantify how institutions react to new technologies and trends is to have colleges and universities keep scorecards. The idea is to give the institution positive points for providing and supporting a given technology, no points for taking no action regarding a new technology or service, and negative points for arresting the diffusion of a service or product. Using this method, institutions can compare themselves to peer colleges and universities. They can also study their evolution over time, perhaps discovering how market opportunities, current events, and institutional leadership influence their stance towards technology innovation on campus. I started to
use this methodology at the Georgetown University Law Center in 2004. This scorecard was the precursor of the integrated model for technology adoption on campus presented in the next chapter.

**Driving Campus Technology Adoption with Technology Elements**

What drivers can higher institutions and their constituents use to change the architecture factor? Higher education constituents, particularly administrators, must ask themselves whether or not a candidate technology offers the functionality that they need and works well within the context of their technical milieu. Therefore, higher education institutions and their constituents can use technology elements to change the architecture factor, which in turn shapes technology adoption on campus.

Academic leaders may choose to work with the technologists to erect technology barriers shaping how campus community members adopt technology. For example, to prevent copyright infringement, some colleges and universities ban peer-to-peer network traffic on campus networks.

Administrators and technologists may also use technology elements to promote technology adoption. For example, to promote the use of tablet devices, they may expand wireless connectivity to all campus locations, including the offices where faculty members traditionally work with wired desktop computers.

In other words, technology elements can be used both to restrict and to facilitate technology adoption. For example, when a document management system is configured in a way that it is easy to use and convenient, most faculty and staff members will adopt it. If the same system is implemented with cumbersome technology processes, e.g., out of extreme precaution against information security risks, adoption will be more difficult. In
their zeal to protect their information systems from abuse or hacking threats, sometimes technologists hardly consult with their constituents before implementing technology elements that limit seriously the freedom of faculty, staff and students.

The cases and examples discussed in this chapter prove that architecture, that is, how technologies are configured and deployed strongly influences how faculty, staff and students adopt those technologies. Understanding how the technology elements drive the use of technology gives institutions and their actors a powerful mechanism to influence technology adoption on campus.

The implication for the integrated model is that colleges and universities can use technology elements to drive how the architecture factor influences the technology adoption behavior of faculty, staff, students and administrators.

<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
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<tbody>
<tr>
<td>Rules</td>
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<tr>
<td>Norms</td>
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<td></td>
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<tr>
<td>Prices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Architecture</td>
<td>New devices</td>
<td>Security controls</td>
<td>Web sites and mobile applications</td>
<td>Available technologies</td>
</tr>
</tbody>
</table>

Table 8. Sample technology elements in the technology adoption model.

In the preceding pages, we examined the four drivers –legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements- affect the four technology adoption factors –rules, norms price and architecture- as perceived by faculty, staff, students and administrators. The next chapter offers an integrated model showing how the drivers, factors and actors interact to either retard or promote technology adoption on campus.
CHAPTER 5

AN INTEGRATED MODEL FOR TECHNOLOGY ADOPTION

Colleges and universities are often surprised by new technology developments like Apple computers, Facebook, Twitter, smartphones and tablets. Virtually every higher education executive was unprepared for these trends and disruptive technologies. More breakthrough technologies are coming, from social networking developments to advances in cloud computing. Colleges and universities risk underusing these and other technologies because of their poor preparedness to adopt them.

For example, electronic books could transform education as they make their way from mass consumer markets to university classrooms. Kindles or iPads may be the breakthrough devices that finally popularize the electronic books that enterprising professors sought to develop and promote (with only limited success) among students with laptops.

Sometimes the problem is not that institutions and their agents are unaware or unwilling to embrace new technologies. The problem is that oftentimes they miss the true potential of the new technologies at hand. The cartoon below illustrates the misalignment between the institutional uses of web technology and the needs of the constituents in colleges and universities.
Less facetiously, Jeff Cram analyzed why colleges and universities are not good at using the web:

The majority of higher education leaders I talk to are struggling to simply keep the digital lights on, let alone differentiate the institution online. They spend more time fighting internal politics than building remarkable online experiences. Their Web operations are underfunded, understaffed, and undervalued.¹

Yet, institutions like Georgetown University spend considerable economic resources redesigning and maintaining their web sites, which support the university’s academic mission and offer a wealth of useful information to the world. However, the institutions could do more, much more with this technology.

To improve the way technology is adopted on campus, institutional actors must consider the four factors identified in the preceding chapters: rules, norms, prices and architecture. These four factors and their interactions either facilitate or impede the adoption of information and communication technologies among campus community members. All factors are critical. Their interactions are critical.

I propose an integrated and dynamic model using the four drivers identified in the preceding chapters: legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements. The four-driver integrated model lets higher education institutions and their constituents reduce the gap between the potential benefits of new technologies and the actual benefits. In the context of the model, a technology initiative is any combination of drivers--legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements--devised to change technology behavior on campus.

The proposed model is both integrated and dynamic because it considers the interrelationships of drivers, factors and actors. Each driver is meant to affect primarily its corresponding factor but can also influence the other three. For example, the legal and policy instruments driver mostly changes the rules factor but to a lesser extent can also change the norms, prices and architecture factors. The same is true for the other three drivers: diffusion of innovation dynamics, economic incentives and technology elements.

The integrated model takes into account how the factors shape the use of technology by campus actors. There are many actors involved in the technology adoption process on campus, including outside parties like government officials, vendors, local residents and web site visitors. This thesis focuses on the roles of four groups: faculty,
staff, students and administrators. In technology adoption, members of a group influence the behavior of other members of the same group, as well as the behavior of members of other groups.

The intra-group dynamics and the inter-group dynamics are very diverse. For example, students have a strong say over other students and the other three groups when it comes to social networking: their preference of platform sets the stage for all others who would seek to reach them. Administrators have a strong say over all other groups with respect to the technology to be used for class registration because they control the resources to make that technology available to the community.

The four drivers of the model change the four factors, which in turn have varying effects on the members of each group. For example, legal and policy instruments in the form of password-confidentiality technology policies change the rules factor. In this case, the rules factor shapes the behavior of staff members, who may be disciplined for non-compliance. However, the rules factor influences students and tenured faculty members less because of the lack of enforcement and the absence of disciplinary limitations.

Here is another example. Technological elements in the form of mandatory logins to use school-owned computers or to connect to the campus wireless networks change the architecture factor. In this case, the architecture factor affects faculty, staff and students equally. Combining these interactions of drivers, factors and actors with the intra-group dynamics and the inter-group dynamics makes for an integrated and dynamic model for technology adoption on campus. The following figure provides a graphical representation of the model.
Figure 9. An integrated model for technology adoption on campus.

**Quantifying the Model: The Technology Adoption Matrix**

Is there a practical application of the model? In other words, with so many interactions, how can we quantify how much we are promoting or retarding the adoption of certain technologies on campus? How can we use the model to compare two baskets of drivers, e.g., two candidate technologies with their corresponding policies, change
management and economic consequences? One practical solution is to depict the model as a two-dimensional matrix with annotated numeric values. We plot the actors along the x-axis and the factors along the y-axis. Each xy intersection point of a factor and an actor lists one or more of the enabling, neutral and preventing drivers that influence the adoption of a technology initiative. Each cell also lists a negative, neutral or positive aggregate score.
<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rules</strong></td>
<td>Academic policies mandating online course evaluations</td>
<td>Personnel policies mandating cumbersome security</td>
<td>Student handbook rules prohibiting the use of laptops in class</td>
<td>Higher education laws mandating emergency alert systems</td>
</tr>
<tr>
<td></td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
</tr>
<tr>
<td><strong>Norms</strong></td>
<td>Successful technology use demonstrations by fellow professors</td>
<td>Training courses for employees to use new technologies</td>
<td>Classmate use of social networking for research and collaboration</td>
<td>Board member ideas to make the web site friendly for mobile users</td>
</tr>
<tr>
<td></td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
</tr>
<tr>
<td><strong>Prices</strong></td>
<td>Grants to learn and use simulation software in courses</td>
<td>Bonuses to implement a new student information system</td>
<td>Discounts and perks to purchase Apple computers</td>
<td>Savings from installing a new human resources and payroll system</td>
</tr>
<tr>
<td></td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
</tr>
<tr>
<td><strong>Architecture</strong></td>
<td>New devices to prepare and show interactive class materials</td>
<td>Security controls with unreliable fingerprint recognition</td>
<td>Mobile applications to access course materials anywhere</td>
<td>Joint technology development with a new company</td>
</tr>
<tr>
<td></td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
<td>Score: -1, 0, 1</td>
</tr>
</tbody>
</table>

Table 9. Sample drivers and scores in the campus technology adoption model.

The aggregate score rates the overall influence on technology adoption of the enabling, neutral and preventing drivers in each particular cell according to a qualitative scale, e.g., with values of minus one, zero, and one. It is possible to choose a more granular quantitative scale, e.g., assigning an integer score from minus five to zero for
negative influences in technology adoption and from zero to five for positive ones. Obviously, a more granular scale for rating each one of the factors allows for a more nuanced interpretation of the impact of the drivers on the actors.

The use of a numerical scale permits the summing of all of the intersection scores and produces an aggregate numerical value. If the aggregate number is negative, the institution is retarding the adoption of the technology by a factor commensurate with the value of that aggregate number. If the aggregate number is zero or near zero, the institution is taking a neutral stance towards the adoption of the technology. If the aggregate number is positive, the institution is promoting the adoption of the technology by a factor commensurate with the value of that aggregate number. Using a -1 to 1 scale, a score of 16 shows the highest proclivity toward adoption and a score of -16 shows the opposite tendency. Using a scale of -5 to 5, a score of 80 would show the highest preparedness toward adoption and a score of -80 would show the opposite tendency.

To retard technology adoption is not always bad. For example, retarding technology adoption may be a reasonable strategy when a new technology could expose a college or university to risky litigation, as in the case of peer-to-peer file-sharing networks that could enable behaviors in violation of copyright laws.

Preparing the model is a recurring four-step process: scoring, identification, evaluation and remediation. The first step is scoring, that is, assigning a score to each cell. The second step is identification, that is, spotting any critical problems by examining the scores. Extreme negative scores highlight factors that can either slow down significantly or stop altogether the technology adoption process. The third step is the evaluation, that is, deciding whether the problem points identified in the model are deal-
breakers or whether they can be addressed by changing some of the input drivers. If they are deal-breakers, the initiative should be abandoned. If they can be addressed, the model calls for a remediation step. Remediation involves recalculating the model by tweaking one or more of the drivers: legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements. For example, offering technology to faculty and staff could be a good remediation step using diffusion of innovation dynamics.

The model has some obvious limitations. Each individual data point, each intersection, is assigned a number using both objective and subjective criteria. For example, what would be the score when a technology upgrade changes the architecture factor for faculty and results in a mixed batch of functional efficiencies and inefficiencies, e.g., more security but slower data processing? Would it be better to average the pluses and the minuses, follow a utilitarian approach by considering what benefits the majority, or assign a score using other criteria? In these cases, the qualitative annotations may help to discern relative weights and resolve conflicts.

While adding the numbers gives us an easy-to-use and convenient score, the truth is that the aggregate score may hide important information. For example, an institution could be neutral about a technology initiative not because the drivers leave the factors unaffected but because the resulting factors cancel each other. This could be the case, for example, if an institution were to promote laptop adoption among students by encouraging them to purchase laptops with financial aid funds but did not have a campus wireless network robust enough to support the laptops, or if its faculty prohibited the use of laptops in the classroom altogether.
Operationalizing the Model

How can institutions use the model? Colleges and universities can apply the model in three stages: valuation, deliberation and execution. In the valuation stage, stakeholders evaluate whether or not a given technology initiative makes sense for the institution. In the deliberation stage, stakeholders decide which one of several candidate technology initiatives or options is the best one. But the valuation and the deliberation go only so far. In the execution stage, stakeholders modify the drivers for the technology initiative to promote adoption and to remove obstacles.

For example, campus executives and technologists considering a classroom recording system must evaluate, deliberate and execute. First, campus executives, faculty, student representatives and technologists must evaluate whether or not it makes sense to adopt such a system. Then, they must deliberate over which one of the available technologies, or combinations of technologies, would be the best one for the campus. Finally, once a decision is made, they must find the best way to execute it with specific drivers –legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements- to change the four factors –norms, rules, prices and architecture- and their impact on the four actors –faculty, staff, students and administrators.

Perhaps the fundamental application of the model is to evaluate the impact on campus of a new technology initiative before launching it. In the context of the model, a technology initiative is any combination of drivers –legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements- devised to change technology behavior on campus. Studying how the drivers used to adopt a
particular technology initiative would affect the rules, norms, prices and architecture
factors as perceived by the faculty, staff, students and administrators, brings both clarity
and transparency to the technology adoption process.

When a technology initiative shows horizontal conflict among actors, e.g., faculty
versus administrators, the model can either contribute to resolve the conflict before
execution or at least clarify the issues and facilitate understanding among those affected
after execution. For example, in the case of classroom recording systems, a conflict
usually arises between the desire of the students for wide access to the recordings and the
interest of the faculty in retaining control over the digital reproduction of lectures. The
model helps identify this conflict and suggest ways to address it, e.g., crafting and openly
communicating a class recording policy to all the stakeholders.

When a technology initiative shows vertical conflict among factors, e.g.,
economic efficiencies versus legal risks, the model can show ways to compromise by
tweaking the drivers. For example, in the case of cloud computing services for email, a
conflict arises between the savings resulting from moving email services to the cloud and
the concerns of faculty members about unrestricted law enforcement access to data in the
cloud. The model helps identify this conflict and suggest ways to address it, e.g.,
retaining sensitive email accounts on a local system. Tables 11 and 12, introduced later in
this chapter, show two technology adoption matrices for a classroom recording system
before and after resolving the horizontal and vertical conflicts.

After valuation comes deliberation. A new model matrix is prepared for each of
the candidate technologies, as supported by the corresponding drivers. The model
provides a multi-dimensional overview of each candidate technology, including
advantages and disadvantages in terms of rules, norms, prices and architecture for each of
the constituent groups affected: faculty, staff, students and administrators.

Once a candidate technology has been selected, it is time to execute. The execution stage is an interrogative and interactive process. Is there a roadblock? If yes, remove it or at least make it less disruptive to adoption. Does the removal create new challenges and opportunities? If so, address the challenges and harness the opportunities.

The stages influence each other. For example, the valuation of whether or not a new technology initiative makes sense depends on the available candidate technologies in the market place. Deliberating over several candidate technologies may change the previous valuation analysis, as new technologies or their applications are better understood. It may also identify execution challenges ahead of time. In the end, new information that surfaces in a detailed execution analysis may sharpen the preceding valuation and deliberation analyses.

The Application of the Model at Georgetown University

An interesting application of the model is to compare technology adoption cases across different organizational units of an academic institution, e.g., several schools of the same campus or several campuses of the same university. The next paragraphs show how the model was used in two of the three campuses at Georgetown University.

Located in Washington, DC, Georgetown University is organizationally a unique academic institution. The University has three campuses: the Main campus, the Law Center campus, and the Medical Center campus. Each campus has schools, institutes and centers, even in distant locations like the School of Foreign Service campus in Doha, Qatar and the Center for Transnational Legal Studies in London, United Kingdom.
Each of the three Georgetown University campuses operates under the leadership of either a Provost or an Executive Vice President, who in turn reports to the President of the University. Under a three-campus, three-budgets model, the campuses enjoy significant financial and operational independence. The Law Center campus, for example, has its own personnel and services for facilities, public safety, financial affairs and technology services. The Law Center campus has its own Chief Financial Officer and its own Chief Information Officer.

As a consequence of this organizational structure and independence, technology services at the Main, Law Center and Medical Center campuses are not uniform. In other words, some technologies are used in all campuses; sometimes, however, the campuses adopt different technologies. As the Law Center campus CIO from 2000 to 2012, I reported to the Executive Vice President for the campus. Starting in 2007, I also served with a secondary appointment as Associate Vice President of Information Technology for Georgetown University, reporting to the University CIO.

This dual role provided me with the unique opportunity to evaluate and influence technology adoption at both the Main campus and the Law Center campus of Georgetown University. It was this dual appointment as both Law CIO and University Associate Vice President that helped me understand how technology adoption was different at two campuses of the same University. At the Law Center I had formal authority, and therefore great influence, over technology decisions. On the other hand, I exerted much less influence over technology adoption decisions at the Main campus. Between 2007 and 2012, I refined and developed this multi-dimensional model by leading, observing and contrasting technology adoption on both campuses.
In my capacity as Associate Vice President of Information Technology for the University between 2007 and 2012, I evaluated whether or not to adopt new multi-million dollar technology systems for student information management, finance, human resources and payroll for the three campuses of the University. The most complex of these systems was the new system to manage student information. To help the executives of the University and the members of the Board of Directors make an informed decision about these large projects, the technology executives and their partners in many academic and administrative departments prepared a proposal.

The proposal considered the rules, that is, why the upgrades were important to comply with the new financial aid and Higher Education Opportunity Act regulations. The business case also considered the prices, that is, the economic analysis projecting the total cost of ownership of at least two candidate technologies. However, we failed to consider fully the norms, that is, how individuals would adopt the new system in executing their academic and business processes. We also underestimated the architecture, that is, how to integrate the new system within the pre-existing technology ecosystem.

By failing to take fully into account these two factors, norms and architecture, we spent more resources than we had anticipated, to the frustration of many community members. It also took the University much longer than expected to reduce the gap between the potential benefits of the new system and the actual benefits. Had we worked with the technology adoption matrix proposed in this model, we could have identified these problems and addressed them before adopting the new student information system.
with drivers like additional training, business process reengineering and technology architecture reviews.

As Chief Information Officer for the Law Center campus of Georgetown University from 2000 to 2012, I evaluated whether or not to adopt Main campus technology systems, e.g., a learning management system, at the Law Center campus and at the Center for Transnational Legal Studies in London. The Main Campus started using a learning management system made by Blackboard, Inc. in 2000. At that time, the Law Center already had in place a custom-made system, one tailored to the specific needs of its faculty. During the twelve-year period between 2000 and 2012, we examined periodically whether or not it made sense for the Law Center campus to embrace the Main Campus learning management system.

The first criterion when choosing singular versus university-wide technologies for a campus were rules. Did the university-wide solution comply better or worse than the campus-wide solution with the laws, regulations, and rules of professional conduct and policies for the campus? Other legal criteria, which generated much controversy over time due to the difficulty of conducting objective assessments, were the information security and privacy risks associated with the technology solutions under consideration. For example, the Main Campus technology office took the position that all of the systems under its control were more secure than those of individual campuses or units, based on comparative resource allocations. On the other hand, some of the individual departments and units challenged this assessment by pointing to the higher number of data leaks at the Main Campus technology office compared to those at the local technology units.
The second criterion for evaluation was norms. Would the Law Center community members use the new technologies? If a university-wide technology service were to replace an existing campus technology service, community members would demand that the reliability and the functionality of the new service be equal to or better than those of the campus service. A reduction in functionality would bring about a need for training and change-management strategies with an adverse impact on the adoption of technology innovations on campus.

The third criterion was prices. To adopt a university-wide technology service for the Law Center campus, the cost-benefit analysis for the new service had to match or be more favorable than that of the available campus alternative. The potential economies of scale of adopting university-wide systems did not always seem more advantageous than singular technology implementations for an individual campus.

The fourth criterion was architecture, that is, whether or not the technology was available in other campuses, its integration with other systems on campus, and the governance of the system. In this context, governance refers to deciding when to schedule outages for maintenance, when to upgrade the system, and how to configure the system to strike the appropriate balance of autonomy for the users versus institutional control of their activities. At Georgetown University, when the governance process was not articulated, when the governance of the system was based mostly on implicit good will, the candidate technology was adopted only in parts of the University and not across most campuses and departments.
**Applying the Model: Classroom Recordings**

A practical application of the model shows the interrelationship of rules, norms, prices and architecture in the recording of classes. Class capture recording systems are particularly useful services for students with disabilities. Blind students can listen to class recordings to supplement the electronic materials that they can read with their computers. Students with attention deficit disorders can listen to class recordings at the point when their attention waned in class.

These systems also benefit students who find themselves temporarily unable to attend classes due to sickness or other reasons. For example, after the terrorist attacks of September 11, 2001, the Georgetown University Law Center decided to audio record all classes and to make them available to all current students. Students who were distracted or depressed temporarily were able to listen to the class sessions and review the materials instead of dropping out of their academic programs.

The same applies to students who miss class due to religious, personal or professional obligations. Thanks to technology, those students can receive substitute recordings for the learning experiences that they had to miss. Increasingly, experiential learning opportunities and global academic initiatives place students off campus, both in other regions of the United States and internationally, while school is in session. Once again, classroom recording technologies can help students keep up with all of their classes while participating in extra-curricular activities, like Georgetown Law Professor Charles Gustafson’s trip to Sweden for tax law students every spring.

It is part of the fundamental mission of colleges and universities to prepare new knowledge workers for the practice of their professions. To join the labor market upon
graduation, and even before graduation in a part-time or temporary capacity, students must attend job-recruitment events and job interviews. Classroom recording technologies allow students to keep up with classroom sessions when they have to be elsewhere during their job searches. Using these technologies effectively increases the likelihood of the students joining the labor force, gives the students new skills for working online once employed, and helps higher education institutions fulfill their mission.

The Georgetown University Law Center Campus recorded classroom lectures on audiotapes for its students from 1985 to 2006. At the request of the students, the information technology department at Georgetown Law devised an ingenious class recording system to replace the tape recorders with a digital online system in 2006. More than 40 classrooms on campus already had microphones installed in them. The microphones picked up the audio in the room, both the professor’s speech and the student comments and questions, and sent it via copper wires and fiber optic cables to a control room in the audiovisual department. Once in the control room, 40 computers would encode the audio signals and store them on a multimedia streaming server. Occasionally, the system also records and processes the video signals coming from portable or built-in classroom video cameras.

A sophisticated web-enabled software application would allow students to request that a class be recorded. Academic administrators would review the student requests and then approve or deny them. The logic in the system would ensure that students could only access those recordings that they were authorized to access, as determined by the academic administration.
Once the technical solution was ready, but still inactive, it took over one year for the Technology Users committee and the Teaching committee to build consensus among faculty, academic administrators, the students about a new policy to regulate the production and distribution of digital class recordings. In addition, the policy and its implementation demanded minor yet critical technological changes to the system to ensure that faculty and administrators trusted its security controls.

As predicted by the final execution matrix, adoption on campus was widespread and successful. The usage statistics of the classroom recording system from 2007 until 2010 are telling. Of note is the growth in the use of the system, from 35 unique users and 116 class session recordings in the fall semester of 2007, to 1,166 unique users and 4,808 class session recordings in the spring semester of 2010.

Yet, the initial valuation matrix for the classroom recording initiative showed a technology adoption score of 7. Most importantly, the scores for the rules factor for faculty and for administrators were negative and the corresponding annotations revealed a major impediment to adoption. Discussions with faculty members and administrators revealed that the rules factor had to be addressed. Without addressing these concerns, the initiative could not succeed.
<table>
<thead>
<tr>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules</td>
<td>Faculty privacy and intellectual property concerns</td>
<td>Unaffected</td>
<td>Unaffected</td>
</tr>
<tr>
<td></td>
<td>Score: -1</td>
<td>Score: 0</td>
<td>Score: 0</td>
</tr>
<tr>
<td>Norms</td>
<td>Meetings and surveys to solicit faculty recording preferences</td>
<td>Training for academic administrators and technicians</td>
<td>Email messages and web site pages informing students</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
</tr>
<tr>
<td>Prices</td>
<td>Minimum time and effort commitment</td>
<td>Minimum effort to review requests</td>
<td>No specialized software or media devices necessary</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
</tr>
<tr>
<td>Architecture</td>
<td>Recordings available to authorized users for the desired time</td>
<td>Automated online process</td>
<td>Convenient online requests and access to recordings</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
</tr>
</tbody>
</table>

Table 10. Classroom recordings at the Law Center with an adoption score of 7.

Classroom recording technologies are especially interesting because they may present unique dilemmas. For example, what are the legal and policy considerations of a digital classroom recording system for an academic institution like Georgetown University? Undeniably, the advantages are numerous for the students, who can listen to class recordings if they missed lectures or needed to review them. On the other hand,
classroom recording technologies present unique intellectual property issues for faculty, as well as privacy issues both for faculty and for students. Because digital recordings are far easier to copy and to disseminate than analog recordings distributed on physical media, whatever is recorded in class and stored digitally may end up in the wrong hands for the wrong reasons.

Faculty, administrators and students fear that what is said in a class could be used out of context. To ensure that students freely speak their minds in class, they must be assured that what they say in a class discussion will not come back to haunt them years later, should they run for public office or hold a position of corporate responsibility. Similarly, faculty members fear that a class recording could end up in the wrong hands, e.g., in those of an unscrupulous reporter. The easy availability of class recordings and the exploitation of their content out of context can unleash a storm of misunderstandings, if not a flurry of lawsuits.

Faculty members are compensated for teaching and researching. What they do is not considered work-for-hire under copyright doctrine, however. When classes are recorded, faculty members fear that they may lose control over their lectures. For example, institutions may feel tempted to take the classroom recordings and make them available to distance learning students without consulting with the professors.

Some faculty members face a conflict of interest between professional conduct and teaching. To make their classes more relevant and meaningful, many discuss confidential information of past and current cases with some degree of anonymity and the understanding that what is said in class stays in class. Once the class discussions are recorded digitally, an accidental or intentional leak of the recordings may jeopardize the
outcome of the cases and the reputation of those involved, including that of the professor. This situation is particularly problematic for adjunct faculty members discussing notorious transactions, cases and events.

Another unique case is that of the law school faculty members who teach in clinics, that is, they teach practical legal skills through actual, on-going work on real-life cases. Law Center clinicians opted out of the institutional class recording system; instead, they were issued personal digital recorders to exercise absolute control over the recordings of their classes and the distribution of the recordings. Their aim was to protect the attorney-client privilege in the same manner that clinic faculty members in a medical school must protect doctor-patient confidentiality.

One of the most challenging conflicts of interest was the need to balance the needs of the students with disabilities, e.g., those who suffered from attention deficit disorders, and the wishes of faculty members who preferred not to be recorded. In these conflicting situations, the academic administrators convinced the faculty members by highlighting the benefits to the student and the institutional need to comply with the American with Disabilities Act. Occasionally, the academic administrators failed to persuade a faculty member and had to overrule the professor’s preferences for compliance reasons.

All of these considerations prompted the Georgetown University Law Center to spend over one year discussing a new policy for the digital recording of classes. The Technology Users Committee, and most importantly the Teaching Committee, with representative faculty, staff and student members wrote the highly controversial new policy. During the policy discussions, the committee members learned that many students
were already recording class sessions, for themselves or for non-present classmates, using their laptops, iPods or other inconspicuous audio recording devices. The first statement of the policy was to ban the recording of classes by the students themselves without the explicit authorization of the faculty member.

Consistent with our mission of training lawyers who act with the highest standards of honesty, integrity and trustworthiness, and with respect for the legitimate interests of others, students are not permitted to record a class themselves by any means without prior express authorization of the faculty member.²

At first, the procedure to ask faculty members for their preference regarding class recordings called for an opt-out default setting. In other words, the presumption was that faculty members preferred not be recorded unless they stated otherwise. Interestingly enough, faculty preferences in this matter seemed to evolve and became over time more permissive of recording. This could be attributed to a variety of factors like peer pressure, greater familiarity and understanding of the technology and its benefits, greater trust in the strength of the system to prevent unauthorized access to recordings, more confidence in the permission-granting process of the academic administration, and even greater appreciation for the unique pressures summarized under the rubric of “extenuating circumstances.”

In the 2009-2010 academic year, the administration adopted a new default setting for class recording. In the summer of 2009, Georgetown University administrators prepared for a possible swine flu pandemic. In the event that students fell ill in large numbers, the Law Center campus administrators decided to change the default setting for class recordings. Starting in the fall semester of 2009, the default setting was that classes

would be recorded unless faculty members expressed explicitly their intention to opt-out. Still, administrators had to decide under what particular conditions the recordings would be made available to individual students.

The next step was to prepare the deliberation matrices, which were simpler to prepare and easier to understand than the valuation matrices. The main decision was whether to use a commercially available solution or to develop an in-house one. Both systems would impact the rules, norms and architecture for faculty, staff and students in similar ways. There was, however, an important difference in the prices factor.

At the time, commercially available systems had a cost of $50,000 per unit. A campus like the Law Center, with 40 classrooms at times in use simultaneously, needed 40 units. The price tag for this option was two million dollars. By contract, a home-grown solution only required 40 Apple Mac Mini computers, with a total price tag of $20,000.

Obviously, the Law Center chose to implement a home-grown system. After resolving the conflict in the rules factor, the score differential between a commercially available system and a home-grown one was only 2 points, 11 versus 9. The annotations, however, revealed a significant price difference of $1,880,000. The tables below show the model matrices to deliberate between these two technology options.
<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules</td>
<td>New policy addresses privacy and intellectual property concerns</td>
<td>New policy helps staff resolve faculty-student preference conflicts</td>
<td>New policy clarifies competing interests and recording limitations</td>
<td>New policy addresses concerns about student privacy</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
<td></td>
</tr>
<tr>
<td>Norms</td>
<td>Meetings and surveys to solicit faculty recording preferences</td>
<td>Training for academic administrators and technicians</td>
<td>Email messages and web site pages informing students</td>
<td>Deans plan an information campaign endorsing use of the system</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
<td></td>
</tr>
<tr>
<td>Prices</td>
<td>Minimum time and effort commitment</td>
<td>Minimum effort to review requests</td>
<td>No specialized software or media devices necessary</td>
<td>Low cost solution at $20,000</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td>Architecture</td>
<td>Recordings available to authorized users for the desired time</td>
<td>Automated online process</td>
<td>Convenient online requests and access to recordings</td>
<td>Imperfect system reliability</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
<td></td>
</tr>
</tbody>
</table>

Table 11. Law Center home-grown classroom recordings with an adoption score of 11.
Faculty | Staff | Students | Administrators
--- | --- | --- | ---
**Rules**
New policy addresses privacy and intellectual property concerns | New policy helps staff resolve faculty-student preference conflicts | New policy clarifies competing interests and recording limitations | New policy addresses concerns about student privacy
Score: +1 | Score: +1 | Score: +1 | Score: +1

**Norms**
Meetings and surveys to solicit faculty recording preferences | Training for academic administrators and technicians | Email messages and web site pages informing students | Deans plan an information campaign endorsing use of the system
Score: +1 | Score: +1 | Score: +1 | Score: +1

**Prices**
Minimum time and effort commitment | Minimum effort to review requests | No specialized software or media devices necessary | High cost solution at $2,000,000
Score: 0 | Score: 0 | Score: 0 | Score: +1

**Architecture**
Recordings available to authorized users for the desired time | Automated online process | Convenient online requests and access to recordings | Imperfect system reliability
Score: +1 | Score: +1 | Score: +1 | Score: -1

Table 12. Law Center commercial classroom recordings with an adoption score of 9.

To use the model in a comparison, below is the four by four technology execution matrix for the deployment of a digital classroom recording system at the Main Campus of Georgetown University. The Law Center implemented its digital system to record classes in 2007. For years, the Main campus formed committees to discuss implementing such a
system and even conducted some pilot tests. It was not until 2012 that faculty members could use a digital classroom recording system for pedagogical reasons or business continuity in some of the Main campus classrooms.

<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rules</strong></td>
<td>No new or amended policies for classroom recordings</td>
<td>No new or amended policies for classroom recordings</td>
<td>No new or amended policies for classroom recordings</td>
<td>No new or amended policies for classroom recordings</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
</tr>
<tr>
<td><strong>Norms</strong></td>
<td>Email notification and training for faculty members</td>
<td>Email notification and training for technicians</td>
<td>No notification or training</td>
<td>Notification within email messages about academic continuity</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td><strong>Prices</strong></td>
<td>Time and effort commitments to learn and to record</td>
<td>No time or effort necessary from most staff members</td>
<td>No specialized software or media devices necessary</td>
<td>Medium cost compromise between low-end and high-end solutions</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
</tr>
<tr>
<td><strong>Architecture</strong></td>
<td>Recordings manually available to authorized users</td>
<td>Simple, easy-to-understand technologies</td>
<td>Convenient online access to recordings</td>
<td>Expected system reliability and functionality</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: 0</td>
</tr>
</tbody>
</table>

Table 13. Classroom recordings at the Main campus with an adoption score of 6.
The Law Center matrix shows a score of 11 because the campus paired the technology implementation with the writing and the approval of a policy to balance the interests of faculty, staff, students and administrators regarding privacy, intellectual property, disability accommodations, convenience, and pedagogy. It also paired the technology deployment with change management techniques including widespread awareness and communication campaigns for faculty and students, and training for staff and academic administrators.

An interesting element of note in the Law Center execution matrix is the negative architecture factor for administrators. To ensure reliability, the technology team engineered a system that would record in all classrooms at all times during business hours. The system would only make available the approved time segments to authorized students. Some faculty members expressed serious concerns about a big brother recording system that could be abused by hackers, law enforcement or administrators.

To respect faculty preferences of not recording all class sessions by default, the system had to be programmed on the fly to recognize that a student had requested recording and that the corresponding faculty member or an overruling administrator had approved it. To make matters more complex, academic programming changes and unforeseen circumstances forced last minute changes of classrooms and class times. This complex set of variables contributed to occasional failures to record due to human error. On those rare occasions, faculty, staff and students were aggravated.

The Main campus matrix shows a score of 6 because the campus did not develop any policies to balance the interests of faculty, staff, students and administrators regarding privacy, intellectual property, disability accommodations, convenience, and
pedagogy. Campus officials notified faculty, staff and administrators about the new system, and even offered training to faculty, but did not inform the students.

It follows from an examination of the matrices of the model that crafting supporting policies improves adoption thanks to the rules factor. Communicating with all the stakeholders improves adoption thanks to the norms factor. Finding low cost solutions is very appealing to administrators and therefore improves technology adoption. Providing easy-to-use technology elements improves adoption thanks to the architecture factor.

The scores in the model explain the adoption differences at two different campuses of Georgetown University. Whereas use of the digital classroom recording system was pervasive at the Law Center Campus, faculty members seldom used the system at the Main campus.

**Applying the Model: Web Conferencing**

Another practical application of the model shows the interrelationship of rules, norms, prices and architecture in the adoption of web conferencing services. In preparation for a swine flu pandemic, the Law Center administration decided to adopt web conferencing services campus-wide in 2009.

The main driver for adopting web conferencing services was to assure for academic continuity, that is, to be prepared to carry on with academic operations in the face of the potentially disruptive impact of a swine flu pandemic. The goal was to augment the existing campus-wide digital class recording system with web conferencing services. Thanks to the class recording system, students could review missed class sessions if they were away from campus, either being sick themselves or taking care of
others who were sick. With web conferencing, faculty members could teach while away from campus, either during regular class meeting times or once they had recovered from their illness. With occupancy rates for the Law Center’s forty classrooms approaching saturation, it would have been very difficult indeed to have rescheduled make-up classes in the wake of a pandemic, short of extending the semester long beyond its established endpoint.

The initial valuation matrix for the web conferencing initiative showed a technology adoption score of 6. Most importantly, the scores for the norms factor for faculty, staff and administrators were negative and the corresponding annotations revealed a major impediment to adoption. Discussions with faculty, staff and with administrators revealed that the norms factor had to be addressed. Community members were unfamiliar with web conferencing, worried about its reliability, functionality and ease of use. Without addressing these concerns, the initiative would not be widely adopted.
<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rules</strong></td>
<td>Academic standards and accreditation rules accept occasional online teaching</td>
<td>Supervisor approval of online meetings for staff members</td>
<td>Unaffected unless used by a faculty member</td>
<td>Explicit endorsement of acceptable use for faculty and staff</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td><strong>Norms</strong></td>
<td>Resistance to change established teaching practices</td>
<td>Resistance to change established working methods</td>
<td>Awareness about the possibility of using the technology</td>
<td>Resistance to operate in a different way</td>
</tr>
<tr>
<td></td>
<td>Score: -1</td>
<td>Score: -1</td>
<td>Score: 0</td>
<td>Score: -1</td>
</tr>
<tr>
<td><strong>Prices</strong></td>
<td>Convenience when use is necessary</td>
<td>Travel savings when bringing candidates and business partners to campus</td>
<td>Minimal time and money savings for job interviews in unique situations</td>
<td>Travel savings when inviting candidates and guest lecturers to campus activities</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td><strong>Architecture</strong></td>
<td>Ease of use and integration with existing systems</td>
<td>Ease of use and integration with existing systems</td>
<td>Ease of use and integration with existing systems</td>
<td>Technical security and privacy assurances</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: +1</td>
</tr>
</tbody>
</table>

Table 14. Web conferencing at the Law Center with an adoption score of 6.

In this case, the deliberation matrices were simpler to prepare and to understand.

For the three major candidate technologies under consideration -- Cisco Webex, Adobe Connect and GoTo Meeting -- there were no appreciable differences in the rules, norms, prices or architecture factors.
Because of the lack of distinction among the three options, some of the campus constituents involved in the discussion became paralyzed in the decision process. The use of Gartner’s Magic Quadrant for Web Conferencing, as a third-party objective document, helped the technology team make the case swiftly and to gain consensus. With little time for contract negotiations and technology adoption, including the training of community members, the institution succeeded in making a decision and in implementing the service before the first reported cases of swine flu hit the campus.

There were other reasons for choosing Cisco Webex over competing products and services. One of the reasons to champion WebEx was the strategic relationship between the institution and Cisco. This relationship resulted in donations by Cisco and some of its executives to the University, and in ongoing acquisitions of Cisco products and services by the University. The strength of this relationship became evident when Susan L. Bostrom, Executive Vice President and Chief Marketing Officer for Cisco Systems and mother of a Georgetown University student, became a member of the Board of Directors of Georgetown University in 2010.

A contributing factor in selecting the Cisco solution was the ease of integration of the WebEx service with the existing campus technology infrastructure, like the Microsoft Exchange email system. In the end, the preponderant criterion was the belief that, in the event of a real swine flu pandemic, the demand for web conferencing services worldwide could spike and that only one of the strongest providers, i.e., Cisco, would be able to deliver reliable services.

Yet, none of these business and technical reasons seemed compelling enough to bring consensus among the decision makers. A financial analysis did not help because
they were no significant cost differences among the most desirable options. Sharing the Gartner report with the decision makers changed the situation. Web conferencing services competing with Cisco Webex ranked lower in the Ability to Execute or the Completeness of Vision in the Gartner Magic Quadrant. This helped the CIO and his team members validate their views before the other campus executives making the decision. The CIO and his team relied on Gartner research as supporting documentation.

Once a vendor had been chosen, the critical deliberation was either to host the solution on campus or to use a service hosted by the vendor. Both options would impact the rules, norms and architecture for faculty, staff and students in similar ways. There was, however, an important difference in the architecture factor. In case of a true pandemic, it was conceivable that technology employees who felt sick would be unable to repair the system in case of a system malfunction.

Because of this, the Law Center chose to implement a web conferencing service hosted by the vendor. After resolving the problems with the norms factors, the score differential between a hosted solution and an in-house was only 2 points, 12 versus 10. The annotations, however, revealed the critical reliability problem with a solution hosted on campus. The tables below show the model matrices to deliberate between these two technology options.
### Table 15. Law Center in-house web conferencing with an adoption score of 10.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic standards and accreditation rules accept occasional online teaching</td>
<td>Supervisor approval of online meetings for staff members</td>
<td>Unaffected unless used by a faculty member</td>
<td>Explicit endorsement of acceptable use for faculty and staff</td>
</tr>
<tr>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td>Norms</td>
<td>Email notification and training</td>
<td>Awareness about the possibility of using the technology</td>
<td>Email notification and training</td>
</tr>
<tr>
<td>Faculty meeting, email notification and training</td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td>Score: +1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prices</td>
<td>Convenience when use is necessary</td>
<td>Travel savings when bringing candidates and business partners to campus</td>
<td>Travel savings when inviting candidates and guest lecturers to campus activities</td>
</tr>
<tr>
<td>Score: 0</td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td>Architecture</td>
<td>Ease of use and integration with existing systems</td>
<td>Ease of use and integration with existing systems</td>
<td>Lack of reliability in an emergency</td>
</tr>
<tr>
<td>Ease of use and integration with existing systems</td>
<td>Score: +1</td>
<td>Score: +1</td>
<td>Score: -1</td>
</tr>
<tr>
<td>Score: +1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 16. Law Center hosted web conferencing with an adoption score of 12.

To use the model in a comparison, below is the four by four technology execution matrix for the deployment of web conferencing at the Main Campus of Georgetown University. The Law Center implemented web conferencing for all faculty, staff and students in 2009. For years, the Main campus conducted some pilot tests with Elluminate,
Adobe Connect and other products. It was not until 2011 that most faculty members could use web conferencing, first Elluminate and later Blackboard Collaborate, for academic continuity at the Main campus.

<table>
<thead>
<tr>
<th></th>
<th>Faculty</th>
<th>Staff</th>
<th>Students</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules</td>
<td>No new academic policy interpretation or review</td>
<td>No new labor practices by supervisors</td>
<td>Unaffected unless used by a faculty member</td>
<td>No new policy interpretation or review</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
</tr>
<tr>
<td>Norms</td>
<td>Email notification and training</td>
<td>Lack of notification</td>
<td>Lack of notification</td>
<td>Email notification</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: +1</td>
</tr>
<tr>
<td>Prices</td>
<td>Convenience when use is necessary</td>
<td>Unaffected</td>
<td>Unaffected</td>
<td>Unaffected</td>
</tr>
<tr>
<td></td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
<td>Score: 0</td>
</tr>
<tr>
<td>Architecture</td>
<td>Integration with existing learning management system</td>
<td>Not available to staff without access to learning management system</td>
<td>Integration with existing learning management system</td>
<td>Unaffected</td>
</tr>
<tr>
<td></td>
<td>Score: +1</td>
<td>Score: 0</td>
<td>Score: +1</td>
<td>Score: 0</td>
</tr>
</tbody>
</table>

Table 17. Web conferencing at the Main campus with an adoption score of 4.

The Law Center matrix shows a score of 12 because the campus paired the technology implementation with clear directions from administrators and supervisors.
encouraging faculty and staff members to use web conferencing. It also paired the technology deployment with change management techniques including widespread awareness and communication campaigns for all in the community, and with training for faculty, staff and administrators.

The Main Campus matrix shows a score of 4 because the technologists integrated web conferencing with the learning management system, which was only available to faculty and students. Campus officials notified faculty and administrators about the new system, and the technologists and the pedagogical experts even offered training to the faculty, but did not inform the staff or the students. The Main Campus web conferencing initiative was designed to make the technology available only for teaching and not for other purposes, like having online staff meetings.

It follows from examining the matrices of the model that crafting supporting policies improves adoption thanks to analyzing the rules factor. Communicating with all the stakeholders improves adoption thanks to analyzing the norms factor. Saving money is very appealing to administrators and therefore improves technology adoption. Providing easy-to-use technology elements and integrating them within the ecosystem available to all improves adoption thanks to the architecture factor.

The scores in the model explain the adoption differences at two different campuses of Georgetown University. Whereas web conferencing proved popular at the Law Center Campus, faculty members seldom used the system at the Main campus.

While the effects of the swine flu were less severe than anticipated in the 2009-2010 academic year, the Law Center community was ready for it. As a practical benefit, many professors, staff members and students used the web conferencing services to
conduct classes from a distance, to celebrate meetings with remote participants, and to bring outside speakers to campus without leaving behind carbon footprints or travel expenses.

The system proved indispensable to continue operating when several snow storms, known popularly as Snowmaggedon, hit the Washington, DC metropolitan area in February of 2010. It also proved productive when scores of Georgetown University administrators and faculty members were stranded in Europe due to the eruptions of the Eyjafjallajökull volcano in Iceland, which brought air traffic over the North Atlantic to a halt for several days, during the spring of 2010.

Still, the system was not as widely used as it could be because faculty members preferred to teach in person. Similarly, staff members preferred to attend meetings in person. In this case, the norms among faculty and staff members changed slowly over time but still retarded the adoption of web conferencing services at the Law Center campus. At the Main Campus, technology elements, i.e. the integration of web conferencing services with the learning management system, retarded the adoption of web conferencing for staff members.

**Did the Model Work across the Board?**

The application of this model translated into faster and more widespread technology adoption at some of the Georgetown University campuses than others from 2000 to 2011. The Georgetown University Law Center campus implemented voice-over-IP telephony, wireless networking, electronic commerce, video streaming and webcasting, academic iTunes, YouTube channel, digital class recording system, online course evaluations, online seating charts, online exam management, web collaboration
sites, web conferencing and chat services years before the Main campus of Georgetown University. As the following paragraphs explain, the model explains many of the differences in the pace and breadth of technology adoption across campuses but not all of the differences.
<table>
<thead>
<tr>
<th>Technology</th>
<th>Law Center campus general availability</th>
<th>Main Campus general availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice-over-IP telephony</td>
<td>2003</td>
<td>Not available as of 2011</td>
</tr>
<tr>
<td>Wireless networking</td>
<td>2001</td>
<td>2011</td>
</tr>
<tr>
<td>Electronic commerce</td>
<td>2001</td>
<td>2002</td>
</tr>
<tr>
<td>Video streaming and webcasting</td>
<td>2001</td>
<td>2006</td>
</tr>
<tr>
<td>Academic iTunes</td>
<td>2004</td>
<td>2008</td>
</tr>
<tr>
<td>YouTube channel</td>
<td>2004</td>
<td>2008</td>
</tr>
<tr>
<td>Digital class recordings</td>
<td>2007</td>
<td>2012</td>
</tr>
<tr>
<td>Online course evaluations</td>
<td>2007</td>
<td>2011</td>
</tr>
<tr>
<td>Online seating charts</td>
<td>2009</td>
<td>Not available as of 2012</td>
</tr>
<tr>
<td>Online exam management</td>
<td>2009</td>
<td>Not available as of 2012</td>
</tr>
<tr>
<td>Web collaboration sites</td>
<td>2007</td>
<td>2010</td>
</tr>
<tr>
<td>Web conferencing</td>
<td>2009</td>
<td>2011</td>
</tr>
<tr>
<td>Chat services</td>
<td>2001</td>
<td>2010</td>
</tr>
</tbody>
</table>

Table 18. Technology adoption comparison at the Main and the Law Center campuses.

Thanks to the model, technology management at the Law Center was both more structured and more predictable than at the Main campus. Technology evaluation decisions at the Law Center considered the four factors: rules, norms, prices and architecture. Taking these four factors into account, I led the adoption of technologies at the Law Center by leveraging four drivers: legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements.
Legal and policy instruments, in the form of a more nuanced interpretation of the compliance and regulatory framework, contributed to more agile technology adoption at the Law Center than at the Main campus. When necessary, the Law Center administration wrote and approved institutional policies to support the adoption of technology. For example, when the Law Center embraced a campus-wide digital class recording system, it did so by developing the necessary policy framework to support it. Thanks to the written policy, the faculty embraced the new technology, the academic administrators managed it, and the students used it in compliance with privacy and intellectual property laws. By contrast, policy writing and approval took much longer at the Main campus and therefore could hardly be used to support technology adoption.

Diffusion of innovation dynamics, that is, facilitating the specialized communications from the early technology adopters to the overall campus community, contributed to faster and more widespread technology adoption at the Law Center than at the Main campus. For example, the annual Law Center technology retreats for faculty members were catalyst moments to showcase how faculty members use some technologies, e.g. web collaboration sites, and entice other professors to adopt them too. Similar sessions for students, staff, librarians and administrators helped too.

Economic incentives, in the form of thorough financial analyses and predictable allocations of funds, made technology adoption more predictable at the Law Center than at the Main campus. Between 2000 and 2012, the Law Center technology department projected realistically the cost of new technology adoption initiatives, stayed within the predicted cost projections, and took into account the associated risks. This lent considerable credibility to the technology adoption initiatives at the Law Center campus.
By contrast, some failed projects with cost overruns and failed delivery of functionality, e.g. the undergraduate admissions system and the data warehouse projects, eroded the credibility of some technology initiatives at the Main campus. When administrators cannot trust that technology initiatives will be done on time and on budget, they become skeptical and their support for technology adoption wavers.

For example, the adoption of electronic commerce at the Law Center campus required a detailed financial analysis of costs, benefits, commissions and risks. The campus Chief Financial Officer and other University executives endorsed the Law Center electronic commerce initiative promptly thanks to the clear analysis. On the other hand, the Main campus faced a delay of one year in its adoption of electronic commerce, partially because the lack of a detailed financial analysis with corresponding cost-benefit and risk assessments slowed down decision making.

Technological elements, in the form of integration with existing systems, contributed to more agile technology adoption at the Law Center than at the Main campus. Many new systems, like the ones for exam management, online course evaluations, seating charts and digital class recordings, were designed for tight integration with the student information database, the courseware platform, and the website of the Law Center campus. By contrast, some of the new Main campus academic systems like the one for course evaluations were stand-alone systems that could not be easily integrated with pre-existing Main campus systems like the Blackboard courseware platform.

A successful application of the integrated model was a key factor accounting for faster and more widespread technology adoption at the Law Center campus than at the
Main campus of Georgetown University. However, it was not the only factor. Differences in system scalability, technology staff sizes, user population size and homogeneity, economic resources, management structures, organizational complexity and leadership were concomitant factors affecting the adoption of technology on both campuses.

The Four Constituents of the Technology Adoption Model

Writer Lawrence Durrell’s most famous work, *The Alexandria Quartet*, narrates a single set of events that took place in Alexandria, Egypt before and during World War II. He presented the events from four different points of view, those of the fictional characters whose names gave titles to the books of his tetralogy: *Justine, Balthazar, Mountolive* and *Clea*.

With narrative license, I rely on a similar method to examine how the participants and stakeholders on campus participate in the technology adoption process. In other words, I explore solutions to improve the technology adoption process in higher education from the perspective of the four critical stakeholders involved: students, faculty, staff and administrators. The following pages examine the role of students, faculty, staff and administrators in applying the model to improve the adoption of information and communication technologies in colleges and universities in the United States.

**Students: What Can They Do to Better Use Technology in Higher Education?**

Students can benefit from considering the four factors of the model when embracing new technologies, instead of one or two. When students focus on norms and prices, but fail to consider the impact of rules and architecture in their academic

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institutions, they may end up being unable to derive the full benefits of their technology adoption decisions. For example, this would be the case of those who purchase a laptop for their education, yet find themselves in classrooms in which laptops are not allowed or where the wireless network and electricity infrastructure cannot support their use.

What students can do is to bring their creativity, energy and ingenuity to the campus. They can ensure that colleges and universities focus their efforts, resources and processes in their educational mission. They can demand that administrators and staff members use technology to run a more efficient institution. They can demand that faculty members use technology in teaching to match the learning styles of the students.

Students influence the technology adoption initiatives of the University mostly with norms, that is, by using diffusion of innovation dynamics. They do this every time they choose an Apple laptop over a Dell laptop, or a Facebook social networking site over an institutional one. They do this every time they talk to their friends and peers to offer them technology suggestions. The technology choices of the students influence technology adoption on campus.

As Sherry Turkle claims in her book *Life on the Screen: Identity in the Age of the Internet*, the interaction of human beings with technology shapes our identities. People make choices about the software, hardware, services and web sites that they prefer to use. These choices in turn shape their identities because they influence their communication, cognitive and social styles. Student technology choices and practices affect their academic lives and their careers.

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Students can propose new technology adoption ideas to faculty and staff members. Some gifted students can even implement the technology initiatives themselves and then make them available to the campus community. In 2003, a first-year law school student met with me to suggest the creation of an online campus face book, so that she could meet others from Missouri and watch some college basketball games together. Until the arrival of Mark Zuckerberg’s Facebook in 2004, the student-inspired online campus face book helped build communities of students at Georgetown Law.

Students can play a very active role in the adoption of information technologies by virtue of their campus employment. Research and teaching assistants can influence faculty adoption of information technology. For example, in a student-to-faculty-mentoring program informally known as adopt-a-dinosaur, students helped faculty members discover and use new information and communication technologies at the Universidad Javeriana in Cali, Colombia. Part-time student workers can also influence technology adoption in the campus departments where they are employed.

Students have other means to reach out to the faculty and the staff members of the institution regarding technology adoption. They can fill out course evaluations with relevant feedback, they can publish pieces on the campus newspapers, they can meet with administrators to voice their concerns, they can protest using social networking sites, and they can circulate petitions. At the Georgetown University Law Center campus, the Student Bar Association circulated a petition requesting funding for an upgrade of the wireless network infrastructure in 2011. Hundreds of students signed the petition. Students can vote with their feet, by favoring courses with professors who use technology efficiently to achieve their educational objectives.
Students must adopt technology well in pursuit of their academic goals. They must learn how to use technology well in higher education, so that they can use technology well once they join the work force. Colleges and universities must educate the next generation of knowledge workers. Knowledge workers must learn, both on their own and with the help of their educational institutions, the necessary skills for the practice of their professions. They must be efficient in using information technologies to communicate and to collaborate with others, to research, to make decisions, to solve problems, and to develop their professional practice methods. Students must know how to use information technologies. They must also learn how to use them responsibly.

They must use technology professionally and morally, with particular attention to ensuring both privacy and information security. Students must understand the unique moral dilemmas that information technologies present within the practice of their professions and the exercise of their citizenship. They must understand that they are accountable for the digital assets that they control and that, as they grow up and mature professionally, their responsibility and accountability also grow.

The pervasiveness, flexibility and reach of information and communication technologies make libel, defamation, harassment, hate speech, privacy breaches, security lapses, and copyright infringement more common and consequential. Technologies pose new challenges such as those derived from the temptation to hack and the temptation to gain unauthorized access to systems. Students must learn to manage hacking risks, that is, the inability to prevent others from gaining unauthorized access to one’s confidential materials.
Without this preparation, students will not be as productive as they can be in the knowledge society and they will be unable to make the contributions that society expects from them. If students fail to succeed, colleges and universities fail. It is mission-critical for higher education institutions to provide adequate information and communication technologies for student use on campus. The technology is the education. This is obviously a hyperbole but one that can help us understand that in addition to communication skills and critical thinking, using technology responsibly is a necessary skill to learn in knowledge societies.

Students must do the necessary academic work with technology support. They must take the courses and enroll in the appropriate programs to acquire the information technology skills that they need to become successful knowledge workers. They must demand effective technology use throughout the curriculum and courses with significant experiential technology components.

**Faculty: Professional Conduct**

Professors can influence the technology adoption initiatives of the University by considering and changing the four factors of the model: rules, norms, prices, and architecture. They can use legal and policy instruments by participating in the governance committees and processes of the institution. They can use diffusion of innovation dynamics because they can convince their peers and students to adopt certain technologies, and also because they can petition the administration to implement new technologies, e.g. upgrades of classroom audiovisual systems. They can take advantage of economic incentives in the form of research and teaching grants to adopt new
technologies. Finally, they can use technology elements that support well their preferred research and pedagogical methods.

However, there may be tension between the autonomy of faculty members and institutional goals. Other than the periodic negotiations about what courses to teach and when, faculty members are seldom told what to do. When they are, they often do whatever best suits their interests. Engaged in tenured labor relationships with guaranteed employment and limited variable compensation, faculty members have few incentives to do things professionally that do not benefit them directly.

Tenured faculty members, for example, do not entirely fall under the category of agents for their organizations. Instead, they behave more like free agents, like those in sports franchises, or trustees. Regardless of their hard work, regardless of their loyalty to their respective organizations, both elite sports athletes and college professors first and foremost promote their own interests and then align themselves with their organizations. Professional athletes train and play their games. They also pursue many activities on the side, from marketing sponsorships to public appearances and non-profit work. Faculty members do the same. They research and teach but pursue all manner of side activities: book publications, consulting, conferences, board participation, activism, non-profit volunteering, etc.

Faculty members may even have a unique sense of ownership. In a corporation, knowledge workers know that what they produce belongs to their organization. In other words, whatever they produce is work-for-hire. Faculty members, on the other hand, retain the rights and control over their intellectual works. By the same token, they may feel that their computers, email accounts, software programs, and web sites belong to
them. They often feel that those resources are there mostly for their own benefit, and not for the benefit of the institution or others.

Professors who choose not to use technologies efficiently out of indifference may be shortchanging new generations of students and non-traditional students. The appropriate use of information and communications technologies enables more efficient learning for students with diverse cognitive styles and lifestyles. Professors who do not evolve and incorporate technology in teaching may be committing educational malpractice. Jeffrey Young wrote about this issue in a July 25, 2010 piece of The Chronicle of Higher Education: “that [neglect of technology] frustrates Chris Dede, a professor of learning technologies at Harvard University, who argues that clinging to outdated teaching practices amounts to educational malpractice.” Bertrand Russell’s remark about education in a modern world illustrates this state of affairs well.

It is because modern education is so seldom inspired by a great hope that it so seldom achieves great results. The wish to preserve the past rather than the hope of creating the future dominates the minds of those who control the teaching of the young. 5

Education visionaries like Roger Schank demand fundamental changes in educational systems. His belief is that the best way to educate college students is by immersing them in experiential learning; in particular, he is a proponent of educational simulations with artificial intelligence and virtual world technologies. He argues for the primacy of experiential learning in those disciplines best learned by doing, like engineering or business.

Faculty members in many disciplines, including law and medicine, subscribe to the idea that experiential learning can prepare students better. Yet it is a challenge not always met both to scale up and to monitor experiential learning. Technology can help faculty members run simulations so that virtual environments become suitable experiential learning environments. For example, Georgetown University Law Center professor Laura Donohue ran simulations in 2011 and 2012 with the students in her national security law class. She fed students information about a simulated national security crisis in the form of videos, memos, emails and phone calls. Students, playing roles like those of lawyers advising the federal government or the military, had to provide legal advice based on the developments of the situation.

I ran simulations in 2011 and 2012 among my Managing Information Security graduate students at Georgetown University. Instead of teaching only concepts and cases, I asked my students to put themselves in the shoes of the Information Security Officer of Georgetown University. I challenged my students with real-life situations or incidents, from the death of a faculty member under federal investigation to an electronic harassment scenario. To make it realistic, I even included digital forensic materials for them to analyze. Students had to use their judgment against sparsely available information to make sound professional decisions.

As an adjunct faculty member, I teach courses like Ethics in Technology Management in the Masters of Professional Studies in Technology Management at Georgetown University. In addition to building the subject matter skills that students in this program need, I refine the overarching skills that will help them advance in their professional careers. These skills include critical thinking, debating, research, writing,
collaboration and presentation skills.

Since 2010, I focus also on the students’ ability to make informative and convincing presentations online. To that end, groups of students are required to present their research paper proposals online to the rest of the class via web conferencing. Students also must ask and answer questions about the presentations. After the online session, student groups gain access to a recording of the session and self-evaluate their performance. The feedback from the self-evaluations and the institutional course evaluations supports further use of this technology in higher education. I wrote a chapter, “Georgetown University: Web Conferencing—A Critical Skill for the Connected World,” about this topic in the book, Game Changers: Education and Information Technologies.6

Information and communication technologies can also help faculty members supervise students engaged in real life work situations for pedagogical reasons and experiential learning, like those who participate in the well-known cooperative education programs of Northeastern University. Under these programs, students alternate semesters of academic work with semesters of full-time employment related to their education. Web conferencing technologies, for example, can help students in the field and faculty members in their offices stay connected while students work off campus.

To summarize, faculty members who make the effort to use technology effectively can explore and embrace new pedagogical models, models that help educate new generations of students better. Faculty members must also be willing to teach new courses and programs that can build the information technology skills that new generations of students need to become successful knowledge workers.

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Staff: How Can Institutions Better Adopt Technology?

In general, staff members influence the technology adoption process the most by using technology elements and legal and policy instruments. By shaping how certain technologies are made available to community members, staff members exert tremendous influence over technology use on campus. They also do this by crafting business and academic processes either peppered with specific uses of technology or bans on technology, e.g., exam taking.

Staff members, particularly technology leaders, play a decisive role in the adoption of technology on campus. By purposefully leveraging the four drivers of the model they can shape how community members use technology on campus.

For example, executives who believe that peer-to-peer networking services expose the institution and its members to copyright violation liabilities can use legal and policy instruments, e.g., a copyright policy, to penalize community members who use those technologies. They can use diffusion of innovation dynamics to tell community members not to use those technologies, e.g., during orientation speeches for incoming students. They can use economic incentives, e.g., issuing fines for using peer-to-peer software, to make those technologies unattractive. Finally, they can use architecture, e.g., firewalls to block certain types of network traffic, to prevent community members from using those services.

Staff members can use the integrated model to implement successfully ad hoc technology initiatives. However, the greatest benefits come with a systematic application of the model in the long run. To adopt technology efficiently and effectively, higher education institutions and their technologists must use discipline and establish a clear
framework, one that leverages the four drivers. As CIO between 2000 and 2012, I did such a thing. I designed, refined and followed a comprehensive strategic and operational program for technology adoption at the Georgetown University Law Center. I named it the five Ps program, in recognition of its five components: plans, people, processes, policies, and products.

**Plans.** Without plans, institutions, teams and individuals lack purpose and alignment. Higher education institutions craft plans to meet their educational mission and goals. Long range plans, annual plans, and project plans enable colleges and universities to have a sense of direction. Similarly, technology plans help institutions and their constituents align their efforts and investments with the overall plan of the University and remain focused in the face of changing technology trends and marketing hype. Plans must take into account the long-term financial costs and benefits of following a technology adoption path. A well-crafted plan leverages the four drivers: legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements.

The plan paves the way for the long process of writing and approving the legal and policy instruments to shape the use of new technologies at the institution. The plan works as a diffusion of innovation dynamics driver because it informs community members of the intended path for technology use on campus. The economic incentives are reflected in the financial analyses supporting the adoption of the technologies in the plan. Technology elements are an important component of the plan because they define what the technology ecosystem of the institution will look like in the long run.
**People.** Awareness and education at all levels of the organization are critical. Faculty, staff and students must know how to use technology well and responsibly. College and university executives must both sponsor and demand the effective and efficient use of technology on campus. To do technology well, well-prepared technologists and knowledge workers must do it. Diffusion of innovation dynamics, that is, promoting acceptable uses of technology among the community of campus users, as well as the appropriate change management and training, are critical in technology adoption.

**Processes.** A process can be thought of as a cookbook recipe for carrying out an organizational activity. Processes must generate the proper and pertinent amount of information. Technology can make processes more efficient and effective, to the point that technology can even contribute to reengineer processes altogether. Technology can also provide more and better information about processes and their outcomes, and so help monitor them and improve their efficiency. Processes are designed using a combination of legal and policy instruments, diffusion of innovation dynamics and technology elements in performing an activity. Changes in any of these three underlying components translate into changes in the process.

**Policies.** Accepted practices and policies serve as the scaffolding for technology adoption and use in higher education institutions by shaping how plans are developed, how processes are designed and executed, what products are adopted, how the technologies are configured and deployed, and how people can and must use technology on campus. Legal and policy instruments draw boundaries and set limits for the use of technology on campus.
**Products.** Hardware, software, consulting and online services conform the generic category of technology products. All technology products and services form the infrastructure or technological ecosystem of a college or university. Technology elements, that is, how new technologies are deployed, configured and integrated with the pre-existing technology ecosystem, shape their adoption and use by community members.

It is common for U.S. higher education institutions to embark on technology adoption initiatives by focusing exclusively on products. For example, influential community members become aware of a product or service in use somewhere else and champion its implementation on campus. Without the proper framework, these shallow product adoption initiatives may fail to support strategically the mission of the institution.

**Administrators: Leading Technology Adoption in Colleges and Universities**

Considering the four factors of the model, decision makers must answer affirmatively four questions when considering a candidate technology. Is it legal? Will people use it? Does it make economic sense? Will it work? These are the four primary questions that higher education executives must answer to decide whether or not to adopt a given technology for the institution, e.g., a new academic records system. In other words, the evaluation process must examine the candidate technologies using multidimensional factors: rules, norms, prices and architecture.

Once the adoption decision is made, the four-driver integrated model helps the leadership of the institution derive the greatest benefits from the technology. The model prescribes that four sets of additional decisions are required to optimize the adoption, each set corresponding to one of the drivers in the model.
Using legal and policy instruments, the institutional leaders must decide what business rules, administrative processes and policies will regulate the operation of the system and the interactions of its users. Using diffusion of innovation dynamics, the leadership must decide what change management, communication and training initiatives will lead community members to embrace the new technology. Using economic incentives, the administrators must decide the allocation of resources to guarantee a successful adoption, and to reward the adopters and to penalize those who resist. Using technological elements, the executives must decide what particular system to adopt, e.g., Oracle or Banner for student records, and how to configure the technology, e.g., what trade-offs to implement between security and privacy.

When higher education administrators regulate technology adoption on campus, they do so according to the values of the institution, as Larry Lessig illustrated by focusing on the two different Internet access approaches implemented at Harvard and the University of Chicago in 2000.

Different implementations of the same technology, e.g., the sudden availability of office network ports with Internet connectivity, forced users to adopt technologies and to behave in different ways. In the case of Harvard, for example, users were aware that it was easy for University administrators and their designated technology employees to keep track of their activities online. This awareness shaped what web sites campus members visited and what they did on those sites. Even if campus policies, including human resources policies, strived to ensure the privacy of online activities, educated users knew that registration as a precondition for network access allowed school technologists to learn the identities and activities of Internet users.
In the case of the University of Chicago, however, users knew that their online activities were more private because they were never asked for identification before going online. With anonymous web use, users realized that it was much more difficult, almost impossible, to identify who they were and what they did online. With their actions, University officials, technologists and the users themselves shaped how technologies were adopted in these two higher education institutions.

When adopting information and communication technologies, higher education administrators must strike a balance between competing sets of values: autonomy versus control, privacy versus security, and conformity versus individuality. Institutional values guide decision makers, and by extension all community members, in shaping technology adoption.

Institutional technology choices may have a lasting influence over student lives. Schools choosing to subscribe to online music services to protect their students from harmful copyright lawsuits may be sending a confusing message. On the one hand, they signal that they take copyright issues very seriously so students should too. On the other hand, they hint that they do not trust their students to behave morally. If people cannot be trusted to make the right moral choices when they are college students, how can they be trusted once they graduate and become professionals?

Much has been written about whether or not colleges and universities should focus on things other than the pure dissemination of knowledge to new generations of students. However, a cursory review of the mission statements of many U.S. higher education institutions reveals a definite inclination to go beyond pure academic concepts
and into moral issues and values. Academic honesty, truth, social justice, and solidarity are common terms found in the mission statements of colleges and universities.

Technology adoption can support the values of academic institutions. In the case of religious universities like Liberty University in Virginia, administrators use legal and policy instruments, diffusion of innovation dynamics, economic incentives and technical elements to promote a porn-free campus in line with the Liberty way. Other institutions like the MIT use the four drivers to fulfill their mission to generate, preserve and disseminate knowledge among the public by using webcasting and streaming media, Open Courseware and other technology initiatives. Yet, academic institutions like Regis University in the United States and volunteers like myself use the four drivers to educate the next generation of knowledge workers in refugee camps in Malawi and Kenya.

**Mind the Gap: All Aboard**

Successful technology adoption can help colleges and universities educate more people by making their administrative and academic processes more productive. It can also help colleges and universities educate people better by adapting to the learning and cognitive styles of new generations of students. Colleges and universities can also educate students better by ensuring that they graduate with the advanced information technology skills that new generations of knowledge workers need.

Technologies enable students to develop the research, problem solving, collaboration and communication skills that are critical in contemporary knowledge societies. The lack of institutional efficiency in embracing these technologies and embedding them as an integral part of the curriculum and the educational experience is a missed opportunity.
Administrators, technologists and staff members must use legal and policy instruments, diffusion of innovation dynamics, economic incentives and technology elements to partner with the faculty in helping the students achieve those educational outcomes. They must support the infusion of technology in the pedagogical practices of the school. They must add new courses and programs to the curriculum to help the students develop those technology skills.

Within the constraints of their organizations, faculty, staff, students and administrators enjoy a certain freedom of action when adopting information and communication technologies. Each one of these constituent groups has unique opportunities and challenges in improving technology adoption on campus. Each constituent group can derive unique benefits for themselves, for their organizations, and for society at large. When the efforts of the constituent groups are aligned, the results are optimal.

Some breakthroughs are the result of new technologies becoming available. Others (...) are the result of social forces. iPods and podcasting are not groundbreaking technical realizations of new physical theories. But they’re cool (and that’s official)! Their humanized and stylish approach allows users to easily manage multimedia content. This changes a paradigm. In the past, campus technologists had the primary role of leading their communities in the intelligent use of technology by adapting whatever resources were thought to be efficient and appropriate. Now, however, one of their main roles is to scout, identify, and intelligently sponsor technologies that their constituents may already have adopted. When considering open-source learning management systems or research portals, institutions must consider not only the official uses of these systems but also the effects of the impromptu bursts of collaboration among groups of researchers or students engaged with these systems.⁷

By leveraging legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements, higher education faculty, staff, students

and administrators can reduce the gap between the potential benefits of new technologies and the actual benefits of adopting those technologies. Students, staff, faculty and administrators can make a difference in the adoption and use of information and communication technologies on campus by exercising their rights and fulfilling their responsibilities. The final chapter summarizes the findings, discusses further research opportunities, and elaborates on why this is important to society.
CONCLUSION

In spite of major investments and efforts, why has U.S. higher education not adopted technology the better to fulfill its mission of preparing the next generation of knowledge workers, and of creating, disseminating and preserving knowledge? The preceding chapters showed that the root of the problem is a de facto non-integrated approach to considering the legal, social, economic and technological factors of technology adoption in higher education.

Technology decisions on campus usually happen in this way. An influential member of the community, e.g., a department head, will decide based on something that she learned from friends or relatives, peers at sister schools or in the media that she would like to adopt a given technology. She would then tell the CIO that she wants the technology. In turn, the CIO will evaluate the technical architecture, that is, whether or not the technology could work on campus as well as its technical merits. Then, the CFO will determine whether or not there are sufficient funds for acquisition and maintenance fees based on the prices factor. Finally, legal counsel will examine the terms of the contract.

Each of the decision makers examines the desired technology from a very narrow perspective. In this process, there is not an integrated model to ensure that the specific implementation of a given technology on campus will be legal, will be adopted by community members, will make economic sense and will offer the appropriate functionality. Furthermore, the process does not call for a concerted effort to come up with the necessary drivers – legal and policy instruments, diffusion of innovation.
dynamics, economic incentives and technology elements - to ensure that technology adoption happens successfully.

The integrated model proposed improves the adoption of information technologies by higher education faculty, staff, students and administrators by leveraging four sets of drivers: legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements. Each driver affects a corresponding factor: rules, norms, prices and architecture. Each factor in turn shapes the technology adoption behavior of the campus community members, that is, the actors: faculty, staff, students and administrators. The theoretical foundation for the model was laid out first by identifying the four factors influencing the adoption of technology on campus, as well as some of the drivers that can change those factors.

Actors—faculty, staff, students and administrators—in colleges and universities adopt and use technologies in certain ways to comply with current laws and regulations: institutional policies, local ordinances, state legislation, federal laws, and accreditation rules. Institutions can therefore craft and enforce legal and policy instruments, e.g. an acceptable computer use policy, to change the technology adoption behavior of campus actors.

Campus actors are also influenced in their use of technology when communicating with others and by social norms. Therefore, higher education institutions can use proactively diffusion of innovation dynamics, e.g., change management techniques like communication campaigns and training, to shape technology adoption on campus.
Organizations and individuals must spend scarce resources, time and money, to adopt new technologies. Therefore, institutions can leverage economic incentives, e.g. faculty grants or student discounts, to promote the adoption of technology on campus.

Technological elements, and their implementation within the existing ecosystem of an institution, can make it easier or harder for campus actors to adopt a candidate technology. Institutions can therefore tailor their systems to promote or inhibit technology adoption on campus by making it harder or easier for community members to use those systems.

A key contribution of the model allows institutions to identify during valuation and deliberation, and to resolve during execution, potential conflicts between actors and conflicts between factors when contemplating new technology initiatives.

**Future Research and Applications**

This model is one more step in the academic quest for finding models to explain technology adoption and to optimize it, joining others such as those developed by Everett Rogers and Geoffrey Moore. Building on the model, there are opportunities for further research.

The model considers the success of technology adoption by examining how many people adopt the technology over a period of time. However, the model could be improved significantly to consider how effective the adoption of technology is in qualitative terms. Georgetown University Executive Director and Assistant Provost for Teaching and Learning Initiatives, Professor Randall Bass asked a puzzling question during a tutoring session in January of 2009 in the following terms: does the adoption of IT in higher education lead to innovation or better teaching? It often does not, he and I
concluded. The adoption of Blackboard as a learning management system in some cases brings about pedagogical innovations. In many other cases, however, all that it brings is a new way for faculty members to reach all of the students in a class, a new way to make class syllabi and materials available to students without making photocopies and distributing them.

Additional research could fine-tune the model, particularly by considering its applications within a given academic context, by taking into account the size, homogeneity, organization, leadership and culture of the campus. It would be interesting to study how much these elements can explain any technology adoption differences across campuses of the same institution or even across institutions. For example, could these issues explain some of the technology adoption differences between the Georgetown University Law Center campus, with a graduate student population, and the Main Campus, with a large undergraduate student population and a small graduate one?

In this fashion, the model could be used to compare differences in technology adoption between clusters of institutions: for-profit versus non-profit, public versus private, small versus large, religious versus non-denominational, and liberal art colleges versus research universities.

An interesting research development would be the refinement and application of the model in academic institutions located in countries other than the United States of America. How would the model work in countries with other cultures and languages? How would the model apply in nations with a different take on technology and a fundamentally different understanding of higher education? How would the model work in countries where religion plays a significant role in both education and technology
adoption? How would the model work in countries with fundamentally different legal and economic systems?

Beyond tertiary education, further research could explore how to develop corresponding models in other organizational settings: primary and secondary educational institutions, non-governmental and non-profit organizations, governments, and corporations. The primary actors of the model are unique in some of these settings. College students and professors are different than grade school, high school or trade school students and teachers. Clients, donors, staff members and administrators are the main actors in non-governmental and non-profit organizations. Citizens, staff members, political appointees and politicians are the main actors in governments. Customers, staff members, executives and stockholders are the main actors in corporations.

Even if the four factors – rules, norms, prices and architecture - remain the same in the model across different organizational settings, it is conceivable that the relative importance of factors would change with the setting. For example, corporations are much more driven by economic incentives, either making money or saving money, than non-governmental and non-profit organizations, governments, and academic institutions.

An interesting line of applied research would be to focus on the role of technology vendors in the model. Technology vendors come up with new technologies, business models and marketing initiatives to promote adoption of their products and services and make money. A recreation of the model from the point of the vendors may yield great business opportunities to this collective.

Practitioners and consultants could use the model to develop best practices for certain technology implementations. For example, the thesis discusses an operational
approach based on the model for the adoption of a new operating system, e.g., Microsoft Vista or Windows 7, on campus. A practitioner or consultant could develop best practices for implementing technologies such as operating systems, learning management systems, human resources cloud services, online document repositories, or other technologies. Also, the model could be used practically to assess how much better or worse an academic institution or department adopts technology compared to others.

**Better Technology, Better education, a Better World**

Education helps human beings realize their full potential. Education enables people to acquire knowledge, learn skills, and develop critical thinking. In 1948, the General Assembly of the United Nations adopted the Universal Declaration of Human Rights. The declaration enshrined many fundamental human rights. One of these rights was education, including higher education, as expressed in Article 26 of the Declaration:

> Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.

The United Nations Millennium Development Goals written in 2000 asked for ambitious advances worldwide in poverty reduction, health improvement and education by the year 2015. In education, the most ambitious goal was for primary education rates to double, and to narrow significantly the gender gap in primary and secondary education. Although the United Nations recognizes that time is running out to meet these goals, there is still hope that the world will reach them eventually. Once we do, it is reasonable to expect that the goals will be extended to tertiary education. To meet the

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new set of goals and meet the demand for higher education of an ever-growing population, the appropriate adoption of information technology on college campuses worldwide will be critical.

In the United States, President Barack Obama established an ambitious goal for the tertiary education system. In his Presidential Address to Congress on February 24, 2009, the President said: “By 2020, America will once again have the highest proportion of college graduates in the world.” He called for a national effort to regain the prominent place in education that the United States once enjoyed for having one of the highest college graduation rates in the world. Sensible technology adoption, following the model proposed in this thesis, can make the higher education system in the United States more efficient and productive.

Why does information technology matter to higher education? Appropriate technology adoption in higher education improves the efficiency of traditional academic activities. It enables more efficient processes and better monitoring of those processes, from registration to teaching, from assessment to research. More efficiency leads to more affordability, which translates into more opportunity. More efficient colleges and universities can educate students better and spread more knowledge to more people, therefore benefitting society.

Technology makes education more accessible in the United States to non-traditional students by reducing geographic, temporal and cognitive barriers. Universities are able, thanks in part to technology, to reach out to non-traditional students – those who could not give up their personal and professional responsibilities to go to school full-time, those who live far away from any college or university. Students who participate in full
distance learning or in hybrid onsite-remote course delivery methods are now able to
attend their classes at different times and from different locations than they would
through traditional academic programs. Technologies make it possible to facilitate
educational opportunities to those who otherwise may have missed out, including
students with disabilities.

Information and communication technologies allow higher education institutions
in the United States to reach beyond their physical boundaries and beyond their national
borders, thereby increasing the impact and the reach of their mission. Using distance
learning technologies, colleges and universities can educate many students from other
parts of the world who otherwise would not be able to afford to attend school in the
United States.

To achieve these objectives, higher education institutions must adopt technology
well. By applying the integrated model proposed in this thesis, colleges and universities
can reduce the gap between the potential benefits of the technology and the actual
benefits of the technology. Applying the model, institutions can take advantage of the
existing rules, norms, prices and architecture factors in their societies, and augment them
with their own drivers – legal and policy instruments, diffusion of innovation dynamics,
economic incentives and technology elements- to promote technology adoption on
campus.
Colleges and universities are great learning centers where professors and students get together, both in person and online. They are the institutions charged by society with preparing the next generation of knowledge workers, and with generating, disseminating and preserving knowledge. The world would gain if higher education institutions could educate more people better worldwide. A more effective adoption of information and communication technologies can help us achieve this. The integrated model proposed in this thesis shows efficient ways to use legal and policy instruments, diffusion of innovation dynamics, economic incentives, and technological elements to improve the adoption of information and communication technologies in academic settings.

Why should universities and their constituents devote any efforts and resources to information technologies? When done effectively and efficiently, investments in information and communication technologies support the mission of higher education institutions. When done ineffectively or inefficiently, however, investments in information and communication technologies can interfere with the mission of higher education institutions. This is why colleges and universities must adopt information technology well. To do it well, they must apply a model that integrates the rules, norms, prices and architecture factors. They must use the appropriate drivers that change those factors and shape the technology adoption behavior of faculty, staff, students and administrators on campus.

An Oxford polymath once said that all that is needed to have a university is a library and a printing press. I would argue that as of 2012, what is truly needed to have a university is a technology-ready and savvy community of faculty, staff and students. To narrow the digital divide and to bring higher education to more women and men, we need
efficient and pervasive technology services for academia that citizens worldwide can access. We need student populations, both in the United States and in other countries, with the necessary academic, language and technology skills to study in global university campuses. With these inputs in the tertiary educational system, more people, armed with their higher education degrees, can make significant contributions to society by practicing their professions, solving humanity’s most challenging problems, and advancing our collective body of knowledge. Adopting technology better is particularly important because of the arrival of new technologies like tablets, cloud computing, big data and analytics, and because of the online tsunami prompting many traditional academic institutions and for-profit higher education companies to offer more distance learning programs.

As of the end of 2012, higher education institutions have been rushing to adopt such technologies as cloud computing, analytics, social networking and mobile devices. This is partially because many technologies, if properly adopted, can make colleges and universities more effective and their constituents more productive. Chief among the technologies with great potential for increasing the effectiveness of higher education institutions are the three combinative technologies that make distance learning possible: learning management systems, multimedia production and streaming, and electronic publishing.

This is a very timely moment to propose an integrated model for the adoption of information technology in colleges and universities. Distance learning technologies, including Massive Open Online Courses or MOOCs, are transforming higher education. Massive open online courses are the latest incarnation of both a technology revolution
and a higher education revolution. They make it possible to enroll thousands of students at once in an online course for free and without credit. Online universities, traditional universities with online programs, and unique academic consortia like edX and Coursera are changing the way in which students gain access to higher education.

The President of Stanford University, John Hennessy offered an interesting analogy during a public interview with The Wall Street Journal’s Walt Mossberg at the D: All Things Digital Conference on May 31, 2012: "What I told my colleagues is there's a tsunami coming. I can't tell you exactly how it's going to break, but my goal is to try to surf it, not to just stand there."

Others refer to it as a rush. In his article, *Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility*, education expert Sir John Daniel wrote:

The competition inherent in the Gadarene rush to offer MOOCs will create a sea change by obliging participating institutions to revisit their missions and focus on teaching quality and students as never before. It could also create a welcome deflationary trend in the costs of higher education.²

Adapt or perish. On December 13, 2012, the New York Times’ Andrew Martin reported about the financial situation of many colleges and universities in the United States:

The pile of debt — $205 billion outstanding in 2011 at the colleges rated by Moody’s — comes at a time of increasing uncertainty in academia. After years of robust growth, enrollment is flat or declining at many institutions, particularly in the Northeast and Midwest. With outstanding student debt exceeding $1 trillion, students and their parents are questioning the cost and value of college. And online courses threaten to upend the traditional collegiate experience and payment model.³

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My home institution, Georgetown University, slowly embraced distance learning, first with continuing legal education programs starting in 2001, then with master’s degrees in nursing and in taxation in 2012, and with massive online open courses projected for the fall of 2013. On December 10, 2012, University officials announced that Georgetown had joined the edX distance learning initiative of Harvard and MIT. The announcement also highlighted that this was but the next stage in an overarching institutional strategy: “the edX announcement follows on the heels of Georgetown’s $8 million investment in an Initiative on Technology-Enhanced Learning (ITEL).”

Associate Provost Randy Bass (who is also the director of this doctoral dissertation) is one of the leaders at Georgetown University behind these initiatives. He knows that the buy-in of the faculty is a critical element of this effort. He knows that faculty needs handholding and a good deal of support to join the distance learning tsunami. He knows that the organization that he founded and leads to transform pedagogy at Georgetown University, the Center for New Designs in Learning & Scholarship, needs the funding and the resources to contribute to the transformative power of technology on campus. He knows also that faculty members react well to economic incentives in the form of grants.

However, what we missed at Georgetown is a comprehensive use of the drivers in the model proposed in this dissertation: legal and policy principles, diffusion of innovation dynamics, economic incentives and technology elements to ensure that the institution derives the full benefits of distance learning technologies. In a book that I co-authored in 2010, Gestión de Proyectos de E-learning, I hinted at the need for an

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An integrated approach to this systemic change sparked by the availability of new technologies. The subject of the book is the importance of planning, financial management, organizational development and information technology when developing distance learning projects.5

To compete and to fulfill their educational mission, many U.S. colleges and universities have yet to adopt fully the technologies that make distance learning possible. The model in this doctoral dissertation can help them embrace these technologies. Those who follow the model will better adopt. Those who better adopt will educate a greater number of people in a better fashion and at a lower cost, thus benefitting society. How can the model be used to help institutions embrace and derive the benefits from distance learning? How can the model be used to promote systemic change in higher education facilitated by information technology adoption?

An interview with Randy Best about online education

On December 14, 2012, I met with higher education visionary and entrepreneur Randy Best in Washington, DC. Among other companies, he founded Academic Partnerships to help public colleges and universities in the U.S. and other countries embrace distance learning and other information technologies to fulfill their mission. As of the date of the meeting, Academic Partnerships worked with about 41 public colleges and universities in the United States.

Randy Best predicts a normalization of higher education in the coming years. In other words, the business principles that apply to industries in free markets will apply to

5 David Roldán, Félix Buendía, Elena Ejarque, Pablo García, Antonio Hervás, José Luis Martín, Olga C. Santos, and Juan Vicente Oltra, Gestión De Proyectos De E-Learning (México, D.F.: Alfaomega, 2011).
higher education. The same laws of gravity that apply to the rest of the world will now apply to colleges and universities.

Instead of being a producer-driven market as it is now, higher education will become a consumer-driven environment in which students and employers will assess the quality of the programs. Students are 21st century consumers with very clear expectations. Most of them are non-traditional. One third of U.S. students are taking online courses already.

Online education does not dilute an institution’s brand. Instead, if well done, it brings additional followers, builds customer loyalty and strengthens the brand name of the institution. In the past, higher education institutions followed a specialization market strategy. They marketed their programs based on quality and high price. The applicable analogy would be that of Rolex watches. Everybody needs to know the time, but only a few individuals spend money on a Rolex not just to tell the time but also to tell the rest of the world about their status in society.

Instead of determining quality by exclusion, e.g., how many students are turned away, universities will become more open, with more provisional admissions. Let students take two or three courses with guidance from admission counselors. If they thrive, let them stay. If not, they will have to withdraw and find a more suitable program for their academic level and skills. For the first time in history, the best educational programs will be universally available to the most talented students worldwide. One billion students in Africa and many in Asia deserve more educational opportunities and distance learning programs that technology adoption can make possible.
One third of all public campuses in the U.S. will disappear as online operations change the enrolment patterns and as state systems consolidate their campuses. Does it make more economic sense to have fifty physical college campuses in Texas or to consolidate them into ten with hybrid programs and shorter residency requirements?

There is a confluence of factors forcing public institutions to become more efficient by adopting technology efficiently, particularly distance learning technologies. First, society and their representatives in state legislatures are concerned, some of them are even angry, about the huge funding requests of public institutions of higher education and the insufficient educational results that they produce.

The private sector of education has been unable to feel the gap and offer additional educational opportunities more affordably. The tragedy of some of the for-profit colleges and universities is that they promised to use technology to become more cost effective and offer better quality. They failed because many of them ended up offering more expensive, lesser quality academic programs.

What is the university model of the future? Because the new market of higher education will be unforgiving, it will produce both big winners and big losers. Those that fail to adapt will fail spectacularly. Those that succeed will do so spectacularly too. Colleges and universities must adopt a new model and adopt technology well to support the model.

**Using the model to succeed in distance learning**

Colleges and universities can use the integrated model to promote the adoption of distance learning technologies among faculty, staff, students and senior administrators. By applying the model, higher education institutions, their partners, and the online
learners can realize the full potential of these transformative technologies. The model will help them craft the appropriate legal and policy instruments, apply diffusion of innovation dynamics, devise enticing economic incentives and deploy the supporting technology elements.

Higher education institutions can exert pressure on congress and the administration to establish the laws and regulations that will support their distance learning initiatives. They can lobby the corresponding accreditation bodies for clear and supportive rules of the game. They can craft their own institutional policies and practices to support distance learning in the form of new academic policies, credit rules and attendance requirements.

To promote adoption of distance learning programs and technologies, several diffusion of innovation dynamics come to mind. Offering the high-quality training and support that the faculty, staff and students need to use these technologies is quite possibly the most important step to succeed. To this end, it is critical for organizations to count with departments, either in-house or outsource, able to assist with technology use, instructional technology and online pedagogy. A sensible, hopefully truth-in-advertising, communication campaign can spread the word about the new programs and technologies to potential students.

To make distance learning sustainable the economics of it must work. This is beyond question as institutions launch online or hybrid programs, sometimes partnering for resources and know-how with the corporations that have experience in this sector. When it comes, to massive online open courses, the economic rewards are less clear. Other than collecting reputational gains by offering MOOCs, it is yet unclear how
Coursera, edX or other consortia and organizations will make money. A Freedom of Information Act request of the contracts between Coursera and some public universities revealed some interesting ideas: asking select students for tuition payments, charging for certificates of completion, providing employer access to the best performing students, advertising, etc.

To encourage faculty members to devote their time and effort to do something onerous like teaching online, institutions must consider economic incentives in the form of grants, supplemental income, sabbaticals, or even offering a bonus or fee for each student enrolled in an online course. An even more radical approach would be to offer an economic incentive for each student who achieves a certain level of academic performance.

To ensure that the available technology supports the pedagogy of distance learning and even increases the productivity of faculty, staff and students, the quality and reliability of the actual technology elements employed are critical. Chief among the technology elements is a learning management system tailored for distance learning, integrated with other administrative systems, e.g., registration- and academic systems, e.g. online library resources. Similarly, the technology eco-system must offer easy-to-use access to video production and delivery, simulations, interactive assessments and other pedagogical resources.

An interesting application of the model is the decision of building versus buying the technology and the auxiliary support to engage in distance learning initiatives. Most institutions do not even know where to begin. They cannot disrupt their faculty, staff and technologists with new demands for their time and effort. Instead, they have chosen to
contract with some of the companies that have distinguished themselves in offering
distance learning partnerships for colleges and universities.

Two such companies are 2U, which partnered with Georgetown University to
offer an online master’s degree in nursing, and Academic Partnerships, which helps
public colleges and universities put their degrees online. These companies have the
know-how, the economic resources and the technology to embark in these projects. On
case-by-case basis, the model can help institutions decide whether to go at it alone or to
partner with corporate experts.
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