This article considers the pace of innovation and technology adoption in higher education and suggests that the rate of change on 21st century campuses is remarkably similar to earlier centuries when it may have taken over 30 years to introduce “modern” inventions like the telescope, microscope, and barometer to students.

The literature shows that centralization is frequently negatively associated with innovativeness and that contemporary governance does not appear fundamentally different in regulating the pace of change than in America’s first colleges.

Some researchers have concluded that colleges and universities are insulated from many of the competitive pressures that stimulate innovations in industry to be adopted almost twice as fast as those in higher education.

In American higher education, “adoption of innovation” occurs so slowly as to make the phrase a relative non sequitur when compared with the pace common in industry. In the past decade, in spite of much talk on campuses about “the need to prepare for the 21st century by emulating industry and becoming more flexible and responsive to change,” Seigfried, Getz, and Anderson (1995) reported that the innovations in industry tend to be “adopted twice as fast as those in higher education.” Although similar stages
of the innovation-decision process exist among institutions of higher education and industry, organizations in the commercial sector frequently reach the decision stage much sooner.

INNOVATION AND ADOPTION

Rogers (1983) defined innovation as an idea, practice, or object that is perceived as new by an individual or group. According to Rogers, “it matters little, so far as human behavior is concerned, whether or not an idea is ‘objectively’ new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation” (p. 11). In the literature, “technology” and “innovation” are often synonymous—and conceptually, each may connote an association with an original idea, a novel process, a new product, or invention. For example, recently developed virtualization software that allows a computer user to run Microsoft Windows applications on an Apple Macintosh computer simultaneously with the Macintosh operating system could easily be described interchangeably as a new technology and an innovation.

Rogers (2003) defined a technology as “a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome” (p. 36). Many potential adopters are often aware of an innovation but are not motivated to try it. In an early hybrid corn study for example, almost all of the Iowa farmers in the study had heard about the innovation, but only a few were planting it. Ryan and Gross (1950) concluded, “It is evident that...isolation from knowledge was not a determining factor in the late adoption for many operators” (p. 679).

The adoption of an innovation and its rate of diffusion in a particular organization however, are distinct actions separate from the innovation concept. According to Rogers (1983), adoption is usually measured by the length of time required for a certain percentage of the members of a system to adopt an innovation. Not surprisingly, history has shown that innovation is not a reliable antecedent to adoption. Evidence is provided in countless example that would include everything from the Maginot Line and the Edsel, the Dvorak keyboard and U.S. Metrification Campaign, to New Coke, New Math, Cold Fusion, and the Open Classroom concept of the early 1970s.
Wilson, Sherry, Dobrovolny, Batty and Ryder (2002) described the adoption of an innovation as “a process of information diffusion, culminating in a rational choice to use (or not use) the new technology.” Further, if viewed as consumer behavior, “adoption can be measured in terms of units purchased or number of programs installed.” And perhaps most significantly with respect to higher education, “adoption can be seen as the assimilation of new cultural tools and practices.”

**INNOVATION, CHANGE AND THE ACADEMY**

Universities and colleges throughout history have collectively been slow to change and adopt contemporary innovation. Almost a century before Yale University’s founding in 1701, Keppler, Galileo, and others were using telescopes, microscopes, and barometers for scientific research. Thirty-three years passed before the instruments were first made available to students at Yale. Interestingly, this period of inaction corresponds to the typical adoption period of modern times which places adoption rates at universities at approximately a quarter-century, or longer, from introduction of innovation to acceptance. It took almost as long for the traditional curriculum of the colonial colleges to shift from the exclusive study of Latin, Greek, and Hebrew languages to include French and German—the contemporary “languages of science.” A similar pace was also reflected in the move toward more secular governance and tradition in both university curricula and faculty orientation over time, beginning with the colonial colleges in the early 17th century to the turn of the century. Thomas Jefferson called for the “abolition of the professorships of divinity and oriental languages,” in 1779—86 years after the founding of the College of William and Mary, and a few decades after similar influences had already occurred in the English dissenting academies and secularized learning had taken hold in Scottish universities. Jefferson, then governor of Virginia, hoped to reorganize the entire course of study at the College of William and Mary to bring the institution “into line with the future.” (Rudolph, 1990) This phrase is common even today as institutions consider contemporary innovations and adoption of particular emerging technological advances.
WHAT'S YOUR AVERAGE?

Seigfried et al. (1995) reported that their investigation of approximately 200 institutions of higher education found that the average time between adoption of 30 specific innovations by the first institution and its adoption by half of them was more than 25 years. This rate was contrasted with Mansfield (1968) who investigated 12 important innovations in coal, steel, brewing, and railroad industries and found the rate of adoption to be an average of eight years. In their examination of the adoption of technologies in schools and universities, Wilson et al. (2002) reported that technology integration into schools and universities certainly is not an anomaly—rather, schools have usually followed business and government in the adoption of new technologies.

Evidence from adoption and diffusion research in industrial organizations shows that new technologies and innovations are frequently adopted more quickly when managers have relatively high levels of education (Rogers, 1995). The Seigfried study theorized that because colleges and universities have more managers with Ph.D.’s than any other business, prompt adoption of successful innovation might be expected. This view was contradicted by evidence from the survey that showed that even when reviewing financial innovation—an area presumed to have high priority status among private and public institutions of higher education—the decision stage took an average of 40 years for half the institutions to adopt the five financial innovations studied.

Seigfried et al. (1995) reported little correlation between the characteristics of the institutions and the speed at which they adopted innovation. Further, there was little correlation between the characteristics of the innovations themselves (online registration, microcomputer labs, video projectors and wireless microphones, interdisciplinary majors, fixed payout from endowments, and others) and the relative speed at which they were accepted. Thus, the report suggested, “innovation in higher education seems to be almost random.”

When a comparison of higher education and the health care industry is made, Seigfried et al. (1995) suggested that even while both sectors have experienced price increases exceeding the consumer-price index for decades—very different—rather than similar forces appear to exist that influence innovation in each of the respective sectors. “Hospitals seem to
participate in a technological ‘arms race’ vying to be the first to offer CAT-scans and the like. In contrast, higher education moves at a snail’s pace.” Why is the pace of innovation so slow in higher education? Why are less innovative institutions not at a competitive disadvantage?

**THE PACE OF CHANGE IN THE UNIVERSITY**

Seigfried et al. (1995) concluded that colleges and universities are insulated from many competitive pressures that might influence quick adoption of innovation. “[The universities] have no stockholders, and their governing boards have few ready measures to judge performance.” The report speculated that a variety of reasons exist in higher education to impede more rapid adoption of innovation:

...top university administrators often operate reactively. Their agendas are molded by whoever is sufficiently motivated to demand their attention. Short-run problem solving erodes the time available to focus on the ‘big picture.’ And administrators’ ability to initiate change is constrained by the academic tradition of collegial decision-making.

This “academic tradition of collegial decision making” is a condition that is frequently precipitated as much by the universities in particular, as by statewide higher education coordinating boards and multi-campus state-university systems that exist in many states. According to Fisher (1995) the boards have become the most important players in some states—regularly managing the expenditure of billions of dollars in the past 40 years. Fisher pointed out the statewide coordination of higher education was attempted as early as the 1920s and began to bloom in the 1950s and 1960s when former state teachers’ colleges were trying to become liberal arts colleges and comprehensive universities, thus leaving elected officials perplexed about how to handle those aspirations. Fisher interviewed approximately 300 college presidents, politicians, academics, members of coordinating boards, and other higher education experts in 48 states about how the boards operate. Several problem areas were identified and are summarized as follows:
State boards result in unnecessary layers of bureaucracy. In terms of time, money, and initiative the cost is great. In some states it takes three years or longer for a new educational program to even be considered.

Many boards have begun to function as miniature governments, with which a college must negotiate all matters, even though the officers of the state coordinating boards and university systems are not directly involved in the delivery of educational services to students.

The quality of boards’ staff members is generally low. Many of them have mediocre academic credentials or are career state-government bureaucrats or political appointees.

The Fisher report excerpts a letter from an unidentified dean departing an institution in a state with both coordinating board and a multi-campus state-university as saying:

During my tenure as dean I have observed virtually no positive contributions to public higher education by these entities....Their bureaucratic procedures stifle and impede educational innovation....Their clumsy centralized approach...represents the antithesis of what is needed in today’s environment of nimble, customer-focused “learning” organizations.

By comparison however, it would appear that our institutions of higher education are neither “nimble” nor “customer focused.” Fisher contends no full examination of the results achieved by coordinating boards has ever been undertaken to reveal if the boards have accomplished what their creators intended. “As in so many areas of government, once a new agency is created, it continues for years, impervious to evaluation, increasingly imperious, often oppressive and protected by law” at the expense of taxpayers.”

BUREAUCRACY’S LONG-STANDING TRADITION

In considering the impact of governing boards on the rate of innovation adoption in higher education, the contemporary iteration does not appear
fundamentally different in regulating the pace of change than in America’s first colleges. In short, the rate of change and adoption of innovation in higher education today frequently occurs as slowly as historical precedent. Similarly, while the governing boards of colleges before the American Revolution were often composed entirely of clergy, and later the business community, the layers of bureaucracy appear as effective in mitigating the rate of adoption when wearing sectarian or secular stripes—both in the 18th century and now.

Adoption-diffusion research on organizations engaged in fields ranging from agriculture to education shows that centralization has usually been negatively associated with innovativeness. Introducing enduring innovations into a higher education organization according to Curry (1992) requires commitment and support from colleagues and involves three basic steps for organizational change: (a) mobilization; (b) implementation; and (c) institutionalization. Without institutionalization, the innovation is likely to be terminated despite how well it may be communicated and implemented. Learning organizations, such as universities, can become innovative communities, where such innovation results in productive behavior, if organizational members have valid information upon which to base their actions and are thus more able to control what happens to them as community members. An organization’s leaders and members must be flexible in developing innovations and setting levels at which these changes will achieve institutionalization.

THE FACULTY FACTOR AND COMPARING APPLES TO APPLES

Hussain (1990) examined the significance of the relationship between general departmental support of instructional innovations by faculty at Michigan State University and the influence of this relationship on the adoption of instructional innovations by faculty innovators. Findings from this study show a significant relationship exists between general departmental support and adoption of innovations by faculty innovators. This study also revealed significant relationships between office support and adoption, colleagues’ support and adoption, and technical support and adoption. While historical precedent for innovation at institutions of higher education appears protracted when contrasted with industry, the question arises about whether the comparison is an adequate one with which to begin. Perception
of speed is a relative measure in most venues and the pressures to adopt innovation are largely felt by individuals first, and institutions and organizations last. Perhaps the innovators at universities are discontent with the status quo when it comes to educational innovation, but are ill prepared for the commitment necessary to mobilize a bureaucracy to the precipice of change. Creating meaningful change that is adopted at university institutional and administrative levels, in many cases, requires an effort and persistence that extends well beyond typical faculty teaching and research loads. Anecdotally, the adoption of innovation in higher education appears to correspond closely with “generational” attributes and the “career windows” of university administrators and faculty. A common notion is that if educational change or particular acceptance of a technology or innovation does not occur immediately it is only necessary to wait until the next dean, or the next provost, or the next president arrives to replace the current one.

This waiting takes time that often accrues by decades. Presumably, adoption of innovation in universities may be inhibited equally by a bureaucratic governing board; the myriad forces that control institutionalization of a particular technology; or may only change with the individuals who comprise the organization. In other words, given any specific slice of generational time of approximately thirty years—an innovation introduced early in the period may require the forces of attrition, institutional philosophy, and consensus to act upon the decision before a technology can be adequately institutionalized and the benefit, if any, realized. If again the comparison to industry is applied, one might argue that the individual tenure of managers and employees of business organizations also reflect similar generational shifts and changes in staff and mission over the years as in higher education, yet industries continue to change and adopt twice as fast.

**THE PERCEPTION OF REALITY**

Looking beyond the perceived generational factors that may influence the rate of adoption, one must begin to consider both the real and perceived market pressure that comes to bear upon the commercial and educational sectors as conceded by Seigfried. Rosovsky (1991) wrote that, “American universities exist in the real world, where leaders are challenged and sometimes forced to make room—even be replaced by—newcomers” (p. 226). And further, “[F]or us, the comforts of Oxford, Cambridge, the
University of Tokyo, and the University of Paris do not exist. At all times there is a group of universities clawing their way up the ladder and others attempting to protect their position at the top” (p. 226). By contrast, a significant challenge exists to try to think of any university that has closed its doors in recent history from the competition that Rosovsky described. Now consider for a moment, the businesses that have failed in just the past decade. Competition among American universities appears to exist, but a significant difference between the industrial and educational sectors becomes apparent in that institutions of higher education appear to compete for prestige while industry competes for the product, and by default—market share. Universities compete for students and endowment, but unlike any industry, the existence of higher education is not threatened by market forces that demand innovation or improvement to a tangible product to remain visible. Rathbone (1980) contrasted American universities with Great Britain by saying:

Very simply, Oxford is not obliged to compete. There are no challengers perpetually ready to dispose Oxford’s from its preeminent position. Much of the strength of Oxford’s institutional integrity comes from its own self-assurance. Oxford, then, unlike its American counterparts is not out to prove itself. As an establishment institution, Oxford is an unalterable fixture in the life of the nation. (p. 10)

Could not Harvard, Yale, Princeton, and the like be considered America’s “unalterable fixtures?” For that matter, could not any state university be considered likewise? Competition in higher education derives in part from the sheer number of operating universities in the United States, but what is the product? Is it research and development? Enlightened minds? An employable and competent citizenry? The consequence of “losing” to a competitor in higher education has little corollary in industry. In higher education, poor quality or quantity of “product”—education, research, teaching, professor tenure, and student enrollment rarely elicits a compelling need for a university to innovate and improve in the traditional industrial sense. Instead, these institutions orchestrate a manipulation of standards to stimulate the appearance of competition while maintaining status quo.
THE UNJUST REWARD

Perhaps the least regarded attribute affecting not only the pace of change, but also the incidence of innovation in higher education is found in a reward structure guided by the status quo and administered by a nonproducing but eminently powerful and politicized technocracy. Consider a professor who works long hours advising, researching, teaching, publishing, and mentoring students on a daily basis. She/he will have received the same compensation today when she/he goes home for the evening as yesterday when she/he got up early and stayed late to “get some extra work done.” Meanwhile, her/his colleague is a ghost, attached annually to just the right number of committees and subcommittees and nebulous research commitments so as to appear sufficiently engaged at all times. This individual manages consistently to produce surprisingly little substance in any tangible form, in any aspect of performance to the benefit or displeasure of few. Yet, this particular colleague will receive identical compensation for producing the absolute minimum required—by virtue of simply sharing an identical employer that values the appearance of work and working as highly as all else. Individuals who bring genuine innovation, contribution, and substance to higher education are not compelled by the same forces as those who do not. And it is this fundamental difference that brings time to bear upon the adoption of change. Collectivism is the fuel of bureaucracy in higher education, and it relies on the talent, skill, integrity, and dedication of many individuals to particular and personal ideals in order to sustain the value of the organization as a whole.

Rightly or wrongly, the proinnovation bias of many innovators demands payment in speed of adoption in the absence of other reward. On few occasions, timely adoption of innovation may occur swiftly. But to expect it as a positive correlate to significant innovation, and from an institution of higher education in particular, is an innovation in itself—one that multiple generations have failed to adopt or improve upon.

Wilson et al (2002) provide insight into some of the contributing conditions to help us understand why innovative projects fail, and cite a number of features common to failed innovations reported earlier by Latham (1988), and Dooley (1999).
practitioners become disenchanted and disillusioned because the innovation is more difficult than expected, causing too much disruption and taking too much time;

innovation supporters leave or are not available;

people lack training and lose enthusiasm;

funding runs out;

there is inadequate supervision and support from management;

the program lacks accountability; and

there is a “take-if-or-leave-it” attitude on behalf of program promoters.

In spite of these obstacles, innovators will continue to produce innovation while others wait for it to occur, and adoption of innovation will transpire despite the permeating economic and psychological disincentive that persists in higher education. According to Rosovsky (1991), economic reality works well when a “bottom line” is unambiguous. That may occur when ownership is clearly identifiable. “Whether we are thinking of a baseball team or a factory, stockholders or individual proprietors, it makes sense to manage the institution in such a way as to satisfy those who are entitled to the fruits of the bottom line.” While it makes good business sense to reward individuals in proportion to their contribution to a clearly measured pool of profits, consider for a moment, the problem that exists in a university. First, what is the university bottom line and who are the owners? Rosovsky answered, “In the simplest terms, [universities] teach and educate students and produce research” (p. 219).

But what happens when Professor A teaches many students more than Professor B? According to Rosovsky, “Since students are the major source of tuition income, it might appear attractive to reward star performers who hold forth in blockbuster courses to audiences of five hundred or more.” “But any experienced academic leader...will know that this line of reasoning is a meaningless parody and can only have destructive consequences” (p. 232). He cited the largest course at Harvard as “Principles of Economics,” with nearly 1,000 students annually enrolled yielding three-million dollars in
tuition income. The problem arises in part when one tries to assess the importance of the economics course relative to “Middle Eastern Languages,” or “Thermodynamics” for example. The importance depends on one’s own conception of importance. Again, a tangible “product” and a clear view of the “producers” remain elusive and vague. This attribute contributes as much of a burden to timely adoption of innovation as a languishing bureaucracy.

Where industry may apply profit sharing, incentive, and tangible reward to employees and shareholders for performance in its quest for a share of the marketplace—higher education substitutes collectivism, the status quo, and equivocality to fertilize an administrative paragon. The realization that a university is not as much industry as it is industrious, is a cod-liver oil for the individual, the “star performer,” and the truly innovative. The product and “bottom line” at educational institutions will always require a squint and a shrug even as modern learning organizations imitate producing organizations through research, applied scholarship, and even actual innovation.

As everyone knows, imitation is the sincerest form of flattery and where particular product development efforts are concerned, universities today can look a lot like any successful commercial industrial enterprise—spinning off new technology companies and innovations at a record pace.

According to the annual survey of licensing among its members, the Association of University Technology Managers (AUTM, 2004) reported that since the 1980 Bayh-Dole Act helped to establish the field of technology transfer in the United States, “…universities, hospitals and research institutes have spun out 4,543 companies based on licenses from those institutions. Two-thirds of these companies [as of 2004] are still operating.” The survey also reported that the US Patent and Trademark Office issued more than 3,800 U.S. patents to universities in 2004 compared to less than 250 issued in 1980. According to AUTM, in the U.S. alone, 567 products based on university or nonprofit research results were introduced in 2004, and more than 3,100 new products have entered the marketplace since 1998.

Innovation of course, may occur at any level in the university but the “institutionalization” that Curry (1992) talked about requires consensus that in higher education must come from the top down. One wonders what might happen if “change agent” or “innovator” were a full-time political appointment to the governing boards of competing universities. How would this
individual be compensated? Would the pace of change in higher education, and the quality or frequency and significance of innovation be improved? As individuals and organizations complete the process of adopting new technologies to support learning, a number of factors come into play according to Wilson et al (2002). “Some factors are about the technology, others about the prospective user, still others about the local context of use.” These include “the technology’s design and usability; the fit with local culture and practices; the associated costs; and the expected benefits of adoption.” Rogers (1995) developed a list of six perceived features of technology that largely determine its acceptance, and encapsulated the concepts in the acronym, STORC:

- Simplicity (or conversely, complexity). Is the innovation easy to understand, maintain, and use? Can it be easily explained to others?
- Trialability. Can the innovation be tried out on a limited basis? Can the decision to adopt be reversed?
- Observability. Are the results of the innovation visible to others, so that they can see how it works and observe the consequences?
- Relative Advantage. Is the innovation seen as better than that which it replaces? Is the innovation more economical, more socially prestigious, more convenient, more satisfying?
- Compatibility. Is the innovation consistent with the values, past experiences, and needs of the potential adopters?
- Support. Is there enough...time, energy, money, and resources to ensure the project’s success? Is there also administrative and political support...?”

While the rate of institutional change and learning innovation adoption at universities in the U.S. may still be comparatively “colonial,” many of our contemporary educational organizations are remarkably and outwardly innovative when one considers the actual products, technology and ideas that have been commercialized. So, perhaps the rate of change actually is in balance in higher education—in fact, creating both innovation and innovative companies at a pace that would make our academic forbears’ heads spin—while changing the academy itself, only as fast as administering the preservation and reinterpretation of academic culture will allow.
References


Hussain, N. (1990, February). Departmental support: Its role in adoption of instructional innovations as perceived by faculty innovators at a large university. Proceedings of Selected Paper Presentations at the Convention of the Association for Educational Communications and Technology; IR 014 535 (pp. 281-286), East Lansing, MI, Michigan State University.


