
PREPARING LEADERS FOR THE USE OF TOMORROW'S TECHNOLOGY: PERSPECTIVES FROM CHIEF INFORMATION OFFICERS

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According to the US Census Bureau, computers have entered an increasing number of US homes (from 8.2% in 1984 to 75.6% in 2011) accompanied by Internet access (from 18% in 1997 to 71.7% in 2011). Not surprisingly, technology is also permeating institutions of higher education. Technology use influences data management and learning on college and university campuses and has the potential to transform the way higher education as it is currently delivered. The current study examined Chief Information Officers' (CIOs) perceptions of how technology may impact higher education by 2050 and how leaders may need to prepare to address any impact.

LITERATURE REVIEW

Use of technology for learning

Technology-mediated learning provides access to higher education for learners managing a myriad of responsibilities, including full-time jobs, parenting, elder care, etc. Institutions use online learning to increase access, resulting in an increased number of students electing to pursue a degree online. According to the 2012 Survey of Online Learning conducted by the Babson Survey Research Group, not only has the number of students taking at least one online course surpassed 6.7 million, but 32 percent of students enrolled in higher education take at least one class online. Chief academic officers intend to capitalize on this anticipated movement – 69.1 percent indicate that online learning is significant to long-term strategic plans. Additionally, educators are leveraging

technology to teach blended or flipped-learning courses and to enhance fully face-to-face courses (Kim & Bonk, 2006).

Despite the expanded use of technology for learning, it is not always used effectively; often, technology is used to automate lectures, a primary form of instruction at institutions, and a strategy perhaps needed least by learners (Privateer, 1999). The success of online learning closely aligns with educators ability to link pedagogy with learner needs (Kim & Bonk, 2006). With learner needs as the focus, educators can move beyond facilitating memorization of information toward creating an outcomes-based and learner-centered environment. Such environments promote deeper learning, critical thinking, peer collaboration and interdisciplinary learning experiences (Kim & Bonk, 2006). In an optimal online environment, students can engage in case- and problem-based learning while individualizing their own educational path. Evidence supports the potential of online learning; students who take online classes can perform the same or even better than in face-to-face courses (Castle & McGuire, 2010; Heterick & Twigg, 2003; Kim & Bonk, 2006).

The use of technology can encourage colleges and universities to move from a one-dimensional to a multi-dimensional (physical and online) physical perspective. Moving to a multi-dimensional perspective can facilitate the infusion of innovative practices into the classroom, including international perspectives, a likely standard initiative for many universities in the years to come (New Media Consortium, 2008). In general, online education and technology in general facilitates innovative potential to pedagogy.

Use of technology for data management and analysis

In addition to changing pedagogy, technology enables colleges and universities to collect robust data to support operations and decision-making. Technology is making possible more advanced analysis, where higher education leaders can simulate the results of their decisions before they are made (Goldstein & Katz, 2005). Currently, most data gathering captures transaction data in finance and institutional research for budget and planning processes. There is currently little use of data for informing instruction. However, analytics will mature and become a useful predictor of student achievement and performance in the future (Picciano, 2012). As technology advances and creates the ability to instantaneously access and analyze individual and institutional data, leaders of higher education institutions will need to prepare their organizations for change.

Leadership challenges for leaders in higher education

In order to prepare for change, leaders must address a gap that exists between higher education traditions, “how things have always been done,” and innovations in teaching and

learning. Addressing the gap will be no easy undertaking as the context of leadership in higher education can be more complex than in other educational or business domains. Higher education institutions are classic examples of what theorists call “loosely coupled” systems (Orton & Weick, 1990). In “loosely coupled” systems, like a university, individuals and individual entities have a high degree of autonomy relative to the organization as a whole (Gilmore, Hirschhorn & Kelly, 2013). The leadership challenge lies in the fact that the leader must both unite and engage the entire institution in a common strategic direction. To leverage the unique structure of higher education systems and move toward innovation, leaders must empower the use of innovative technology in pedagogy and daily operations (Archer, Anderson & Garrison, 2013).

RESEARCH QUESTIONS

The purpose of this study was to investigate Chief Information Officers’ (CIOs) perceptions of how technology will be used in higher education in the year 2050 and what campus leaders should do to be prepared for this change. Two primary questions guided this study:

- How do CIOs perceive that technology will be used in higher education in 2050?
- According to CIOs, how should higher education leaders prepare to address future technological changes?

METHOD

Using a grounded theory approach, this study employed qualitative methodology, specifically interviews. The researchers chose qualitative methodology in order to understand how CIOs perceive technology will be used in higher education and how they believe leaders can be prepared to meet these changes. Interviewing allows for follow up questioning and an in depth understanding of participants’ perspectives (Merriam, 1988).

Study participants all held the role of CIO at a community college or university. CIOs are typically in vice president roles at the university who are expected to participate in broad decisions impacting the university while overseeing the technological enterprise of the institution. According to Penrod, Dolence and Douglas (1990), CIOs should possess leadership skills, the ability to establish a vision and to leverage technology to satisfy learning and operational needs. Combined involvement in University leadership and knowledge of technology place CIOs in a unique position to comment on the future of technology and its implications on leadership. The CIOs selected for participation in the study were randomly selected from the list of “The Top 50 Most Social CIOs In

Higher Education" created by Vala Afshar in 2012. The CIOs included on this list are engaged in using current technology, which provided some indication of forward thinking; a characteristic necessary for this study.

A total of seven CIOs participated in an individual interview with one of the researchers. Three of the CIOs were employed at community colleges and four at four-year institutions. Six of the participants were male and one was female. The interviews used a semi-structured interview protocol (Merriam, 1988) and were conducted until saturation was achieved (when new themes stopped occurring) thus reducing the likelihood of garnering new data in subsequent interviews. The constant-comparative method was used to analyze data from interviews and ascertain themes.

RESULTS

When postulating about the future, the CIOs drew upon what technological advancements currently being employed in other fields (e.g. business and medicine) as examples of what might one day be translated into higher education settings. In many cases, the CIOs saw advancements in other fields as inspiration for transforming the potential of the educational experience. Themes and subthemes that address each research question are provided below.

How do CIOs perceive that technology will be used in higher education in 2050?

The CIOs were asked several questions about how technology has been used in the past and how they believe it would be used in the future. The questions focused on use of technology for data management and learning and by leadership. After analyzing the data, two themes emerged about how technology may be used in the future: for decision-making and for individualized learning.

Data for decision making. Technology is being used to gather information throughout higher education institutions, but CIOs note that it is not easily accessible or available for decision making by campus leaders. According to the CIO's, institutional research departments collect information and distribute it in reports a few times a year for review by leadership. When speculating about the future, the CIOs envisioned far more robust data collection, management, and reporting that would impact leaders' ability to make instant, evidence-based decisions. The CIOs noted the importance of making data-driven decisions to create efficient and responsive institutions. One participant, Joseph, described possible increased efficiencies as a result of stronger data collection:

We will definitely be moving to self-service and being able to access data immediately that is no more than a day old, if not up-to-the-minute so that decision makers can get accurate data, advisors can get up-to-date data about students and student affairs professionals can find out information about enrollment, what students are coming in, etc.... The idea that someone would have a question about retention rates and have to wait to get a report back is just not realistic; Walmart always knows how much of any product they are selling down to the minute.

Individualized learning. As noted previously, CIOs discussed the future likelihood of more advanced data collection throughout a student's educational journey. Much like other researchers (Kim & Bonk, 2006; Golstein & Katz, 2005), CIOs discussed how data about students' needs, learning approach, and abilities can individualize their learning experience. Knowing the unique needs of a student would mean that it would be possible to "arrive" to class (virtually or face-to-face) with a clearer picture of what specific areas they need to develop in a course, such as their writing skills.

CIOs discussed the fact that immediate access to information could also help students make decisions about their learning. One CIO described teaching and learning as being driven by students as "consumers." In other words, students would not only make decisions about their learning, but determine how curriculum is presented and sequenced. The CIOs all agreed this would also have implications on teaching. Instead of initiating each college/university course with little knowledge of students' competencies, professors could tailor teaching to meet the needs of specific students.

Peter stated:

...if we had a longitudinal data system, which I think will be more robust in the future, we could track a student from kindergarten to college. This would allow us to understand how she learns; what she did well with and what did she struggle with – this would help inform the next learning level.

In addition to its predictive function, the CIOs discussed how technology will assist in personalizing instruction in real-time, even "on the fly," after a course has begun. Real-time personalization would transform the role of the faculty to one of coach, connector, and facilitator. Sophisticated technology will inform students and professors alike, not only about what the students need to learn, but how they should learn it based on their personal needs and biological state; in the future, individualized learning might even be characterized as "hyper individualized." One CIO, Bill, explained that technology could produce a level of individualization where the learning experience changes and is augmented by biological and brain functions:

By 2050, the whole focus will be on the brain. I see that as being the next round of research beyond the gene. This will likely introduce the use of augmented cognition, through wearable technology, that will help us personalize the experience of the student. We are starting to understand how to relate to the brain. That is likely to enrich by 2050. This will allow us to very cleverly sequence content based on the needs of the individual.

According to CIOs, how should higher education leaders prepare to address future technological changes?

CIOs did not believe that higher education leaders need to be experts in technology to meet the changes of the future; most felt it was only necessary for leaders to understand or experience some of the digital tools used by students. Sarah talked about what leaders actually need to know, “they just have to be aware that things are changing and they have to be somewhat conversed in what technology can facilitate, but they should concentrate on the things they are trying to get done and not on the technology.” Through analyzing the data, three themes emerged to illuminate CIOs perceptions of how leaders can be prepared to meet the changes associated with technology: the importance of being nimble and open to change; empowering and using IT personnel as strategic leaders and thought partners; and the re-visioning of higher education.

Be open and nimble. CIOs emphasized the importance of being open to technological innovation and a willingness to direct the organization toward change quickly; a task that is particularly difficult given the unique nature of higher education institutions noted by Orton and Weick (1990). Expediting change was noted as being particularly important to respond to emerging technological advancements. One interviewee, Charles, used the metaphor of a speedboat to address the way higher education institutions should approach technological advancements:

Higher education moves really slow, like an ocean liner. If you want to change from heading southeast and want to go northwest, well... good luck at getting that thing to turn. It's not going to turn on a dime; it's going to take a couple of nautical miles down the ocean before it can turn right back into the other direction. We need to be able to move our institutions like a speedboat where we can say 'I just want to whip this sucker around and go the other direction.' The needs of the future are going to come up quick and institutions of higher education need to be able to have the ability to do that same thing. Leaders need to create and push that vision.

Along with being open and nimble, CIOs talked about how moving toward innovation takes courage; leaders need to be willing to make mistakes. Aaron said, When you're trying to change a culture that has been steep in history for many years, you aren't going to get it right the first two, three or four times we do it. We need to have room for failure and innovation to perfect things.

Empower and use IT personnel as strategic leaders and thought partners. As previously noted, the CIOs agreed that it is not necessary for higher education leaders to possess specific technical knowledge in order to effectively lead their institutions into the future. The CIOs emphasized that current leaders need to utilize information technology leaders to fill gaps in decision-making. Steve described his leadership role of one of "partner," helping to make possible the goals of the institution through technology and infrastructure.

The CIOs also spoke about the importance of utilizing their expertise (and others with technological knowledge) to engage in intelligent dialogue about the possibilities of what can be accomplished at the institution; higher education leaders need to have people who can match institutional/individual goals with technological resources. As Sarah described, "We are partners – we're not just the tech people. We are here to hear what the goals of the institution are in teaching, learning and research and then try to suggest what [technology] will facilitate those goals."

CIOs also discussed the role they could play in helping to shape the vision of how technology will be used at the institution, and suggested that higher education leaders seek their expertise as the institution prepares for the future, Steve shared:

Shared ownership is key, the outcomes affect everyone. It (change) touches every part of the university. Our business relies on technology, we will move forward by building relationships. If there are issues or questions, we address them together, breaking down the traditional concept of IT vs. institution.

Among all CIOs, there was a consistent theme of preparing for the unknown and unpredictable future. The CIOs shared that institutional leadership must be prepared for dramatic change, a change similar to what "occurred recently in the journalism industry." The CIOs emphasized the critical importance of staying in strategic alignment and agreement; a process that also includes discovering new and better ways of sharing information as leaders.

Re-visioning higher education. Will higher education exist as we know it in 2050? Will there be a need, or the same need for physical spaces for individuals to gather? All CIOs paused and noted that we should consider these questions before addressing the specific advancements of technology in learning and data management. They indicated that virtual learning environments

could be used more, therefore reducing the need for “face-to-face” interaction. As Aaron noted, “technology will be baked into how we do the classroom. The classroom will be virtual, truly interactive.”

CIOs noted that higher education leaders should consider what face-to-face aspects of the college/university need to be protected as pieces are transitioned online. CIO Joseph considered “the campus” experience and what it might look like if curricular learning occurs virtually:

Assuming with global warming continuing and scarcity of resources the idea that 30 students would get in their cars and drive to one place to sit there every week for a lecture seems unlikely.... To the extent that people want the campus experience, they may have that experience but it won't necessarily be co-located with all of the learning resources. Students may come to Future University, but they will take classes from professors all over the world. At Future University, they may experience certain communal growing up experiences, and have a place to meet and work with people.

All CIOs expressed confidence in the fact that if used well, technologies can contribute positively to the educational experience. Aaron noted, “There is a lot of debate as to whether technology will contribute to the academy and still produce quality. I am convinced that the new technologies, if we leverage them, will increase quality and access.”

IMPLICATIONS FOR LEADERSHIP

As the emerging picture of higher education in the future unfolds, the CIOs were unanimously hopeful about the impact of technology on student learning. Participants noted the critical role the CIO will play in mid-21st century higher education. Additionally, important implications remain for higher education leaders as they work to manage the technology that does not yet exist to do things that are not yet imagined.

Strategic planning, facilities and infrastructure

Anderson, Boyles, and Rainie (2012) assert that the growing cost of traditional higher education cannot be sustained, particularly in light of the demand for technology-driven teaching and learning models. Therefore, the Internet will be utilized as a more economical way to deliver higher education. Time must be spent determining if (and how) the institution should strengthen the physical campus environment or transform toward a virtual campus (Colis & Van Der Wende, 2002). Leaders must determine their campuses’ role in the community, the institution’s infrastructure, and the expectations of what will be produced (Privateer, 1999). Responses from a

majority of the participants in this study support the re-imagining of the physical campus; the current and future role of existing physical campus structures should be defined before new buildings are built to service antiquated functional models.

Comprehensive strategic plans must be adaptable and responsive to change as leaders prepare for the future. A clearly communicated implementation strategy should include a frequent review process.

The role of faculty

The CIOs in the study did not emphasize the need for specific training for faculty. However, the literature recommends technology-based training for faculty (Rogers, 2000). Additionally, leaders need to debunk the misconceptions and myths related to online education and prepare faculty to facilitate optimal online learning experiences (Van Dusen, 2014).

The role of the faculty may be changing, however change will not come without consideration on structural and fiscal implications. Tenure and promotion requirements will need to be revised to incorporate technology and innovation (Van Dusen, 2104). Funding for faculty with pedagogical competence will be necessary to attract and retain the most skilled instructors (Kim & Bonk, 2006). It also appears that leaders will need to connect faculty between institutions, even internationally, to produce a competitive advantage.

Assessing learning, and confidentiality

Institutions will be able to easily collect massive amounts of data to predict student performance. Such predictions will produce more precise measures of student readiness and achievement (Kim & Bonk, 2006). As a result, leaders will need to address how data are used, secured, and shared.

Rethinking student services & student development programs

As discussions take place about the future of college and university campuses, student affairs leaders need to provide evidence on the (face-to-face) co-curricular experiences integral for student development. Simultaneously, they need to project and plan effective strategies for providing virtual services and student development programs.

The role of the Chief Information Officer

CIOs are no longer simply managing IT infrastructure, but instead have become critical confidants and thought partners for the decision-making team of the organization. CIOs will need to have great discernment moving forward, differentiating between passing fads and innovations that

are here to stay, while creating a sense of urgency around what opportunities will be critical to seize in order to remain competitive.

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