

# **Four Important Strategic Issues for Computer Information Systems Education**

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## **ABSTRACT**

This paper invites Computer Information System (CIS) program stakeholders to consider several strategic issues. They include: Curriculum & Pedagogy, Business Model & Value Proposition, Increasingly Diverse Student Body, and Student Success & Completion. These strategic issues are those in which faculty have the ability to provide the most influence and make the most impact; areas in which the faculty can make significant contributions without requiring higher-level organizational commitment. In addition, attention to these four areas can help to address the shortage of individual entry-level employees in the field. The paper does not offer prescriptive solutions; rather, it broadly frames some strategic issues and suggests areas for stakeholder consideration. Ideally, each program should weigh strategic issues against the backdrop of the environmental factors, i.e., opportunities and threats, within which it operates, and in the context of its own strengths and weaknesses. Moreover, each program should consider its own relevant strategic issues from the perspective of its mission, values, and aspirations.

**Keywords:** Strategic planning, Pedagogy, Value proposition, Diversity & inclusion, Student success, Student completion

## **1. THE ACADEMIC ENVIRONMENT – “PERMANENT WHITE WATER”**

Peter Vaill (1996) introduced the term “permanent white water” to describe the turbulent environment in which we all live and work. Since the introduction of that phrase, the speed with which change occurs has accelerated, and Vaill’s term “permanent white water” has proven to be prophetic. All college students, regardless of their field of study, need to be prepared to contribute in a world marked by open or unscripted problems – problems where the right answer is far from certain and where solutions are, therefore, created under conditions of uncertainty.

Today, we are educating our students for jobs and career paths that do not yet exist, using technologies that have yet to be invented, to solve problems that we don’t even know are problems yet. These are the kinds of problems we face in today’s economy which is fueled by innovation and ongoing, turbulent change. As Schneider (2015, p. 6) so aptly writes,

These are also ... the kinds of problems we face both in the global community and in our own diverse and deeply divided democracy. Indeed, our graduates are entering a world of extraordinary complexity and uncertainty. The solutions they create will hold lasting consequences for our shared future.

Hap Klopp (2012), founder and past CEO of *The North Face*, advises us to embrace this ongoing state of permanent white water, viewing disruption as an opportunity to engage in “possibility thinking,” i.e., looking for what can possibly be done and deciding on how best to go about doing it, rather than finding reasons why it cannot be done. He opines that to achieve positive results in this disruptive white water world, we must adopt a “no excuses” mindset and assume personal responsibility for success in our own lives as well as for the academic success of our students. Klopp believes that this seemingly monumental task can be reduced to a manageable size and accomplished if we remember the “80:20 Rule” – that 80% of our positive results come from but 20% of our activities. He refers to this 20% of activities as the “success drivers” of our lives and organizations, and he advises that regardless of our vocation we stay focused on the “success drivers.”

## **2. THE HIGHER EDUCATION LANDSCAPE – ON THE NEED FOR CHANGE**

Despite the presence of time-honored academic traditions, higher education is not immune from the world of “permanent white water” and has been in a state of continuous evolution. Lately, much has been heard about the “disruptive” forces that are challenging higher education, forces that are requiring colleges to rethink fundamental academic and business practices. For example, competition from the for-profit sector coupled with the decline of the traditional pools of college-aged students is in combination strong enough to threaten the well-being of some Computer Information Systems (CIS) programs and the very institutions in which they are housed (Sellings, 2017). Simultaneously, this is a promising time for the colleges in which our CIS programs exist because innovation is redefining the concept of higher education at an astonishing pace, resulting in changes in the marketplace that provide an opportunity to shape new strategies that will strengthen both our institutions and our departments.

There have been calls for innovative approaches to higher education before (Tagg, 2003; Bok, 2006; Saulnier et al., 2008; Sullivan and Rosin, 2008; Colby et al., 2011), but somehow this time seems different because there are now cheaper and far more effective technologies available than there were a mere decade ago. While many have concluded that the arguments for remaking higher education are the same ones that they have heard before, others in the academy (DeMillo, 2015; Schneider, 2015; Pelletier, 2016) have concluded just the opposite: that higher education has to be examined and remade because it has become unsustainable in its present form. What makes this time different is the presence of new “tools” to bring about change; i.e., the means of transmitting content information are now available in a wide variety of rich and appealing online formats. As Zakaria (2015) notes, technology is transforming higher education, opening access to the best courses and classes in a vast array of subjects around the world, and we are thus at the dawn of the greatest expansion of education in human history. Coupled with both (1) data analytics, via which we can effectively monitor the students’ learning and provide individual strategies to maximize their learning and (2) our rapidly increasing understanding of the biological basis for how people learn (Bransford, 2000), we can now design new ways

to disseminate knowledge and deploy much better individualized strategies to maximize learning.

The purpose of this paper is to broadly frame some CIS strategic issues and suggest areas for stakeholder consideration. Ideally, each program should weigh strategic issues against the backdrop of the environmental factors (opportunities and threats) within which it operates and in the context of its own strengths and weaknesses. Moreover, each program should consider their own relevant strategic issues from the perspective of its own mission, values, and aspirations. But if Abraham Lincoln was correct in his assertion that creating the future is the best way to predict it, then we need to embrace the technology-fueled innovation which is transforming higher education, introducing new ways to disseminate knowledge and better ways for students to learn.

## **3. CIS CURRICULUM & PEDAGOGY**

Discussions of the curriculum and pedagogy should start with an examination of what the department perceives itself to be and what it wishes to become. As with any organization concerned with finances, these two fundamental questions should be considered in the context of both the market space, composed of both students who purchase services and employers who hire graduates, and the program’s mission. It is with CIS pedagogy that the faculty has the most influence and can be most impactful.

As DeMillo (2015) accurately points out, the “gold standard” for analyzing the competitive needs of organizations was developed by Michael Porter (1980) who laid out forces that need to be managed in order to understand an industry. These forces include bargaining power, competitive rivalry, threats posed by new entrants, and the likelihood that consumers will find a substitute for your products/services. By applying Porter’s forces to higher education, DeMillo (2015, p. 192) astutely concludes,

The only (positive) strategic choices available to an academic institution are those that it uses to differentiate itself to students and gain an advantage over new entrants as well as existing, competitive peers ... Yet this one driving concern of strategic plans ... is almost completely absent from the plans of most colleges and universities.

Though each CIS program should develop its own unique mission, it is highly advisable that we be familiar with both our respective program’s historical context and the development of our national curricular models/norms. The First National Conference on Information Systems Education was held in 1982, a mere 35 years ago, at McCormick Place in Chicago. The discipline has since evolved with the changes in technology, and it is probably best to consider those evolutionary curricular changes considering the technological and educational advances of the past three decades.

Only three years after the initial Chicago conference, Alexander Astin, founding director of the Higher Education Research Institute at UCLA, published his seminal work (Astin, 1985) which advocated for a new approach to higher education driven by the concept of “student improvement” as opposed to the traditional “curricular mastery” models in effect at that time.

During the past three decades, calls have been increasingly heard from higher education leaders to move from a solely curriculum-driven to a more learner-centered approach (Barr and Tagg, 1995; Weimer, 2002; Fink, 2003; Tagg, 2003; Doyle, 2008). Similar calls have been increasingly heard in business and CIS education in the last decade (Saulnier, et al., 2008; Sullivan and Rosin, 2008; Colby et al., 2011; DeMillo, 2015).

Thus, the discipline has evolved in close coordination with advances in information technology and in loose coordination with the shift from a content-centered to a learner-centered educational environment. If we are to survive and thrive as academic departments offering a world-class education in information systems to our students, while simultaneously supplying industry with the highly competent employees that we so desperately need for our country to retain its competitiveness in the global arena, then it is becoming increasingly necessary for us to engage in an ongoing self-examination process at both the curricular and teaching-learning levels.

To stay relevant in higher education's dynamic environment, the CIS curriculum must be both agile and innovative. To do that, we must consider the requirements of our stakeholders. If our goal is to produce graduates who think critically and who are prepared to contribute to business's technology needs, it is incumbent upon us to offer a curriculum that prepares our students for the workforce and beyond. "Information Systems (IS) education needs to prepare students to apply technology to improve the effectiveness of business, the environment, and society" (van den Berg, 2018). According to Fichman, Dos Santos, and Zheng (2014), "new electives could be developed that have an explicit digital innovation orientation" in the IS curriculum. This innovation must start with the first course in the IS curriculum. Fichman, Dos Santos, and Zheng (2014) recommend that students have "a strong grounding in IT and digital innovation in order to manage, lead, and transform organizations that are increasingly dependent on digital innovation."

In a paper by Strecker et al. (2019), the authors present several innovative course (re-)designs. One approach developed by Agnes Koschmider describes an innovative learning approach based on a crowdsourcing scheme in which students work with a software tool that adapts to individual learning progress.

Moller and Crick (2018) suggest the need for reform in computing curriculum. One of the lessons learned in their comprehensive study was the need for public engagement. It is not sufficient to have students study in a vacuum; rather, during their education, they should engage with citizens in the community to understand the reality of cross-disciplinary careers which include both computing and domain/industry specific knowledge. Another major benefit of this community engagement is the development of an appreciation for bilingual/multi-lingual/cultural challenges. They note that though English is the de facto programming "language," there is a need for support of native languages as well. Though the Moller and Crick (2018) study was performed in the U.K., it is perhaps more relevant in the U.S. where other languages have flourished and where the opportunity to leverage other non-native English speakers can provide significant benefits. These benefits include the potential for developing new digital cultures and approaches to technology problems.

Guidry (2017) notes that technology is changing so fast that programs and professors need to keep up with this rapid development. The author also suggest that programs not only teach current skills but also include methods to allow students to learn how to learn since technologies they understand today may be obsolete by the time they graduate. The ability to learn new technologies must, therefore, be an essential component of information systems curricula.

There are several fundamental methods for universities and professors to keep their curricula current. These include: attending training classes, gaining industry certifications, participating in IT conferences and trade shows, and reading trade publications (Computer Science Degree Hub, 2018). However, with tighter budgets in today's universities and increasing student debt, there are significant pressures for colleges to cut costs and eliminate some of these costly activities. Reduction in "continuing education" for computing faculty could eventually cripple the relevancy and efficacy of computing education and result in lower quality programs and less-skilled graduates.

Pontis et al. (2015) explored the challenge of technology academics being able to keep up with the rapid growth of research literature in STEM sciences. They suggest that there needs to be useful filtering tools to be able to extract and summarize research relevant to the specific faculty member. Currently, many faculty members use peer discussion and social interactions to find these data. This may not be sufficient in today's information overload.

Collins and Halverson (2018) present opportunities available from technology: custom teaching versus uniform lecture learning, diverse knowledge sources rather than just textbooks and instructor, specialized assessment possibilities, knowledge in instructor memory versus reliance on outside resources, coverage versus knowledge explosion, and learning by acquisition (lecture) versus learning by doing. They also suggest that we are experiencing a potential third era of evolution in education, the Lifelong Learning era. The prior two eras were apprenticeship and formal schooling. Some of the changes that will take place in this era include: moving the responsibility of one's education from the university to the student, moving from content to generic skills and learning to learn, moving from passive lecture to learning by doing, and moving from generic overall instruction to individualized instruction.

Sinclair (2015) notes that most e-learning researchers have found that e-learning allows for meeting individualized needs as well as allowing for broader connections. He does, however, note that there is an alternate perspective that suggests that the most important part of the educational paradigm is a passionate and enthusiastic educator. This may not be fully realized in an e-learning environment.

Wingo, Ivankova, and Moss (2017) examine faculty perceptions about teaching online. As suggested, instructors are still perhaps the most important element of course content and delivery. Understanding how they approach and embrace alternate delivery methods can spell success or failure for these alternative options. Factors that influenced faculty use of technology included ease of use of technology and tools, clear administrative goals for online education, concern about student interaction, addressing potential cheating, and positive

recognition by their institution for their work. Positive reinforcement is essential.

Morphew, Fumasoli, and Stensaker (2018) note a changing nature of university missions and the “blurring boundaries between public and private missions.” They note that universities have placed an increased emphasis on relevance and service to society as well as having a significantly changing environment of knowledge production. Universities have significantly changed their missions to attempt to address “global challenges in health, environment, or energy areas or a multi-cultural society.”

No longer are universities solely concerned with the acquisition and transfer of knowledge for knowledge’s sake. They are actively engaged in their local and national economies and societies to enact change and improvement where possible. Service, not just knowledge, has become a primary mission of most universities. This provides unique challenges in how to incorporate these goals into university curricula.

In conjunction with this, there is a drive toward the inclusion of social efficiency in university missions. Many universities now include explicit ties between their goals and that of their community, particularly with regard to economic development. As an example, Ohio State University’s mission includes, “We will become the catalyst for the development of Ohio’s technology-based community.” This muddling of education and economic development provides a fundamental change in the academy role in society. No longer is the transfer of knowledge the purpose of education; it is now the improvement of society. How this role will play out for both the academy and society is yet to be determined.

#### 4. THE BUSINESS MODEL & VALUE PROPOSITION

Today, most college business models in North America are experiencing some degree of financial stress, and the business models that brought colleges to their current state may not serve them well in the future. Most colleges use multiple business models; one set of financial structures may be employed for traditional undergraduate programs, while alternative financial structures may be in place for programs geared toward adult and online students.

In the United States, many people are questioning the value of college in monetary terms, even though surveys consistently show that college degrees enhance individual earning power and that graduates earn significantly more over time. Given the availability of content information online and the presence of “for-profit” education alternatives, it is becoming increasingly difficult to argue for the current academic structure based on exposure to content alone. Indeed, the real value of the residential college experience lies not in the delivery of content, but in the exposure to faculty and the overall college environment, including contacts made with other students and alumni.

Driven by the current dialogue questioning the value of higher education and the difficult economic times in which we live, public funding to support higher education appears to be either decreasing or holding steady at best at both the federal and state levels. To offset this loss of government revenue, tuition has been rising at a much faster rate than both inflation and most family incomes. To offset the potential loss of students due to high costs, higher education institutions employ

deep tuition discounting to meet their enrollment targets; i.e., using institutional financial aid to offset the sticker price to help low-income students pay for college and attract certain students they want to recruit. But as that practice has expanded, it has become increasingly less tenable. Additional financial constraints currently faced by colleges include volatile endowment returns, uncertain philanthropic support, and limited debt capacity.

The selection of majors has become increasingly important in the economic value proposition of education. In the “Economic Value of College Majors Report” by Carnevale, Cheah, and Hanson, it is reported that “over a lifetime, the average difference between a high school and college graduate’s wages is \$1 million, but the difference between the lowest- and highest-paying majors is \$3.4 million” (Carnevale, Cheah, and Hanson, 2015, p. 6). According to the report, STEM majors not only have the highest wages, they experience the largest wage growth over the course of their careers. According to the college salary report, information management ranks 29<sup>th</sup> and information systems ranks 39<sup>th</sup> in majors that pay you back (i.e., have a bigger impact on future earnings) (Payscale, 2018). Data from the “Economic Value of College Majors Report” (Carnevale, Cheah, and Hanson, 2015) indicate that MIS and Statistics majors have the highest median salary within the business school. However, it has one of the lower enrollments. Figure 1 shows the enrollment and median income of business majors. This gap between the number of majors and the median salary may indicate that students are not aware of the economics of majoring in computer systems.

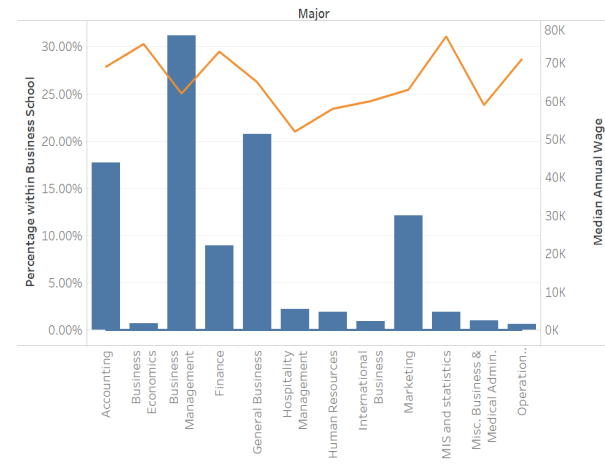


Figure 1. Business Major Enrollment and Income

#### 5. INCREASINGLY DIVERSE STUDENT BODY

Over the last two decades, the student bodies of most colleges have become increasingly diverse. Part of this trend is a function of demographics – the overall population of the United States is becoming more diverse. The National Center for Educational Statistics (NCES, 2017) projects a 7% increase in the number of white students in postsecondary education between 2011 and 2022, compared to increases of 26% for black students and 27% for Hispanic students. Additionally, colleges and universities are enrolling more first-generation

students; about 20% of students today are the first in their families to pursue higher education. These first-generation students encounter many barriers to completing their degree as they usually come to campuses with little to no familiarity with what will be expected of them in college.

To address the national need for greater numbers of graduates, colleges and universities are drawing from beyond the traditional cohort of recent high school graduates and are serving more adult students, transfer students, international students, and students from immigrant populations, including undocumented students. Some of these students are less prepared academically and financially for college than others, so getting them successfully through to graduation can often be challenging. Some are working full-time which makes it much more difficult for them to stay in school and finish their degrees.

Another demographic factor is the declining number of potential students in many states. NCES projects that from 2009-10 to 2022-23, the number of high school graduates will decrease by 10% in the northeast and by 8% in the midwest, while at the same time, the number of high school graduates will increase by 9% in the south and by 5% in the west.

Alegria and Branch (2015) suggest that the study of diversity in all STEM fields has been lacking. When analyzing gender differences, research has generally regarded women as a discrete variable, given as “all women as White, American, and middle class.” Race and citizenship have largely been disregarded. But there are many variables that must be considered when addressing the shortage of women in STEM careers. Their study parses the demographic data to understand specifically what gender/race/citizenship changes are occurring. These changes need to be recognized and incorporated into our information systems education methods, procedures, and concepts.

For example, white men are steadily decreasing as a percentage of science workers. Foreign men now make up a significant number of STEM workers, particularly in computing. Women workers in the life sciences have grown significantly and now equal men, but in computing, there remains a very wide gap between genders. Noor, Kamardin, and Ahmi (2016) suggest that Information Communication and Technology (ICT) corporate boards need to include women in their composition since different genders provide different methods of thinking and allow for more creativity and innovation in ICT expenditures. Izquierdo-Cortazar et al. (2019) studied open stack communities and found a major gender imbalance in these communities with men dominating nearly every aspect of the communities. This comes despite the noted productivity improvements from gender-balanced teams.

Lawler, Joseph, and Green (2018) provide an example of a program to increase the participation of students with disabilities in computing curricula and careers. This is an area that is ripe for potential candidates.

Cilluffo and Cohn (2018) note:

New foreign student enrollment at U.S. colleges and universities doubled between 2008 and 2016, from 179,000 to 364,000, far outpacing growth in overall college enrollment. Growth has been stronger at public schools than private schools. Students from China, India, and South Korea accounted for 54% of all new

foreign students pursuing higher education degrees in the U.S. in 2016.

Peterson (2016) reports several notable statistics about how the diversity of the U.S. and the workplace have changed. Most children under five are now classified as part of a minority ethnic group. Minorities in the workforce are projected to increase to 37% by 2020 and white workforce to decline to 63%. Women are now more likely to have a four-year degree than men. Changing demographics are real and must be considered in the educational environment evolution.

Overall significant gender changes have taken place. The U.S. Bureau of Labor Statistics (2018) notes that in 2017, 57% of women were in the workforce. Women are 52% of management workers. Forty-three percent of women hold a Bachelor's degree compared with 11% in 1970.

Also, significant changes have taken place in race and ethnicity but with this comes a challenge. According to the National Center for Public Policy and Higher Education (2005), unless something is done, the proportion of workers with high school diplomas and college degrees will decrease and the personal income of Americans will decline over the next 15 years. The reason for this is that the highest increases in population will come from racial and ethnic groups that currently have the lowest levels of education. This coupled with the retirement of older, more educated, white Americans will result in a potential decline in our overall education level. There is a vital need to do a better job of raising the educational level of all racial/ethnic groups.

The greatest population growth in the U.S. will come from ethnic minorities, but

the educational gap between whites and Hispanics/Latinos (as measured by the percentage of the working-age population with a Bachelor's degree or higher) has almost doubled over the last two decades – growing from 12 percentage points in 1980 to 19 percentage points in 2000. (National Center for Public Policy and Higher Education, 2005)

While highly educated individuals are retiring, ethnic minorities are increasingly leading to an education gap. In order to maintain the country's economic growth and well-being, it is essential that improvements in educational advancement for ethnic and racial minorities are made.

To address this looming problem, some universities have developed proactive approaches to improve the likelihood of minority graduation and success in the workplace. Hrabowski and Sanders (2015) note a program at the University of Maryland, Baltimore County called the Myerhoff Scholar Program. This was first developed in 1988 and has become a national model for improving performance and retention for minority students in STEM programs. The program involves a comprehensive program of educational, financial, advising, community, and faculty support. The success rate of students in this program is “substantially higher” than other Maryland students of color and can serve as a national model.

Industry has begun to take note of the need for more minority technologists. Leung (2017) and the IEEE have noted the need for more diverse graduates in STEM careers and have formed the Sustainable Horizons Institute which is “dedicated

to developing the scientific workforce with a special interest in creating diverse and inclusive environments.” The PhD Project is a non-profit organization that promotes diversity in the workplace, especially in corporate boardrooms. The goal of The PhD Project is to encourage African American, Hispanic-American, and Native American professionals to achieve a business doctorate. The PhD Project has helped over 1,100 minority doctoral students to achieve business doctorates (PhD Project, 2019)

Scott et al. (2017) describe a “rigorous” program that they developed to address what they name as underrepresented students in computing sciences. According to the authors, there is a worldwide discrepancy between gender and race in terms of success and representation. To address this, they developed a program that attempts to both address this issue and improve outcomes. The program included a multi-year computer science sequence with culturally responsive pedagogy and curriculum, mentorship, and leadership growth opportunities. The results of the program improved results for males, but not females. However, their program did provide a start in trying to address the gender and racial gap in computing program success for females of color.

Sax et al. (2017) also studied promoting gender and racial diversity in computing but note that many universities are planning for change but have not yet implemented necessary changes. They discuss the BRAID (Building Recruiting and Inclusion for Diversity) project. They suggest

four major strategies for increasing diversity in CS, including modifying introductory courses to make them more inclusive and inviting for underrepresented students, facilitating the development of a supportive and inclusive culture and sense of community within the department, increasing outreach efforts to high school students and teachers in the local community, and developing and/or promoting double majors in areas like CS and Biology to attract more underrepresented students.

Daniels (2015) explores an interesting theory that the Internet, as it was developed and continues to function, is not color-blind as many assume. Color-blind racism is the concept that racial privilege no longer exists. He suggests that color-blind racism does exist in the Internet and contributes to overall racial equality in the technology industry and society.

As colleges and universities continue to enroll more students from traditional minority populations, representation of those populations among the faculty has not kept pace.

To be truly inclusive, institutions must both engage and embrace not only people from different ethnic and racial backgrounds, but also lower-income students, first-generation students, LGBT students, transgender students, and many other less traditional constituencies. (Pelletier, 2016, p. 24)

Pelletier (2016) suggests that when colleges and universities consider the interrelated issues of diversity and inclusivity, they need to recognize and consider three key imperatives: (1) the social and moral imperative – the need to provide access to higher education to people who historically

have not had access to it; (2) the economic imperative – in the 21<sup>st</sup> century, if we are to remain economically competitive as a nation, our most important strategic resource is our diverse human capital; and (3) the educational imperative – students learn when they see differences within groups and similarities across group lines and overcome stereotypes through face-to-face interaction that we can provide on our campuses.

Historically, a fundamental role of higher education has been to help students learn to understand and value different perspectives as part of the process of discerning their own opinions, world view, and approach to the world. Unfortunately, recent campus unrest both here and abroad have made it clear that many people, especially underrepresented students, feel that their voices are neither welcomed nor effectively heard on their campuses. Simultaneously, as illustrated by the recent controversy regarding the cancellation of graduation speakers, many colleges and universities are finding it difficult to create and maintain environments that are conducive to productive discussion among parties that disagree about important issues.

A primary challenge for most colleges is to find a way to rejuvenate a campus environment where different points of view can be expressed and argued with equanimity. This process can start at the department level by intentionally supporting and sustaining a diverse, inclusive, and civil culture that welcomes a wide range of people and diverse points of view. Diversity and inclusion considerations may need to be present in recruiting faculty and staff, recruiting perspective majors and minors, and providing the programs and services necessary to provide underrepresented populations access to full involvement in campus life and their long-term success as students, faculty, and staff.

## **6. MAXIMIZING STUDENT COMPLETION**

In recent years, many colleges have increased their institutional resources dedicated to helping students succeed academically and obtain a college credential. Colleges are collecting volumes of data about student performance and analyzing these data at a granular level to identify students at risk, prompting early interventions at a time when the interventions might have optimal impact. Typical interventions include increased support for freshman seminars and other academic and co-curricular programs that orient students toward success, offering more intentional advising for students about academic paths and career goals, providing increased opportunities for tutoring, helping faculty to become better advisors, and providing dedicated support staff whose main focus is academic advising and career development.

Adult students also present a distinct set of challenges. Departments that are used to teaching 18-to-22-year-olds often find that adult students require a unique set of support services, such as day-care for their children, financial-aid counseling, and consultations with faculty members and advisors after normal business hours. Online students, many of whom are working adults with children, often have similar service needs and expectations.

Academia must be ready to provide learning strategies that will complement the learning style of the next generation. Kai Erenli (2016) coins the term Generation I(mmersion) to describe the next generation. In the article, the author concludes

that in order to create an immersive environment, educators need to provide a wide range of skills, including technology, psychology, cognitive science, teaching didactics, storytelling, intercultural skills, and knowledge management

Another area which may warrant program consideration to support student completion is the consideration of competency-based education and other, alternative forms of credentialing, which represent additional ways of moving students through the educational pipeline and into the workforce more efficiently (quicker) and economically (at a lower cost to the student) than the traditional academic-credit degree model. In contrast to the typical college degree based on credits earned from courses completed, competency-based education focuses on student demonstration of competency or mastery in specific “chunks” of subject matter. A burgeoning number of competency-based programs have been started at mainstream colleges and universities, and as part of this effort, “microcredentials” such as badges, certificates, and licenses have been gaining workplace acceptance.

## 7. CONCLUSION

As with so many other facets of the 21<sup>st</sup> century “white water” environment, the pace of change in higher education has never been faster – and it is only accelerating. As a result, it is increasingly necessary that departments address both the immediate challenges and opportunities that they face and also keep an eye on emerging trends, some of which have the potential to quickly bring significant change to the higher education landscape. Many observers are pointing to evolving market forces that rapidly brought revolutionary change to other industries and warning colleges that they too will have to contend with such changes. For example, the healthcare industry is transforming in significant ways, earlier upstarts like iTunes have turned the music industry upside down, and new ventures like Airbnb and Uber have brought disruptive change to their respective industries. Could higher education currently be in the formative stages of a process of transformation not unlike some of those other industries?

Although competition has always been a part of the higher education system, it is now coming from new directions and at a faster rate than ever before. The business community is competing directly in the higher education marketplace. Startups like 2U, which offers a cloud based Software-as-a-Service (SaaS) platform coupled with a suite of technology-enabled services, including coursework design and infrastructure support, are partnering with top colleges to offer complete degree programs online. Companies like Coursera, a Silicon Valley-based company founded by Stanford professors Andrew Ng and Daphne Koller, provide free online courses from top educational institutions, along with credentials upon completion. Companies like Udacity, the outgrowth of free courses offered by Stanford in 2011, specialize in Massive Open Online Courses (MOOCs) and are developing what they refer to as “nanodegrees.” Credentials such as these may in time come to challenge the primacy of the traditional college degree. Companies like Knewton, an adaptive learning company that developed a platform to personalize educational content and develop courseware primarily in the STEM fields, are developing and mastering the use of data analytics to improve student learning through “just-in-time” teaching techniques.

Hockey great Wayne Gretzky was once asked how he had been able to attain athletic success far in excess of his contemporaries. His response: “Most people skate to where the puck is; I skate to where the puck is going to be” (Gretzky, n.d.). Though the future is unpredictable, and we can’t necessarily “skate to where the puck is going to be,” today’s highly disruptive environment creates new opportunities for colleges and universities to take stock of their position in the marketplace, their challenges, and their goals. The challenges that confront us require program stakeholders to think strategically in new and perhaps very different ways, with a willingness to make significant changes in the long-term best interest of stronger and more sustainable programs.

The strategic issues framed herein invite CIS program stakeholders to engage in strategic dialogue at their individual program levels. It’s not necessarily about finding the “right” answers; rather, it’s about asking the questions that speak to us and trusting the process of consideration. It really is about the process; it’s the dialogue itself that truly matters. Considering the ongoing disruptive “white water” reality, this current time is a particularly opportune moment for us to begin the conversation. May conversations at the local level “kick start” a national dialogue regarding the benefits and challenges of these new educational opportunities, and may such conversations help to sustain the continued success of our CIS programs well into the future.

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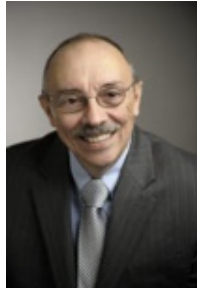
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