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INFORMATION SYSTEMS EDUCATION JOURNAL

A Tribute to Bart Longenecker: An IS Education Maverick and Visionary

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Abstract

Bart Longenecker was one of the most influential Information Systems (IS) educators ever. Renowned for his decades of work on IS model curricula, Bart died in 2016 after a 44-year career. This paper traces the life's work of this EDSIG Fellow and Professor Emeritus to capture his IS education legacy.

Keywords: EDSIG, IS model curriculum, interpersonal skills, systems analysis and design

0. PREFACE

Following his death in December 2016, Bart Longenecker was memorialized by those who loved him.

"In August 1980 I was working to start the School of Computer and Information Sciences at the very young University of South Alabama. In walks this big guy—my future best friend and colleague, Herbert E. Longenecker, Jr. We spent the next three hours talking about plans, and the next thing we knew we had co-chaired the IS Curriculum Models for 1990, 1995, 1997 and 2002. We spent 35 years together. What a ride!

Bart will always live on in the hearts and heads of all the people he touched."

– David Feinstein, EDSIG Fellow

Then in February, he was remembered in a different way at a special service at University of South Alabama School of Computing. A presentation and poster session brought together old friends, alumni, colleagues, and family. Far from a sad occasion, the service promoted Bart's life's work, in what we hoped would be a fitting way to honor him and inspire others to follow his path. Written as part biography and part scholarship, this paper is a follow-on from the memorial service, as we wish to share Bart's legacy with the IS education community he loved.

– The Authors

1. INTRODUCTION

Bart Longenecker, EDSIG Fellow, IS Educator of the Year, and Professor Emeritus of the University of South Alabama (USA) School of Computing (SoC), was a revered figure in the Information

Systems (IS) education community. His professorial career spanned 44 years. He was known nationally for his work in the IS model curriculum, and he was a popular figure at ISECON and EDSIG meetings. In this paper the authors intend to pay tribute to their colleague by synthesizing his life's work and highlighting his legacy.

The approach taken is to write a biography of this IS education giant, highlighting his many accomplishments. There is coverage of his early years, his USA career, and his "retirement". The authors identify emergent themes and trace them from origin to apex. See Figure 2. Through the themes, the authors submit that Bart's work-related accomplishments and strategies reveal important contributions of value to IS Educators and their discipline.

Early Years

Herbert Eugene Longenecker, Jr., was born on May 17, 1943, in Pittsburgh, Pennsylvania. He was influenced heavily by his father who was president of Tulane University, where Bart earned a BS in Chemistry. In 1965 he married Gesina L. Lizana. Bart earned a PhD in Neuroscience from Rockefeller University in 1970 and did post-graduate work in Pharmacology at Cornell University Medical College. Bart and Gesina studied together, investigating neural networks, computing, and the action of drugs on the nervous system. Bart's post-graduate study on the effects of black widow spider venom on the nervous system of cats (Okamoto, Longenecker, Riker, & Song, 1971) was his most-cited pre-computing paper.

In 1972 the couple moved to Mobile, Alabama, where they both worked in the health sciences, Bart as an Assistant Professor. He worked in the areas of neuroscience, neurobiology, and pharmacology. During this time in the mainframe era of computing, Bart developed and administered real-time computer software and hardware as Computing Director for the College of Medicine (Mobile Press Register Online, 2016).

Founding Faculty of Computing at USA

In 1976, Apple's first personal computer was invented in a garage. Four years later, the SoC's roots were planted in a basement at the USA Bookstore. Bart, along with fellow EDSIG Fellow David Feinstein, and V. Gordon Moulton (later Dean of the School of Computing and President of the University of South Alabama) co-founded a new degree program in Computer and Information Sciences (CIS), housed in the free-standing Department of CIS. The program was unique among all other computing programs in that students were offered several choices of computing specializations, including computer science, information science, computer engineering, numerical methods, and education. Bart is generally credited with proposing the design of specializations. The following year they were joined by EDSIG Fellow Roy Daigle.

2. EMERGENT THEMES

In the early 1980s, Bart published the results of his first major systems development project. The project, funded by an NIH grant, developed a tool called FEDIT (Ward, Longenecker, & Abee, 1982). An acronym for *fielded data file editor*, FEDIT was innovative for its time. While dBase (1981) and WordStar (1978) were in their infancy as standalone apps, Bart's FEDIT integrated multiple tools. Documents were stored as hierarchical files. There were CRUD operations, sorting, statistical computations, and word processing features. The system ran on a multi-user operating system called MUSIC/SP (Wikipedia Contributors, 2016). That he worked on this project with students, and published with them, was significant. He would continue this collaborative approach.

Systems Development Projects

Thus, the first of the emergent themes is *systems development projects*. Bart always worked on systems development projects with students, using his classroom as a laboratory for invention. The systems he built mirrored elements of existing products found in industry, but were integrated in innovative ways. The building blocks were always found in the curriculum, and included databases, editors, and control-break reports. Bart filled the role of project champion and relied on collaborators to finish.

Bart continued to develop these systems with students and with colleagues. They published them throughout the years. He developed a learning management system for designing and administering an exit exam for IS students (Reynolds, Longenecker, Landry, Pardue, & Applegate, 2004). He led the development of a user-interface for multi-taxonomic hierarchy representation of curriculum mapping (Presley, Longenecker, Pardue, & Landry, 2006). This system implemented human-computer interaction principles and techniques such as anchoring, overview and zoom, information classification, and dynamic query. He mentored a series of graduate students to develop the Project Meeting Management System (Hussain, 2004) that combined a team meeting tool with project tracking and document preparation, all tailored for coordinated curriculum modeling. A subsequent evolution of this system (Lusk, 2009) was designed and fitted with organizational mission, vision and other features to support a virtual community of practice (Pardue, Landry, Longenecker, & McKell, 2006).

Bart designed integrative systems for industry on a consulting basis. He partnered with fellow CIS faculty, computing professionals, and students. Often the customers were government entities in and around Mobile, Alabama. One of Bart's most enduring consulting projects was the work he did for the Board of Water and Sewer Commissioners of the City of Mobile from 1984-86. The system replaced manual billing and tracked customers. An innovation, in that time period, that Bart and colleague Roy Daigle designed for that system was a dynamically generated individualized system access based on job title. At Bart's memorial service, Mahir Butt, the current IT Director for Mobile Area Water & Sewer System (MAWSS), attended. He shared with Bart's family that the system was in place for more than 20 years and is still used for historical data lookup when needed (M. Butt, personal communication, April 25, 2017). At this time, IS was into the end-user computing era, and Bart was formulating his user-driven development methods.

While Bart always championed these projects with visionary leadership, he rarely if ever saw them through to completion. Bart may have viewed projects as opportunities for experimenting with new ideas, and this sometimes frustrated collaborators who wanted or needed to complete and deliver a final product. Bart was all-too-happy to cede the role of "closer" to collaborators, and through their efforts they, too, shared in Bart's successes.

Systems Analysis Methods

Bart had succeeded in building integrative systems, but by the 1990s he had invented his own systems analysis and design (SAD) methodology for doing so. He called his methodology RAPID, as he envisioned it for short life cycles. Systems analysis methods were the tool of the IS Analyst, and the second emergent theme of Bart's career. RAPID is characterized as having four qualities:

a-Be easily learnable by students and clients
b-Provide end-user satisfaction
c-Be well specified
d-Have stepwise transaction closure

Bart's belief was that IS as a discipline was wholly about the mission of helping organizations and individuals achieve their goals. So, Bart designed information systems in a project setting that was oriented around people and their organizational goals. His SAD methods had to be easy to apply, end-user oriented, and tie together various systems elements. Bart created templates for designers that linked business analysis (SWOT), project management (scope document, status reports), and SDLC (workflow, top down conceptual relational model) methods. Bart's approach to design was concurrent with industry efforts to create a unified object-oriented analysis and design (Booch, 1994) methodology and with trends like joint application development (JAD), agile development, design patterns, and enterprise systems.

Bart was encouraged by colleagues for many years to publish RAPID. Not doing so fueled skepticism about his methods. "How is RAPID better than such-and-such?" Bart would be asked by a faculty member who taught a published or popular method. Rather than write about RAPID or get defensive, Bart evangelized the listener with a Socratic dialogue.

RAPID was first published in a master's thesis (Yarbrough, 2005) which defined RAPID as an approach that integrated "business process reengineering with project management practices and IS analysis and design tasks" (p. 4). He wrote about how RAPID was the backbone of the two-course practicum in the master's program, a course sequence designed to implement the MSIS curriculum model's call for an integrative capstone sequence (Gorgone, Gray, Stohr, Valacich, & Wigand, 2006).

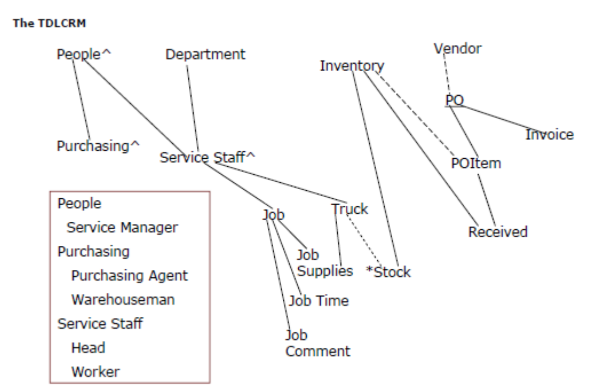

Figure 1 - Example of TDLCRM diagram (Source: Longenecker et al., 2013)

Bart continued to refine RAPID for professional and educational use. He used it in his consulting projects and taught students to use it. Bart believed that his methods, taught in the two-semester, model-curriculum compliant integration and implementation course sequence, embodied what an Information Systems Analyst (ISA) should know and do. The ISA was what Bart was training students to become. Through his work with the Center for Computing Education Research (CCER) and the Institute for Certification of Computing Professionals (ICCP) Bart would eventually certify these skills of the ISA using a certification exam given to IS students across the country (McKell, Reynolds, Longenecker, Landry, & Pardue, 2005).

A comprehensive manuscript on RAPID was published later (Longenecker, Baugh, Feinstein, & Purawat, 2013). This publication illustrated many of the interrelated design templates. See Figure 1 for an example of the Top Down Levelized Conceptual Relational Model (TDLCRM), which is perhaps the RAPID design artifact most well-known by students and clients.

In the last edition of Bart's curriculum vita, Bart lists "IS Rapid Life Cycle Methodologies" as one of his two major research areas (with the other being IS curriculum development). He states that "my research in life cycle concepts has yielded a consistent methodology for the successful implementation of information systems" (Longenecker and Landry, 2016).

Despite early criticisms of Bart's proprietary SAD methods, respect from his colleagues started to grow. Even the more popular or highly touted methods like UML get questioned. "I don't design systems that way," said a professor who was asked to teach a UML course. Bart taught SAD methods that he believed in, used, and could defend, and that was disseminated with peer review.

Mastering Interpersonal and Team Skills

Bart cherished the interpersonal interaction afforded him by his role as educator. He bonded with many students and colleagues over the years. He was referred to by one colleague respectfully as the Master of Interpersonal Skills. His powerful and effective mentorship was affectionately called Wizardry, and his followers, Disciples. Bart was an advocate and strong practitioner of interpersonal and team skills, the third emergent theme.

Curiously, he spent more time away from campus collaborating as on. By the early 2000s Bart was holding meetings off-campus at McDonald's, Satori's Coffee House, or a Chinese buffet. According to Baumeister and Leary (1995), human beings have a need to belong, and shared experiences, such as sports, concerts, meals, and traumatic experiences, create lasting bonds. Bart believed that the shared experience of eating with someone, combined with the release of pleasurable endorphins induced by food, created a lasting social bond. Bart probably learned this because of his background in pharmacology or perhaps because of his wide interests in self-help and social psychology.

Typically, when you met at Satori's with Bart, another student, faculty, or friend would come by and say hello. Then, you would realize that it was not a chance restaurant meeting, but that they too were there for an appointment. Bart kept these off-campus appointments at his regular table or booth between 2 PM and 10 PM on a frequent basis, often working past midnight.

Bart's style of collaboration was unique and became known simply as "Bart Meetings." They were engaging, had no definite ending time or condition, and sometimes covered the same ground as prior meetings. These get-togethers nevertheless created lasting memories in the participants that their work done together mattered, if for no other reason than they cared about each other. As social bonding is often the primary objective, Bart meetings were ingenious and successful.

Beyond emotional bonding, Bart used meeting tactics to achieve project goals. He designed them to engage productive SAD teams and incorporate Bostrom's meeting rules (Bostrom, Kinney, & Watson, 1992).

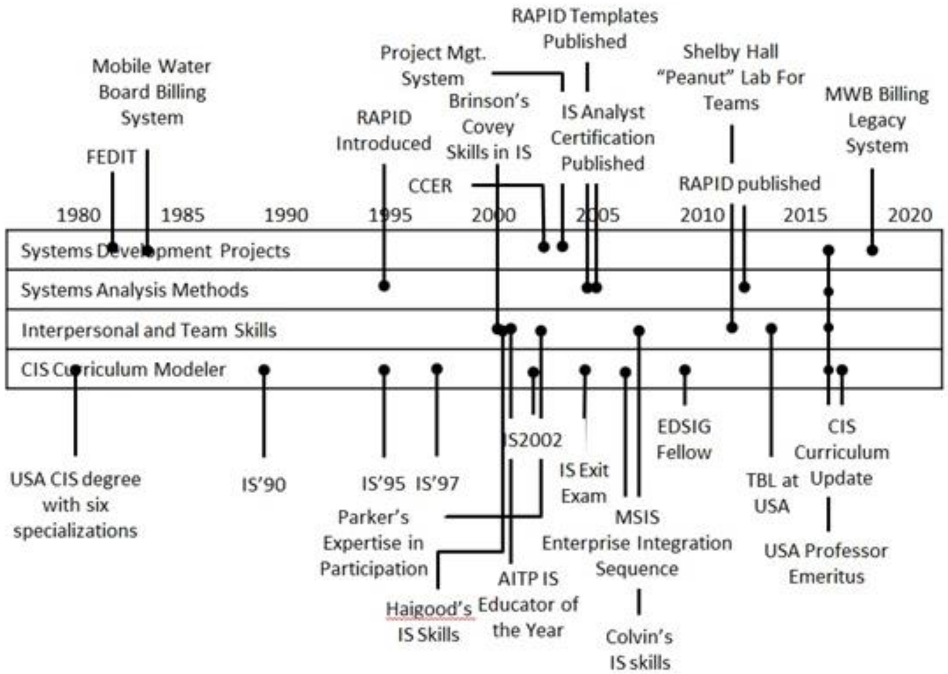

Figure 2 – Bart's Career Timeline by IS Education Theme

Bart's interpersonal mastery emanated from multiple sources. Bart was gifted with a charismatic personality. His father was a powerful influence, as he was also an educator and rose to become president of Tulane University. Bart once related a story on how people around his father would gravitate to him. Bart studied and practiced these skills and encouraged students to develop them behaviorally. He practiced the Socratic method in and out of class, integrating material from both popular outlets as well as academic sources. He was a strong advocate of Covey's seven habits (Covey, 1989). He would quote Covey on his fifth habit—*Seek First To Understand, and Then To Be Understood*, saying "most people don't listen with the intent to understand; they listen with the intent to reply." He gave every student a CD recording of Steve Shapiro's listening skills (Shapiro, 1999), and engaged them on the use of the skills on their project teams.

Building on Bart's practice of facilitated meetings, listening, and Covey's work, Master's student Bonnie Brinson, now Bonnie McNamee, worked with Bart on a thesis. Her field experiment compared a control group team against a team facilitated using the Covey Habits on system resistance/acceptance. She used multiple methods including questionnaires and surveys, and the work was longitudinal. She followed the progress of teams throughout the project, collecting data. Her appendices with instruments, tables, and graphs were as equally lengthy as the prose section of the 100+ page thesis, which was typical for a Bart manuscript. And yes, her results supported the hypothesis and the work was published at a conference (Brinson, Longenecker, & Landry, 2000).

He integrated principles of user participation and involvement from the IS literature (Hunton & Beeler 1997) and co-mentored a thesis on this topic (Parker, 2002). Parker tied user involvement together with Davis' Technology Acceptance Model (Davis, 1989). She found support for several hypotheses, including her thesis of the moderating influence of user expertise on the effects of participation and usefulness on user acceptance. He mentored students to design systems with good listening and involvement among the members of the System Trinity of developers, users, and management.

Bart was a strong believer that interpersonal and team skills were critical to professional success. From his work on the IS model curriculum and with professional organizations, Bart developed a set of work-related skills, and then surveyed IS faculty members nationally on the depth required by IS undergraduate students (Landry, Longenecker, Haigood, and Feinstein, 2000). Two theses resulted, first by Haigood (2001) and then by Colvin (2007). The eight skill areas are as follows:

- individual and team interpersonal

- systems analysis and design
- software development
- web development
- project management
- business fundamentals
- database
- systems integration / platform & networking

Employers today regard these skills as important. According to the National Association of Colleges and Employers (NACE), the top two skills employers most want when they decide on which college graduate to hire are leadership, and the ability to work on a team (NACE, 2015).

Bart's longitudinal work on IS skills is cited in the current revision of the CIS model curriculum (Longenecker, Babb, Waguespack, Tastle, & Feinstein, 2016), which includes a current list of team and interpersonal skills. He was recently reading a book on emotional intelligence.

With unbounded confidence in his students' abilities, he took on large, real-world development projects. His approach to dealing with the complexity of large projects was to create teams within teams through an integrated two-course sequence. The first course, a required graduate capstone practicum, had students working in coordinated teams. The team leaders came from the second course, an elective made up of students who had taken the first course. Both classes met at the same time.

When the School of Computing moved to Shelby Hall in 2012, most of the classrooms were either large lecture halls or small technology-enabled lecture rooms. Bart's unique structure resulted in the only team-based room, which is called the Peanut Room today. It features six semi-circular tables mounted against the walls, and a peanut-shaped table in the center of the room. The peanut table was used for confabs with the team leaders, who would wheel themselves from their team station to the center. Bart managed the class using this two-level nesting of classes.

He believed in the power of interpersonal influence to such a degree that he advocated the Holland College Model as a curriculum design. The model was heavy on the use of cohorts where the upper-class cohort mentored the lower class. Had Bart been accommodated, he would undoubtedly have expanded this collaborative cohort model to the entire curriculum. Despite its radicalness, Bart's capstone course sequence is still successful at USA today, as is the specially designed classroom he used. USA has adopted team-based learning (TBL, Michaelson, Knight, & Fink, 2004) as its campus-wide educational strategy for improving learning.

CIS Curriculum Modeler

CIS curriculum modeler is the fourth and final emergent theme. Bart was a curriculum designer, and he was passionate about it. This stream of scholarship may have begun at USA back in the early 1980's when the future SoC was still part of the Math Department. Bart, according to sources (Pardue, 2016), was instrumental in early curriculum design. His vision was of a single CIS degree program with multiple specializations. Computer science, information science, computer engineering, numerical methods, and computing education were among the first implemented.

By the end of the 1980s, Bart was taking his curriculum modeling paradigm to the national level, collaborating on a model for four-year undergraduate degree programs in information systems, IS'90 (Longenecker, Feinstein, Fournier, Doran, & Reaugh, 1991). He subsequently worked on several more, including IS'95 (Couger, Davis, Dologite, Feinstein, Gorgone, Jenkins, Kasper, Currie Little, Longenecker, & Valacich, 1995; Longnecker, Feinstein, Couger, Davis, & Gorgone, 1994), IS'97 (Davis, Gorgone, Couger, Feinstein, & Longenecker, 1997), and IS2002 (Gorgone, Davis, Valacich, Top, Feinstein, & Longenecker, 2003). These papers were Bart's most-cited, led by the IS2002 paper (468 cites). He was working on a new model curriculum for CIS programs up until his death last December (Longenecker et al., 2016). Each of these projects were large collaborative efforts encompassing months or years, many meetings and presentations, surveys and data analysis, creative mapping of knowledge units to skills across multiple disciplines, the involvement of multiple professional societies, and occasional political battles, such as compromising between the needs and interests of business versus computing schools.

Bart thought of computing holistically, and the integrative nature of his modeling would be a theme throughout his career. Bart's early "basement-built" model at USA is what led to USA being the first university to accredit three computing programs (information systems, information technology, and computer science) at one institution, achieved in 2002.

In 2004, Bart examined the nature of the similarities and differences among computing programs. He surveyed member institutions of the IT Deans Council on the IS2002 knowledge areas. The 26 respondents were from computer science, information technology, information systems, or information science programs. Bart and colleagues (Landry, Pardue, Longnecker, & Feinstein, 2003) found a theme—*systems development process*—from the IS2002 knowledge areas that clustered together on knowledge depth and inter-rater agreement:

- Systems development tools and techniques
- Interpersonal skills/communication
- Systems implementation and testing strategies
- Systems development concepts and
- methodologies
- Approaches to systems development

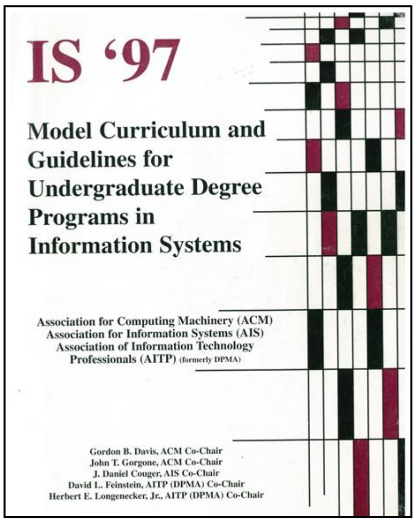

Figure 3 - IS'97 Model Curriculum

Beyond the model curriculum efforts themselves, Bart extended the work to related areas. He published on curriculum mapping (Daigle, Longnecker, Landry, & Pardue 2004), model curriculum and accreditation (Landry, Daigle, Longenecker, & Pardue, 2009), learner-centered education (Saulnier, Landry, Longenecker, & Wagner, 2008), student success (White, Longenecker, McKell, & Harris, 2008) and student success in the programming sequence (Babb, Longenecker, Baugh, & Feinstein, 2014). That did not surprise his colleagues, as they remembered that Bart once conducted an oral comprehensive examination in his hospital room.

The model curriculum work made Bart a prominent figure in IS education. It is probably for these projects, mostly, that he received awards such as the IS Educator of the Year and EDSIG Fellow.

3. POST RETIREMENT WORK

Bart's health steadily declined, but not his will to continue working. With his mobility severely limited, Bart, with great difficulty, decided to retire officially from the University of South Alabama in May 2014. Bart really did not retire, however. For a semester, he stayed involved with his graduate capstone sequence, working with his replacement protégé in a client role. He continued to write and work on the model curriculum, too. Confined to a hospital bed, Bart worked via Skype with other task force members and penned his final publication, an update on the CIS model curriculum project (Longenecker et al., 2016). See Table 1 of draft exit objectives.

#	Exit Objective for IS Programs
1	Accurate business plan developed by end users, management, and developers
2	Translation of requirements into viable software
3	Exceptional requirements analysis
4	Deployment of software product
5	Project management based on established formal written methodology

Table 1 - Exit Objectives for IS Programs (Longenecker et al., 2016)

He was named Professor Emeritus of Information Systems at the University of South Alabama at about the same time. Bart Longenecker died on December 11, 2016, in Atlanta, Georgia, in the presence of his children.

4. BART'S LEGACY

Bart was a true champion of the IS model curricula. While many people and organizations contributed to the sponsorship, development and dissemination of IS model curricula over the years, Bart was perhaps its greatest champion. He spoke passionately about the subject at every ISECON and EDSIG meeting he could, every year. He kept copies of the IS'97 in his USA office (see Figure 3) and handed them out to students and colleagues. Bart also mastered the intricate details of the model curriculum. He demonstrated that IS knowledge units could be mapped along with related computing disciplines to a common body of computing knowledge. He demonstrated how Bloom-like exit skill characteristics could promote industry-readiness. Rather than settling for a simplistic set of standards or model courses, Bart created complex maps that combined technical knowledge, organizational competencies, and interpersonal and team skills that defined the IS analyst. He would want this work to continue, and it should continue, according to his daughter Lani, speaking at his memorial service. If they are to continue in Bart's legacy, these efforts should be large, that is, inclusive of multiple viewpoints.

Bart was dedicated to the IS model curricula, but his dedication to the IS rapid life cycle methodology as the tool of the IS analyst was a close second. RAPID provided a vehicle for Bart's professorial journey. He invented his own life cycle methodology, used it confidently to educate and train others, and then disseminated it through scholarship. Moreover, Bart's invention was true to the discipline of IS. His system analysis methods led to the design of systems that aligned organizational mission, business process, and users/clients. Engaged teams translated requirements into an effective database design and software implementation that supports organizational goals. Bart would recommend that to be IS, one's use of SAD methods should be reflective of this IS vision.

Bart was the idealistic professor's professor, an idealist to the very end. Bart was passionate about and driven by his vision of what it means to be an IS discipline, an IS professor, an IS student, and a good human being. His vision aligned with McNurlin and Sprague's statement of the *mission of IS* as "improving the performance and innovativeness of people in organizations through the use of IT" (McNurlin et al., 2009, p. 19). As such, everything he did could be viewed through the lens of helping people improve themselves and reach their potential. Bart influenced people through caring, listening, his warm charismatic style, and the Socratic Method. Bart integrated his vision and passion into all three aspects of a professors' life: teaching, research, and service. He taught what he researched, he researched what he taught, and the goal of both was service to others.

Bart was never iconoclastic, but his idealism and unwavering focus on the mission of IS education frequently brought him at odds with the sometimes rigid expectations, policies, and constraints of a public university. Bart's unconventional approaches, his steadfast belief in the underdog, his untiring efforts to build large real-world systems with his students, his big ideas often ahead of their time, and his underdeveloped sense of risk, were often difficult to reconcile with convention. And so Bart didn't. Bart was Socrates, expressing his views and beliefs honestly, openly, and irrespective of the consequences. He was a visionary, a maverick, and a beloved professor.

5. LIMITATIONS

This biographical tribute to Bart has two major limitations. The first is that this work is incomplete, as Bart's career spanned 44 years. Numerous papers were omitted, as well as some grants, a variety of consulting projects, other model curriculum efforts, student individual/team projects, and awards.

This paper focused on Bart's scholarship and career, as represented by the tools and methods created, papers written, courses and curricula designed, and theses directed. Such a focus resulted in the second major limitation in that Bart's personal impact was severely underrepresented. Bart the man had a presence, a charisma. He listened, led, and mentored tirelessly. Spending time with Bart left a deep imprint on his students and colleagues that this paper could not capture.

6. FUTURE WORK

Bart's eldest daughter Lani Paxton spoke at his memorial service in Mobile, Alabama, last February. She remembered her visits to South Alabama as a child and several of Bart's major projects. Recognizing her father's greatest passion, she declared that the model curriculum efforts should continue. She also knew of her father's maverick nature. "I bet he drove administrator's crazy," she said. He may have driven many of his contemporaries crazy. But many followed him and collaborated effectively with him. Were they crazy, too? Future work should include studying how to collaborate effectively with the best of the mavericks among us, like Bart.

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Harnessing Business Analytics: Analyzing Data Analytics Programs in U.S. Business Schools

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Abstract

Companies are collecting data at a greater pace and volume than ever before. However, they are struggling to develop expertise and the know-how to aggregate, analyze and more importantly provide executives and managers with the insights needed for informed decision making. As a result, the need for data analysts has never been higher. In fact, the shortage of data analysts is expected to reach 1.5 million within the next two years. As demand for data analysts continues to grow, colleges and universities are rushing to offer programs to equip their graduates with the necessary analytical skills to meet today's data-centric workplace. This study explores masters in business analytics programs from top ranked business schools in the United States and investigates the content of these programs. Our results offer interesting perspectives covering data analytics, interdisciplinary skills, online versus on-campus programs, as well as different geographical areas. Implications and future research opportunities are also discussed.

Keywords: Data Analytics, Business Analytics, Business Intelligence, Business Analytics program, TABLEAU

1. INTRODUCTION

According to Google CEO Eric Schmidt, we create as much information in two days as we did from the dawn of civilization up until 2003 (Schmidt, 2010). While big data is more readily available than ever before, businesses, governments, and institutions around the world are struggling to develop the expertise to create value and most importantly to monetize the unprecedented amount of available data. Today, corporations have come to realize that the collection and storage of large amounts of business operations data has become increasingly easy and inexpensive. However, the ability to leverage computing power to make sense of the data and influence effective decision making is what provides an organization with a competitive edge.

While datasets are readily available in volume, variety and velocity, there is a shortage of professionals capable of analyzing these ever-growing datasets and professionals who can translate analysis into effective organizational decision-making (Cegielski & Jones-Farmer, 2016). These professionals, referred to as data/business analysts, are individuals with a strong background in statistical analysis, operations research, management of information systems, and computer science. Their main aptitude resides in their ability to aggregate, analyze and provide insights from contextualized data (Chiang, Goes, & Stohr, 2012). According to a McKinsey Global Institute assessment, by 2018 the United States alone could face a shortage of 1.5 million data and analytics managers.

As the global demand for data analysts continue to grow, colleges and universities rushed to offer programs to equip their graduates with the necessary analytical skills. In the past decade, data analytics have evolved from elective courses such as data mining (Jafar, Anderson, & Abdullat, 2008) to full fledge degrees and majors in business analytics to respond to the growing demand (Wixom, Ariyachandra, Goul, Gray, Kulkarni, & Phillps-Wren, 2011).

Business Analytics is defined as the process of using data, skills sets, and technologies to make more evidence-based business decisions (Seddon, Constantinidis, Tamm, & Dod, 2016). Business analytics is an interdisciplinary area combining skills from statistics, information systems, business and communication. Universities strive to achieve the following learning goals and objectives: 1) stakeholder value by applying competencies within a focused environment. 2) problem solving and critical thinking skills through the process of conceptualizing, applying, analyzing, and/or evaluating information as the basis for solving problems and making decisions. 3) interpersonal/communication skills by developing the ability to correspond effectively and persuasively with individuals and within teams.

With the plethora of business analytic programs emerging, the question that is posed: How are business analytic programs aligned against industry demand for analytics, statistics, information systems and communication skills? To answer these research questions, we examined MS Business Analytic programs categorizing the required courses into analytical, IT and communication. This research looks at a number of factors such as geographic location, tuition cost, and the number of credit hours and electives.

2. RESEARCH METHODOLOGY

For our data collection, we gathered data from top US business schools that offer MS degrees in business analytics. We used the 2015 TFE Times rankings to identify top traditional and online programs of MS business analytics. For the traditional program, we used the TFE Times (2015) which provided a comprehensive rankings of graduate business analytics programs in the United States. There was a total of 35 on ground programs that were analyzed. For the online Masters in Business Analytics programs 22 programs were identified (Master's in Data Science, 2016). A total of 62 programs were evaluated. Five of these institutions were not used for a variety of reasons, such as link not working, a certificate program or course program were not available. Table 1 provides descriptive details about the type of programs. For purposes of data analysis, required and elective courses were included in the data set for each university. Appendix A shows the number of elective and required courses for each university.

Table 1. Business Analytics Programs

Business Analytics Programs	**Total**
On Campus	35
Online	22
Totals	57
Totals by Region	
• Northeast	20
• Southeast	9
• Midwest	17
• West	4
• Southwest	7
Average Tuition	$31,178
Maximum Tuition	$63,000
Minimum Tuition	$11,568

For the data analysis, we adopted the 2012 classification scheme of Chiang, Goes, & Stohr to classify each business school's program (Chiang, Goes, & Stohr, 2012). Chiang, et al. (2012), provides a list of 29 distinct skills that are needed for success in the field of business analytics. Their research broke down the 29 skills across three categories: 1) Analytical skills which integrates the disciplines of statistics and computer science are mostly used for predictive analytics, 2) Information Technology (IT) Knowledge and Skills which covers a variety of data related skills are mostly used for descriptive analytics and 3) Business Knowledge and Communication Skills are used to support prescriptive analytics.

These three categories can also be mapped to the three types of analytics (descriptive, predictive, and prescriptive) as proposed by Watson (2014). Descriptive analytics examines and summarizes what has happened. Predictive analytics examines and forecasts what might happen in the future and prescriptive analytics is a type of predictive analytics that explores what should happen, i.e., what is the best course of action.

Expanding on Chiang's list some additional skills were included in the analysis. Table 2 presents the total number of skills upon which analysis was performed. The individual skill for each category are given in Appendix 2.

Table 2. Skill Category

Skill Category	# of Skills
Analytic Skills	10
IT Knowledge and Skills	19
Business Knowledge and Communication Skills	16

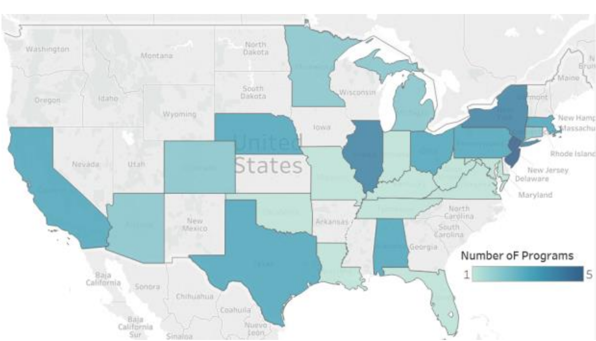
The curriculum for every program was analyzed with each course coded to fit into one of the categories described by Chiang, et al. (2012). Many of the program course titles were vague. Though some of the courses were easy to classify (such as database management, or statistics), other courses especially those related to data analytics were not as clear. A thorough analysis of the course description and/or the syllabus was helpful in the coding process.

3. FINDINGS AND DISCUSSION

In the following, we provide some of the major findings and analysis based on the data collected on the top-ranking universities in the US offering on-campus and online graduate programs in business analytics.

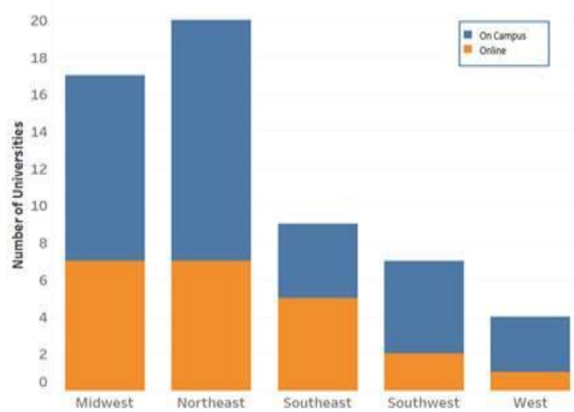
General Program Characteristics

Figure 1. Number of Programs by State



Figures 1 and 2 show the geographical locations of the schools and the number of schools in the various states and regions that offer business analytics programs. When comparing where most top ranked universities are located vis-a-vis their geographical region, the Northeast and Midwest have the highest concentration of online programs and the Northeast has the greatest number of on-ground programs.

Figure 2. Programs by Region



Program Cost and Credit Hours

Appendix 3 shows the total cost of the business analytics program along with the average cost per credit hour. The overall average cost of a master's is $31,178 with an average cost of $881 per credit hour. Online programs tend to be less expensive with an average program cost of $29,929 vs on ground of $31,963.

Appendix 4 shows the number of credit hours required by the different programs. Most schools require 30-35 credit hours for graduation, with an average credit hour requirement of 35 hours and mode of 30 hours.

Type of Skills

There are three categories of skills that courses in business analytics can be classified by: Analytics, IT, and Communication. Appendix 5 shows the percentage of courses for each university that fall into each category. From this chart we note which universities have more Analytical courses compared to Business or IT.
The percentages vary greatly by university to university. For example, Fordham University's program is highly focused in the area of Analytics. Fifty-five percent of their program is focused on Analytic skills, 9% Business knowledge & Communication, and 36% IT knowledge. Whereas, Capella University focuses strongly on Business Knowledge and Communication. Sixty-

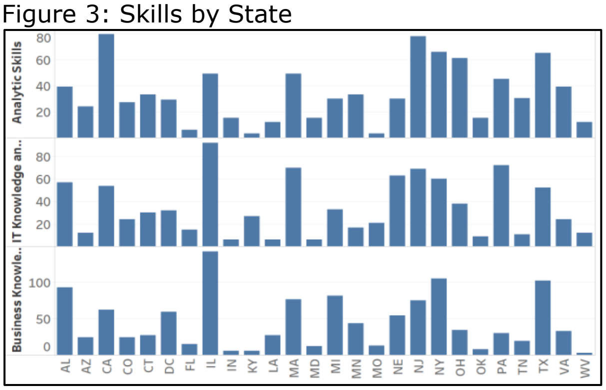
three percent of their course offerings focused on Business knowledge & Communication, 31% applied skills, and 6% IT knowledge. Table 3 shows the average coverage by skill for all of the universities.

Table 3 Percentage Skill Coverage

Skill Category	Average Percentage of total credit hours
Analytic Skills	31%
IT Knowledge and Skills	38%
Business Knowledge and Communication Skills	31%

To analyze this data in further detail, a chart of each type of skill by state was created (see Figure 3. Further data and research is needed to investigate other factors such as job market demands (type of businesses hiring) and type of university (research versus teaching institution) and how much they impact the variation in these percentages.

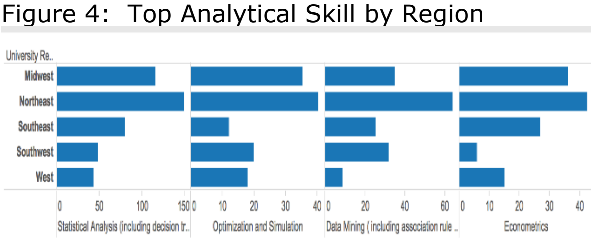
Figure 3: Skills by State



Analytical Skills

Appendix 6 shows the analytical skills for each skill by university and region. The most popular offerings within the Analytical Skills category is data mining, statistical analysis, and optimization. Universities in the Northeast and Midwest concentrate heavily on statistical analysis, data mining and optimization (See Figure 4).

Figure 4: Top Analytical Skill by Region



Many universities offer more statistical analysis skills, which provides students with a basic understanding of how to read and interpret data (statistical analytics). However, very few of the universities offered courses in special statistical analytics applications such as Econometrics and the use of specialization tools such as Deviational Analysis and Anomaly Detection.

Another important course that universities are not offering is Deviational Analysis and Anomaly Detection. This skill provides students with the understanding of why businesses fail and at the same time it provides tools to prevent and understand these errors. The data also demonstrates that while some universities focus on what the local job market demands from students, other universities provide a variety of courses to give their students choices to compete in their job market.

IT Skills

Based on the graph "IT Skills Provided per University" shown in Appendix 7, it appears that most universities are interested in providing IT skills. This may be because in today's world computers play an important role in business management and society in general. Businesses are being managed through technology, therefore it is important to study analytical skills. However, due to technology, it is necessary to learn analytical skills through the reading and understanding of databases. Even though IT is not required before taking analytical courses, the IT skills and analytical skills learning process will be parallel.

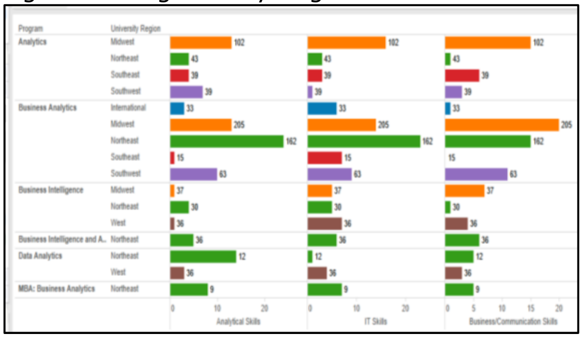
Business Skills

Appendix 8 shows the business skills courses that are offered by the different universities. Courses in Finance, Marketing and other business courses that are part of a traditional MBA are now being offered as courses in the BAN program. Many universities are probably utilizing their MBA courses in order to offer more flexibility and options for their Business Analytics program.

Skills by Region

Figure 5 shows the number of programs offered with respect to regions and three skills, and the numbers which are visible on the horizontal bar charts represent the total number of credits required in that particular region.

Figure 5. Programs by Region



Programs by Skills

Based on graphs (Appendix 7 & 8) of the number of hours required by each university and categorizing it by program, it demonstrates the disparity of credit hour requirements by university within business analytic programs. As you can see in the category of universities that offers Business Analytics programs, Michigan Technological University requires the most total credit hours. Based upon this graph, it will require substantially more money and time to complete a degree at this university. The disparity in the number of credits, particularly amongst the outliers demonstrates that a consensus for what constitutes core curriculum in a master of science in business analytics program does not yet exist.

Actionable Insights

Data Analytics is currently one of the fastest growing professions in the job market. It combines a unique set of technical and analytical skills along with business acumen. The goal of a data analyst is to turn data into actionable insights for companies, organizations and researchers to use to progress in their goals. There are a number of colleges and universities that have created programs to help facilitate the growth of students and working professionals into data scientists.

The graduate program in business analytics is appropriate for students in functional business units, the sciences, as well as information technology because it leverages information technology and business thinking to turn data into actionable intelligence. The graduate programs in Business Analytics provides students with the skills, insights and capability to transform data into insightful information that will lead to better results. Not all relevant skills are taught by universities. Based on the current dataset, there is no uniformity among the universities with respect to the skills covered. While some programs focus on the statistical methods, modeling tools, and data collection and reporting techniques needed to practice successful business intelligence others focus on students gaining more applied analytical functions in marketing, management, operations, finance, and innovation.

The career choices within a business analytics degree span a wide spectrum ranging from very technical, to statistical to excellence in communication and leadership. Prospective students should choose programs based on their career aspirations. Due to the large variety of IT Skills courses offered, universities need to make clear to prospective students what skills they will be learning so that students can ensure they are going to gain the skills they are looking for. This dataset can be leveraged not only by universities and businesses who are trying to teach/acquire the right skills, students should also closely look at the curriculum of every institution to make sure that it meets their career goals. With the availability of competitive programs online, geographic locations are no longer a limitation.

This information can be used to analyze which courses the university is currently providing to its students and which ones should be added or even removed based off other universities and job requirements. If any university wants to improve their Business Analytics enrollment for graduate or undergraduate courses they should consider adding courses targeting a variety of industries. This can help the university attract students from all around the states.

4. CONCLUSION

Google's chief economist explains that while data is abundant and widely available, "what is scarce is the ability to extract wisdom from them" (Cukier, 2010). This highlights how critical business analytics is in preparing organizations to solve 21st Century business challenges.

Business analytics is built upon the layer of Big Data available to most organizations in today's environment. Our analysis of top US analytic programs found little focus however on big data within the curriculum. Further, this analysis showing the disparity in curriculum and the number of program credit hours could serve as a call to action for the creation of a model curriculum for business analytics. We now have a somewhat lengthy history of model curriculums (and revisions therein) for information systems; the time is right to begin a similar effort for business analytics.

This paper contributes to both business analytics literature and practitioners by providing a preliminary analysis of top ranking business analytics programs in the US. The concentration depends on the orientation of the school, the geographical location and the businesses it is supporting. Future research should align these findings with job requirements.

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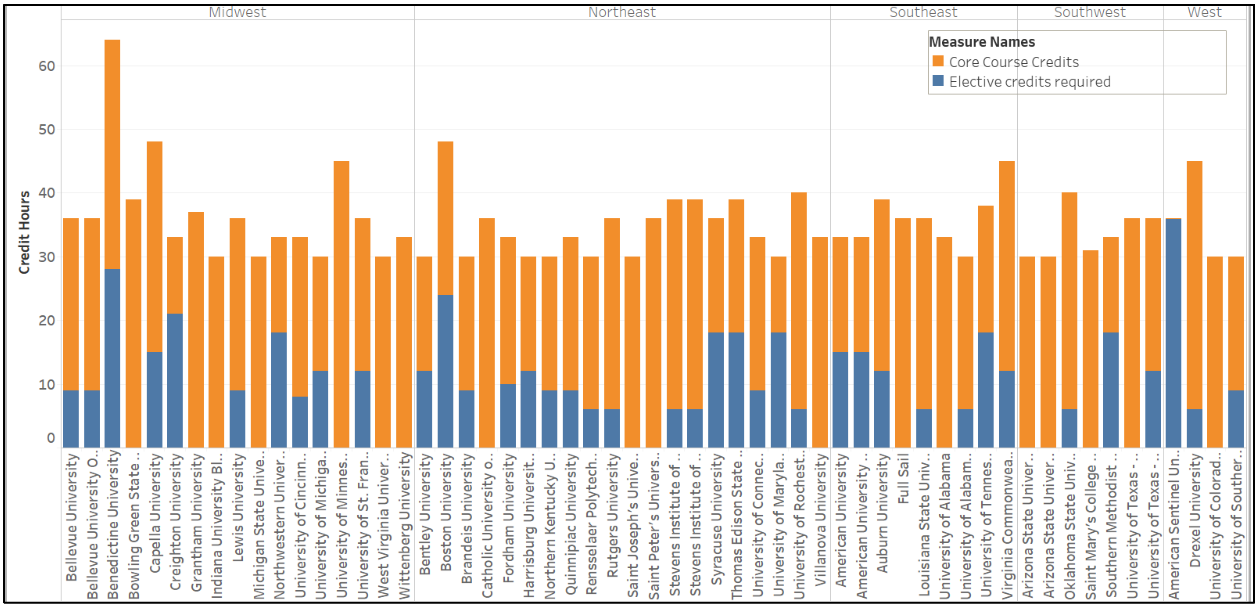
Appendix 1

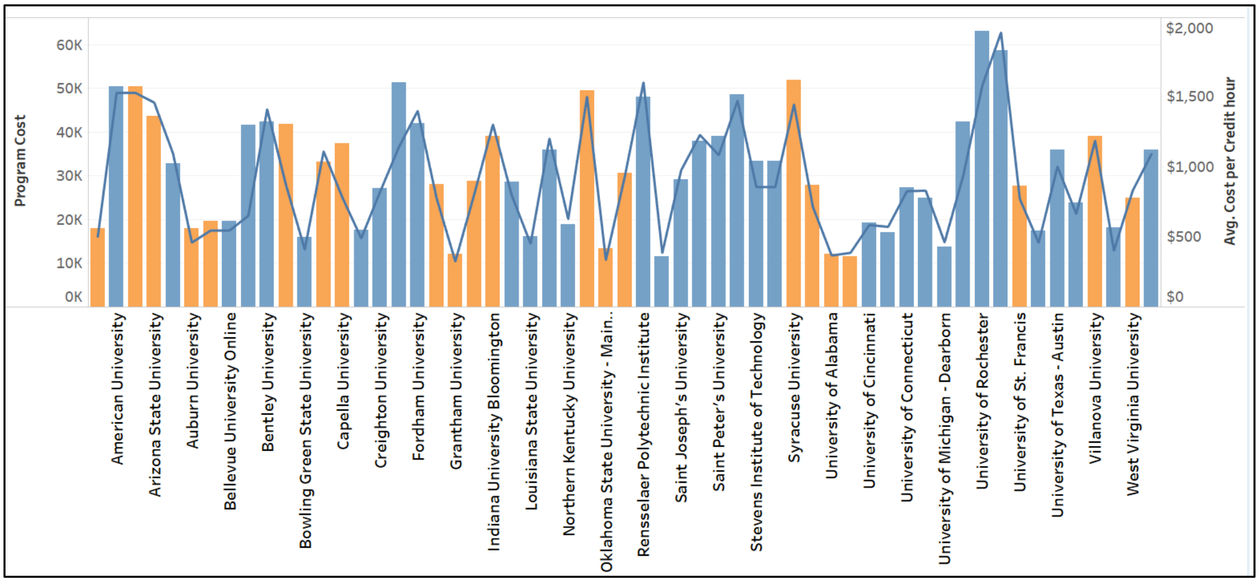


Midwest
Northeast
Southeast
Southwest
West
Measure Names
Core Course Credits
Elective credits required
Credit Hours
0
10
20
30
40
50
60
Bellevue University
Bellevue University O..
Benedictine University
Bowling Green State ..
Capella University
Creighton University
Grantham University
Indiana University Bl..
Lewis University
Michigan State Unive..
Northwestern Univer..
University of Cincinn..
University of Michiga..
University of Minnes..
University of St. Fran..
West Virginia Univer..
Wittenberg University
Bentley University
Boston University
Brandeis University
Catholic University o..
Fordham University
Harrisburg Universit..
Northern Kentucky U..
Quinnipiac University
Rensselaer Polytech..
Rutgers University
Saint Joseph's Unive..
Saint Peter's Univers..
Stevens Institute of ..
Stevens Institute of ..
Syracuse University
Thomas Edison State ..
University of Connec..
University of Maryla..
University of Rochest..
Villanova University
American University
American University ..
Auburn University
Full Sail
Louisiana State Univ..
University of Alabama
University of Alabam..
University of Tennes..
Virginia Commonwea..
Arizona State Univer..
Arizona State Univer..
Oklahoma State Univ..
Saint Mary's College ..
Southern Methodist ..
University of Texas - ..
University of Texas - ..
American Sentinel Un..
Drexel University
University of Colorad..
University of Souther..

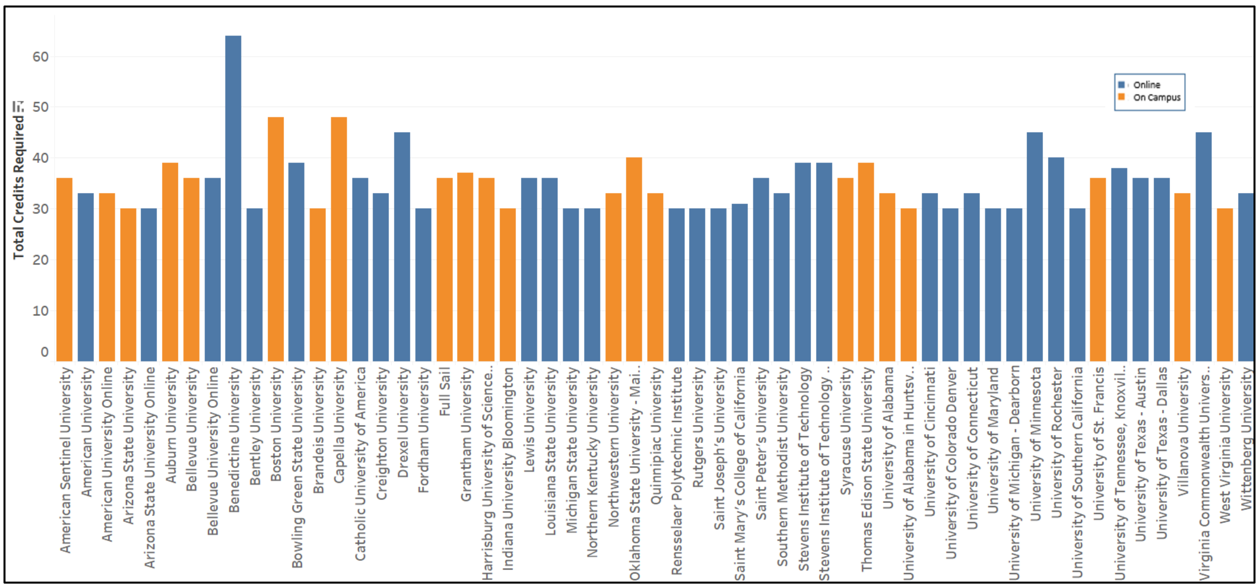
Appendix 2. Skill Classification

Analytic Skills
Data Mining (including association rule mining, classification, cluster analysis, and neural networks)
Deviational Analysis and Anomaly Detection
Geospatial and Temporal Analysis
Network Analysis and Graph Mining
Opinion Mining and Sentiment Analysis
Optimization and Simulation
Statistical Analysis (including decision tree, logistic regression, forecasting and time series analysis)
Econometrics
Text Mining and Computational Linguistics
Statistical Computing (such as R)
IT Knowledge and Skills
Relational Databases
Data Mart and Data Warehouse
ETL (Extract, Transform, Load)
OLAP (Online Analytical Processing)
Visualization and Dashboard Design
Data/ Text/ Web Mining Techniques
Massive Data File Systems (such as Hadoop)
Software for manipulating massive Data (such as MapReduce)
Semi Unstructured and Unstructured Data Management (XML, tagged HTML)
Social Media and Crowd Sourcing Systems
Web services/ APIs/Mashups
Web Collection/ Crawling and Search Engines (both Surface and Deep Web)
Cloud Computing and OO Programming
Mobile Web and Location-Aware Application
Big Data and Machine Learning
Business Intelligence
Ethics/Privacy/Security
Project Management
General IS course
Business Knowledge and Communication Skills
Knowledge in Accounting
Knowledge in Finance
Knowledge in Marketing
Knowledge in Logistics
Knowledge in Operations Management
Leadership and Communication
Knowledge in Healthcare
Applied Analytics
Marketing Analytics
Supply Chain Analytics
Social Network Analytics
Healthcare Analytics
Financial Analytics
Operation Analytics
IT for Analytics
Business Analytics Project/Capstone

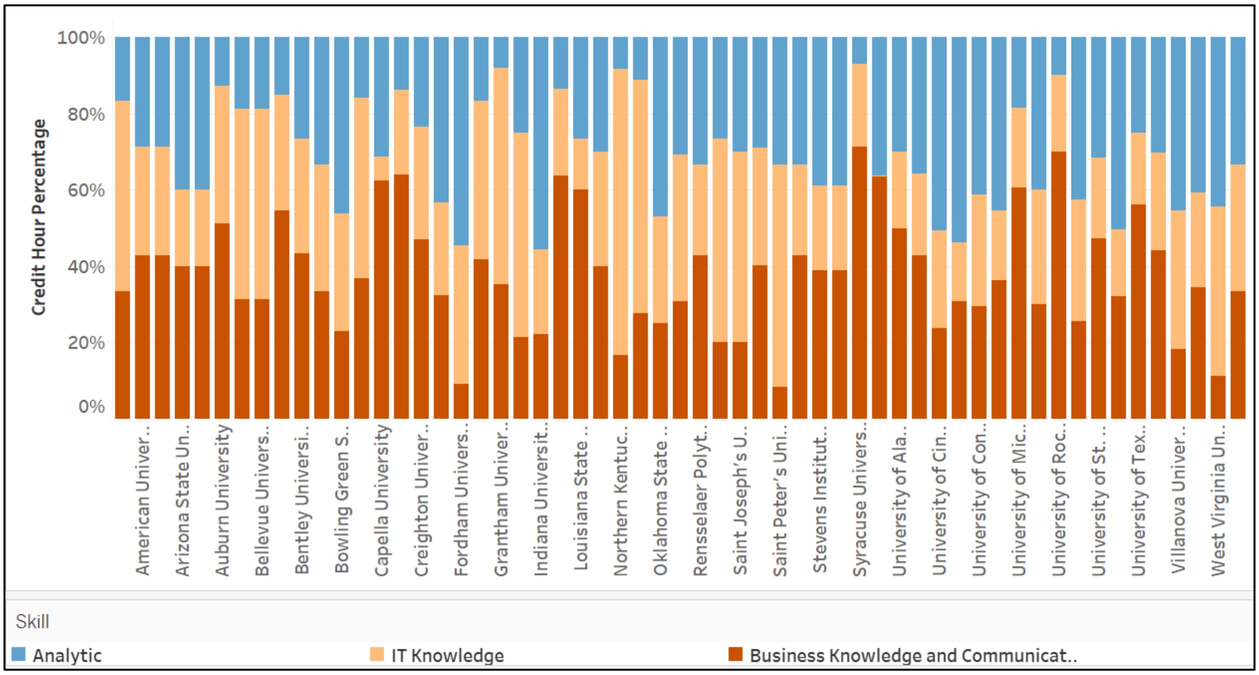
Appendix 3. Program Cost



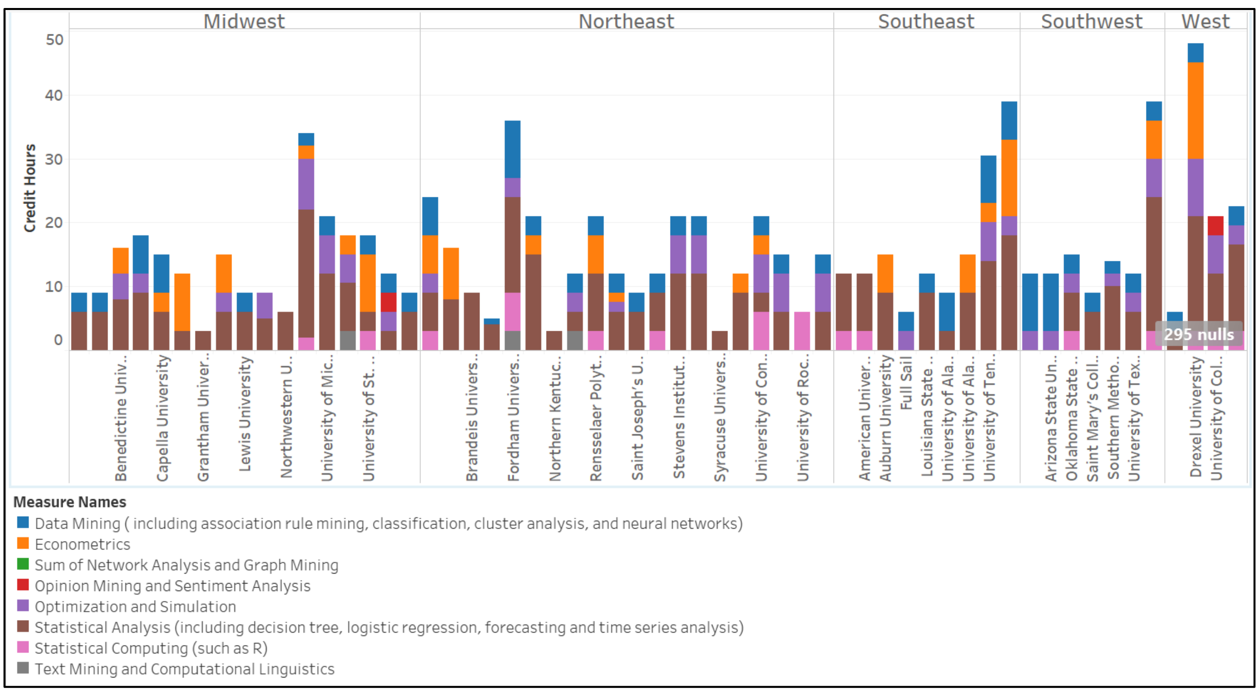
Appendix 4. Number of Credit Hours Required



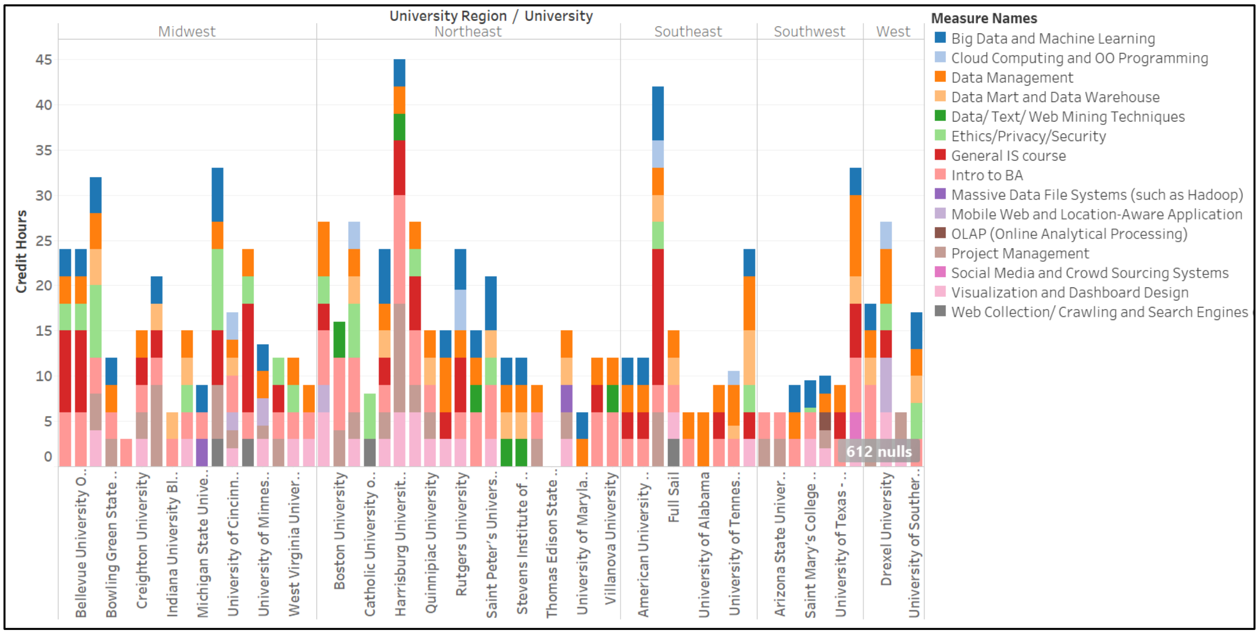
Appendix 5. Percentage Skills by University



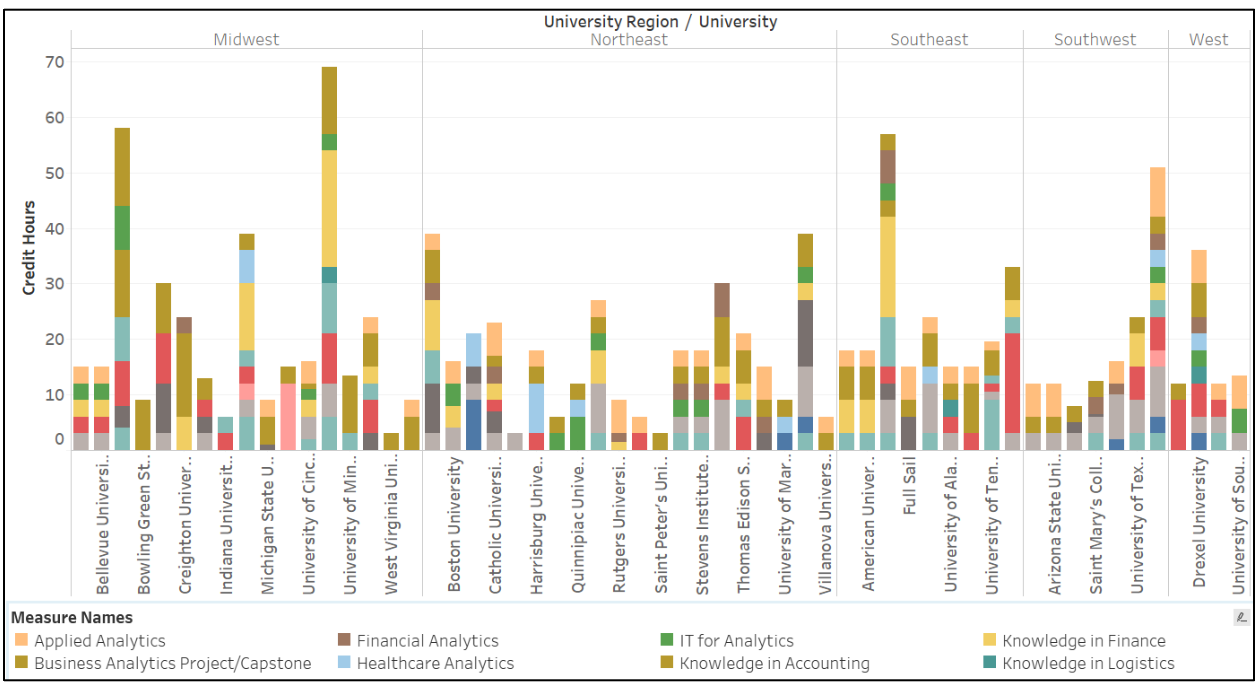
Appendix 6. Analytical Skills by University and Region



Appendix 7. I.T. Skills by University and Region



Appendix 8. Business Skills by University and Region



Administrative or Faculty Control of Online Course Development and Teaching: A Comparison of Three Institutions

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Abstract

Higher education has enrolled an increasing number of students in recent years through programs utilizing online delivery. This increase has occurred at both non-profit and for-profit institutions. Almost every department at every institution has some involvement with online education. A comparison of three quite different institutions, all offering fully online programs, will be provided. This paper will highlight the differences in administrative versus faculty control of the online course development process and the teaching of online courses.

Keywords: higher education, online, administrative control, faculty control, online development, online teaching

1. GROWTH OF ONLINE EDUCATION AND STUDENTS

Higher education enrollments have remained flat for the past three years with overall enrollments in the fall of 2015 down 1.7% (Clinefelter and Aslanian, 2016). However, in 2016, 3.5 million students were still expected to attend online degree programs with enrollments by 2020 projected to be five million (Clinefelter and Aslanian, 2016). The average age of an undergraduate online student is 29 and 33 for a graduate online student—the online student population is getting younger (Clinefelter and Aslanian, 2016). No longer are online programs considered only for nontraditional learners. Younger students are participating at a higher rate—either out of the need for convenience or because they are exposed to technology from an earlier age.

A study conducted for the Babson Survey Research Group that surveyed 2800 institutions of higher education found that the greatest increase in online program offerings occurred in private non-profit institutions, increasing their rate of participation from 22.1% in 2002 to 48.4% in 2012 (Aslanian and Clinefelter, 2013). By 2012, a large proportion of institutions, 62.4%, moved to providing complete online programs (Allen and Seamon, 2013). Most of this increase occurred in institutions that had previously been offering online courses. Allen and Seaman (2013) found that 69.1% of chief academic leaders believed that online learning was critical to their long-term institutional strategy.

In the past, online programs were often associated with for-profit institutions but this is also changing. Private non-profit institutional online enrollments grew by 11.3% while private for-profit online enrollments dropped by 2.8% (Allen and Seaman, 2016). Public institutions now have the largest portion of online students, 72.7% of undergraduates and 38.7% of graduate students (Allen and Seaman, 2016).

Online enrollments have grown significantly in recent years and there is no reason to believe this will change. Online enrollments are projected to grow in future years while other higher education enrollments are predicted to decline. Enrollments translate to tuition dollars that contribute to the overall institutional budget. Online programs will continue to play a significant role in the sustainability of higher educational institutions.

2. ONLINE PROGRAM INFRASTRUCTURE

There are many different administrative structures that provide direction and support to online programs. The type of structure in place at an instruction often varies with the type of institution and the size of online programs. More than 60% of the American Association of State Colleges and Universities (AASCU) use a central administrative unit headed by a senior administrator to manage their online systems and the larger the online delivery system, the more likely that there is a centralization of administration (Aldridge, Clinefelter, & Magda, 2013). It is also more common for schools with a large online presence to manage not only faculty development and instructional design services but to also provide marketing and student retention services (Aldridge et al., 2013). Private institutions exhibit a different infrastructure for the operation of their online programs. Forty-eight percent have an administrative unit dedicated to managing online education with 58% having a senior administrator responsible for online programs (Clinefelter & Magna, 2013). Again, the most common services provided by the centralized units are instructional design and faculty development and training (Clinefelter & Magna, 2013).

One of the most successful online systems currently in place is that offered by Southern New Hampshire University (SNHU). In 2012, SNHU had 17,000 students enrolled online and 32,000 by 2014 (Kingkade, 2014). But, by 2017, there were over 80,000 online students (www.snhu.edu/about-us). What may be most amazing about SNHU is that it is a private, non-profit institution with an on campus population of about 3,000. SNHU's online programs are operated by a completely separate business unit that is structured very much like a for-profit institution. While SNHU prides itself in being a non-profit institution, it does have some similarities to for-profit models including a large use of adjunct faculty and an online operational unit that functions much like a business. Paul LeBlanc, the President of SNHU stated the following, "We are, in many ways, creating a new hybrid non-profit, one that melds a lot of the best operational practices of the for-profits with the values and mission of our non-profit status (and don't let anyone tell you there isn't a difference." (Kingkade, 2014).

This information shows that online program administrative structures can simply provide faculty training and support. Or, they can be a completely separate and autonomous business unit that handles all components for enrolling and retaining online students.

The survey of public institutions conducted by Aldridge et al., (2013) as well as the survey of private institutions by Clinefelter & Magda, 2013) found the following categories of services related to online programs: Enrollment management, bookstore, student retention and support services, academic advising, tutoring, marketing, orientation, LMS hosting, 24/7 technical support, ombudsperson, instructional design, and faculty development and training. At all public and private institutions that were surveyed, the most common services handled by the online program administration are the following: Faculty development and training, instructional design, and orientation (Aldridge et al., 2013; Clinefelter & Magda, 2013). At public institutions, it is more common for academic advising and student retention and support to be provided through the online offices (Aldridge et al., 2013) while at private institutions, more common for online to host the Learning Management System (LMS) and provide 24/7 technical support (Clinefelter & Magda, 2013). Both types of institutions indicated that the online services they considered to be most exemplary were instructional design and faculty development which were both most likely to be administered by a central online unit (Aldridge et al., 2013; Clinefelter & Magda, 2013).

3. INSTITUTIONAL EXAMPLES AND COMPARISONS

A review of three institutions as well as how they managed the foundations of their online programs, including: marketing, admissions, LMS, technology, program evaluation, student services, instructional design, and faculty development follows.

Institution A

Institution A is a large for-profit University with an initial online focus on graduate programs. It is regionally accredited. Institutional wide, fully online programs were first offered in the fall of 2006. Within a year, student enrollments approached 1000 and at this point in time, enrollments are approximately 3303 (www.princetonreview.com). At one point, the enrollments were reported at over 7,000 but the recent problems within the for-profit industry seem to have taken its toll on the institution's online enrollments.

There was a centralized, online business unit that operated virtually all aspects of the online program delivery. Academic control rested with the deans, department heads, and full time faculty within the University but there were many academic functions, including online faculty training and hiring, instructional design, and student advisement that were managed within the online business unit. Strong relationships and reporting lines were built between the business units and the main academic schools and departments of the University but the business unit held a large amount of control regarding the offering of online programs, including the daily operations of managing faculty and online teaching.

The criteria for admissions was set by the main academic entities within the institution but all marketing, recruitment, student advisement and support, LMS, 24/7 technology support, program evaluation, as well as all faculty services were conducted and managed by the online business unit which was headed by a businessman (not an academic officer) whose highest degree earned was a MBA. There was tension between the academic units and the business unit with the academic units believing that the business unit was most interested in profitability and the business unit believing that the academic units operated too slowly and without enough of a thought toward return on investment (ROI). The business unit was to earn a high level of profit which was invested into the corporate structure and into supporting the online business unit.

Full time faculty members were hired on an annual contractual basis. Part-time faculty members were hired only for a specific term with no guarantee of employment beyond the term. All faculty members completed an online training certification that was delivered via online by the business unit. In addition, the LMS collected a large amount of data on a daily basis that tracked faculty involvement in the course, including, the number of days a faculty member was in the online course each week, the number of discussion postings submitted for each discussion, the timeliness of grading assignments, and all interactions with individual students and the class. Faculty members were required to contact students via phone at the start of each semester and to monitor all students each week for at risk behaviors—lack of participation or poor grades. Each morning a list would be produced that supplied the names of the faculty members who were not meeting the requirements for teaching—they may not have been in the online course for two days or may not be participating to the required level in the online course. This list was submitted to an academic department head within the online business unit who would then be required to contact the faculty members to advise them of the corrective actions that were immediately needed.

All faculty members were required to complete the online teaching certification prior to being assigned courses. Faculty members were approved to teach courses through a faculty credentialing office housed within the business operation. During the delivery of the course, if the faculty member was found to be involved less than was desired or was not meeting any number of teaching criteria, that faculty member was immediately counseled. But, if corrective action was not taken, the faculty member would be replaced during the actual term of teaching. The teaching process was structured, mandated, and with little flexibility, even at the doctoral level.

The design of the online courses was done utilizing a master syllabus that had been approved by the academic department head and full time faculty within the institution. However, there was a complete standardization of all online courses—an instructional design team worked with a person approved by the department head to be a subject matter expert (SME). This may have been one of the faculty members who taught the course once it had been created or the SME may never have taught or would teach the course. The SME worked with a team of instructional designers and media creation experts to create the complete online course. The SME created the content map with the design team and provided oversight and review to the content created by the design team. Once the course was completed, it was reviewed by the academic department. This process may have taken as long as six months though there was a huge effort for it to be completed in less than four months. A SME would receive approximately $2500 for their services. Once the course was ready for delivery, it was copied into every section being offered online, whether or not a full time or part time faculty member was teaching. All faculty members needed to teach the course as it had been designed with little flexibility. The concept of master course design and the standardized teaching requirements were viewed as ensuring a high quality student experience and avoiding a situation in which one student may have a robust online experience while another received little faculty interaction or inferior course learning materials. There was no faculty freedom regarding the teaching of content and there were tightly constructed requirements regarding teaching and responsiveness to students. This included a 24 hour response time for all emails and course messages, a 48 hour turnaround time for grading all assignments, and a requirement to be actively present five out of seven days each week with no two consecutive days absent from the online course.

Institution B

Institution B is a small, non-profit professional school whose major online initiative was created in 2006 to target graduate students at the master's and doctoral levels. It is also regionally accredited. Within a year, enrollments were close to 1000. Current enrollments are listed at 1308 as reported by the school to the U.S. Department of Education (www.collegetuitioncompare.com). When the initiative first began, there was a centralized online administrative unit that functioned as an independent campus, headed by a campus president who reported to the system president. The unit was headed by an academic administrator who had a terminal degree in higher education management and many years of on ground and online teaching experience. The president also had business operations background and experience with managing the profitability of online programs. However, the largest focus was on the academic quality of courses and programs, superior student support, and in providing best practices training to the faculty who taught online, full time and part time. Faculty members who taught online were hired from the on ground faculty, hired full time for the online campus, or were part time faculty on ground or part time faculty hired to teach only online. All faculty members were required to complete an online training certification course that was offered via online delivery through the online campus.

An academic dean reported directly to the online campus president with a dotted reporting line to the institutional Vice President for Academic Affairs (VPAA). All online programs that also had an on ground offering were connected in terms of reporting to the on ground department heads while programs that were created to only be online were housed under the online academic dean within the online campus. All admissions criteria were approved by the VPAA. Marketing and advertising was done through a joint venture of the online campus and the traditional department of the institution to save startup costs. However, admissions, financial aid, registration, financial services, student advisement and support, LMS, 24/7 technology support, instructional design, and faculty training and management were handled by the online campus. The online campus was provided a high level of autonomy, both academically and financially with an expectation that there would be significant profitability from the online programs being offered returned to the educational system and that the online campus would be self-supporting.

Faculty members were not able to teach online (even if they were full time faculty on ground) unless they completed the online faculty certification course. In addition, they were required to maintain standards of best practice that included: weekly participation requirements- five days per week in the course with no two days in a row off, timeliness of the grading of assignments (all grading completed with grades posted within 72 hours after the assignment due date), and responsiveness to students, ex: less than 24 hours for email response. If a faculty member, full or part time was found to be performing to a less than stellar requirement, they would be counseled but if this was not effective, they could, in fact, be immediately replaced during the term. All full time faculty members of the institution were contractual employees and most were on multi-year contracts. However, this would not prevent them from being replaced in the online courses if they were not performing to the required level. Part time faculty members were contracted only for the current session and could also be replaced at any point during or after a session.

Instructional designers (IDs) were housed within the online campus. A master syllabus that was approved by the appropriate academic department was used by a SME, who was also approved by the appropriate academic department, to create the online course learning materials. The SME would complete the content map and the instructional designers would functionally create the online course materials and all associated media and utilization of technology. The process would take approximately 16 weeks with a number of review steps built into the system. Once the course was created, the appropriate academic department head would complete the final review or assign another faculty member to complete the review. A completed course would entail the SME receiving approximately $4,000 for his or her work. Once a course was deemed acceptable, the course would be placed into operation. Most often, the SME would also become the first instructor to teach the course online. Again, if multiple sections were being offered, the course would be copied across all sections to ensure the standard student experience and the same learning materials. There was little opportunity for flexibility with the online course content. Faculty could add materials to their courses but were not able to delete any materials from the standard course. This option did provide them with an opportunity to use a current event or something from a personal teaching interest without compromising the standard course offering. Once the course was offered for the first time, the SME with the assistance of an instructional designer would make any needed corrections to the online course content. There was a prescribed method of teaching with standard online course content duplicated across all sections.

Institution C

Institution C is a private, non-profit institution that began a focused online initiative in 2010. Online programs focused on enrolling undergraduate and master's level students though there has been a recent expansion to include one online doctoral program. In the fall of 2010, 74 students were enrolled online with enrollments increasing to a high of 922 by October of 2013. Online enrollments for the spring of 2017 were 628. The institution has undergone a number of changes in the administration of online programs, including several changes in management and multiple changes in oversight regarding the components of online program delivery. For example, at one point there was an academic administrator at the Vice Presidential level in charge of most components for online programs. Currently, there is a senior level administrator in charge of online programs but no longer is this person dedicated to online but instead manages multiple operations within the University. There have also been numerous changes to the management of operations such as LMS, 24/7 technology support, and admissions. Furthermore, the online offices are less involved in marketing and advertising than in the past. While it cannot be proven that these changes contribute to the decline of online enrollments and there can be any other number of reasons, it is important to recognize these operational changes.

As mentioned, in 2010 an online initiative began with an institutional commitment to creating a large online presence at the University. The President indicated that full support would be provided to the online operational unit and that while it would function from within the academic affairs division, it would have sufficient autonomy to allow for rapid growth and flexibility. At the point of startup, the following operations fell directly under the online office: marketing for online programs with a cooperative relationship with overall marketing with the traditional marketing department (ex: website updates), admissions, instructional design, online faculty training and development, student services and support, LMS, and helpdesk support that was not yet 24/7. This placed online program components almost 100% under the jurisdiction of the online program division. Though it had been initially discussed to have a completely separate business unit created (much like SNHU), this had been vetoed by the President. It was also not long that a decision was made to house admissions within the traditional admissions department which had little experience in the recruitment of online students. Subsequently, admissions was moved back to the online division and then, again, ultimately moved back to the admissions department where it currently resides. Student services, instructional design, and faculty training remain within the online offices but all other components are now managed by the traditional departments within the University.

Before further discussion takes place regarding instructional design and faculty training and support, it should also be understood that both the full time and part time faculty members are represented by unions. While full time faculty members have been so represented for many years, it has only been in the past year that the part time faculty members voted to join a union. For the sake of this writing, focus will be on the collective bargaining agreement (CBA) of the full time faculty and its implications on online teaching and development. At this point, little is known regarding the implications of the part time faculty union.

All online course creation, online faculty training requirements, and faculty online teaching requirements are governed by the CBA and negotiated with the faculty union. The current contract provides many details regarding what the online unit may require and enforce. These include: the academic department determines who is qualified to teach online courses; no single model of instructional strategies will be required with each academic department and the online unit working together to determine a model for each course; and, faculty must complete designated training and agree to course assessment (Collective Bargaining Agreement, 2017). There is also a minimum set of standards for all online courses at the University based upon Quality Matters, the Online Learning Consortium Quality Scorecard and the regional accrediting body of the institution (Collective Bargaining Agreement, 2017). While courses are to be based upon the departmental syllabus, there is no requirement for standard content in courses; two sections of the same course could have very different materials and requirements. In addition, there are no set rules regarding faculty participation in courses, response time to students, or turnaround time for grading assignments. The following could take place, and actually has: a faculty member sent email to students stating that after 5pm on Fridays s/he will not be available to students until 9am on Mondays, student assignments are not graded until the final week of the course, faculty have little or no participation in the weekly discussion questions, or, content has been created that is very basic with little opportunity for student-student or faculty-student interaction. There are no steps in place to formally counsel a faculty member (the academic department head can have a discussion with the faculty member) or to remove the faculty member from a course in the event of inferior instruction. In addition, once a faculty member has taught an online course, that course becomes their first right of refusal for the next three years even if they have a less than stellar performance in teaching online. All faculty mentoring or counseling is done by the traditional academic department head. The online office has no ability to discuss performance with any faculty members, full or part time. Faculty members are paid $2448 for the development of an online course.

In the past, the use of part-time faculty was actually more attractive in a number of ways since part-time faculty did not necessarily have seniority. They had no protection from being replaced. The unionizing of the part-time faculty may significantly change this in the future.

While completion of training in order to teach online is required, the ability to hold faculty to the standards of best practices does not exist. Once faculty members complete their training and are assigned to an online course, they are fairly free to teach as they wish.

Comparisons

Table 1 in the appendix shows the accountability of the main components of online program delivery and support across the three institutions. Table 2 shows examples of issues and some institutional responses.

The previous section and tables 1 and 2 exemplify the differences across the three institutions. Institution A placed the online unit clearly in charge of all areas of online programs. While there was coordination with the academic departments, clearly the ultimate decisions and operations rested with the online business operation unit. There was a standardization of all online courses, faculty performance requirements, and no special consideration was given to full time faculty who did not perform well in online teaching.

Institution B had much stronger connections to the academic departments and recreated an academic structure within the online campus itself. There was standardization of online courses, faculty performance requirements, and no special consideration given to full time faculty who did not meet performance requirements.

Institution C has the strongest connection to the traditional academic departments. While there is a requirement for faculty training and instructional design support supplied, there are few set standards for course design and the online department has no ability to enforce performance standards for faculty. In addition, faculty members are provided much more freedom regarding the manner in which they design and teach their online courses. They also have a stronger guarantee to remain teaching no matter their performance.

The Learning House, Inc., and EducationDynamics (2014) found that while academic rigor and faculty engagement are relatively equal between non-profit and for-profit institutions, faculty members at for-profit institutions were reported to be higher touch with a slightly higher level of engagement than faculty members at non-profit institutions, 70% versus 59% of faculty providing quite a bit or very much feedback on assignments. In addition 73% of students at for-profit institutions versus 62% of students at non-profits reported that their faculty used examples or illustrations to explain difficult concepts (The Learning House, Inc. and EducationDynamcis, 2014). This may be explained by the enhanced course design that is often found in the for-profit sector such as that which existed at Institution A.

It should be noted that none of these institutions were public. While there may be similar organizational structures at public institutions, these were not addressed in the comparisons offered here.

4. ONLINE STUDENTS' EXPECTATIONS

A study in improving student satisfaction with online faculty conducted by Schubert-Irastorza & Fabry (2011) showed that students want the following: timely and meaningful feedback with useful feedback on improvement; grades posted in a timely manner, well-organized sequence of instruction, clear explanations, encouragement, and instructor participation. This means that faculty members need to be well prepared with clear grading expectations, need to provide consistent course information, need to respond to students quickly, and, need to be actively present in the course through participation and establishing relationships with the students (Schubert-Irastorza & Fabry, 2011). Clearly Institutions A and B have these requirements for faculty in place while Institutions C does not.

Trammell & Aldrich, (2016) found that students did not have different expectations regarding online versus on ground faculty—they wanted faculty to be approachable, enthusiastic, positive, knowledgeable, organized, consistent, friendly, quick to respond, and with strong teaching skills. The ability to meet these expectations online may be more difficult than the ability to meet them on ground. Furthermore, if there are no standards that must be met or for which faculty may be held accountable when teaching online courses, it is quite possible that some students will not receive the best experience.

5. HOW CAN ONLINE COURSES AND FACULTY MEET STUDENT EXPECTATIONS?

One method of ensuring that the expectations of online students are met is through quality course design and quality teaching. Quality Matters (QM) is a set of rubrics that contains eight general standards and 41 specific standards with the eight standards as follows: Course review and introduction, learning objective/competencies, assessment and measurement, instructional materials, learner interaction and engagement, course technology, learner support, and accessibility (Crews & Wilkinson, 2015). While QM centers mostly on quality online course design, good teaching as researched by Chickering and Gamson, 1987, as found in Crews & Wilkinson, 2015), is described as that would does the following: encourages contact between students and faculty, develops reciprocity and cooperation among students, uses active learning techniques, gives prompt feedback, emphasizes time on task, communicates high expectations, and respects diverse talents and ways of learning.

Utilizing a system such as Quality Matters and requiring an adherence to the practices of good teaching can only serve to increase the quality of online course delivery. However, there are implications when dealing with union contracts as was explained in the discussion regarding Institution C. In an article written by McGahan, Jackson, & Premer (2015), it was found that instructional designers exhibited some difficulty in developing online course evaluation standards for faculty at the University of Nebraska due to the academic freedom protected under the faculty contract. This is the same problem at Institution C.

If course development is predominately left to the faculty to control, there could be a number of instances in which courses are not designed to standards such as those of Quality Matters. If there is little to no standardization or requirements, the quality of the course and its delivery are left completely in the hands of each faculty member. This is not the case at Institutions A and B but is at Institution C.

6. CONCLUSION

The more ability an organization has to ensure standards of design and practice, the more likely there is to be a positive student experience in the online classroom. Utilizing the best practices in instructional design leads to higher quality online courses. Training faculty in the best practices of online teaching further enhances the likelihood that the students will receive a quality instructional experience. While many faculty members reject the standardization of course design and the implementation of faculty requirements related to participation and feedback, research shows that such standards could further contribute to the successful student experience.

Institutions must continue to develop methods to provide students with quality courses and teaching while at the same time balance the professional treatment of the faculty. The faculty must recognize that they have a duty to provide students with the highest quality of instruction.

Hiding behind collective bargaining agreements or the concept of academic freedom is not the best way to provide a quality teaching experience. Taking advantage of technology, training, support, and working cooperatively with instructional designers will provide all constituents with the best possible experience and opportunity for teaching and learning.

There are a number of lessons to be learned from the reviewed organizational structures. An administrator might argue that the more control administration has the better. A faculty member might contend that they are most qualified to determine course content and teaching practices. The optimal situation to allow for the creation of quality online courses and the most effective online instruction is for administration and faculty to work together. Both should acknowledge that the student experience and subsequent learning should be the ultimate goal of everyone.

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Appendix

The following table shows the accountability of the main components of online program delivery and support across the three institutions:

Component	Institution A	Institution B	Institution C
Marketing	Online	Shared	Online and Shared
Admissions	Online	Online	Multiple changes
LMS	Online	Online	Online to IT
Technology	Online	Online	Online to IT
Student Services	Online	Online	Online shared with Student Affairs
Faculty Training	Online	Online	Online Shared with Teaching Center
Instructional Design	Online	Online	Online

Table 1: Institutional accountability for online

Issue	Institution A Resolution	Institution B Resolution	Institution C Resolution
Faculty online training	Training required	Training required	Training required
Faculty best practices adherence	Performance required	Performance required	No performance standards enforced
Instructional design	Course standardization across sections	Course standardization across sections	Minimum standardization across sections
Full time faculty rehire	Only if meeting performance standards	Only if meeting performance standards	Three year commitment
Removal from teaching an active course	Possible	Possible	Not possible

Table 2: Examples of issues

Managing an NSF-Funded Information Technology Scholarship Program

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Abstract

Our nation's competitive edge is highly dependent on the success of STEM education and the ability of information technology (IT) graduates to find jobs. The School of Information Technology at Illinois State University (ISU) is strategically positioned to offer S-STEM scholarships to talented, financially disadvantaged students in the IT discipline. This article shares our experience and strategies from managing the ISU CS/IS Scholarship Program, a National Science Foundation (NSF) S-STEM scholarship grant. Leveraging our unique educational setting and multiple student support activities, we were able to provide financial support as well as implement several strategies needed to educate and retain qualified undergraduate IT students.

Keywords: Information Technology, Scholarship, STEM, Education, Recruitment, Retention

1. INTRODUCTION

In the late 2000s, we witnessed a steady decline in information technology (IT) enrollment among incoming freshmen. In 2009, the National Secondary Computer Science Survey by the Computer Science Teachers Association (CSTA) indicated that there was an 8% drop from 2005 to 2007 and a 13% drop from 2005 to 2009 in the percentage of high schools that offer AP computer science (CS) classes (Nagel, 2009). Although many factors contributed to decreases in course offerings and enrollment decline (i.e., outdated curricula, other competing STEM majors, changing technologies and marketable skills, as well as lacking interest in the IT major; Kershenbaum, Hadimioglu, Ivanov, Schiaffino, & Hoffman, 2006), researchers were concerned that declining enrollment and the lack of public interest in computer science and information systems majors would have a significant impact on U.S. competitiveness and socioeconomic health (Klawe & Shneiderman, 2005).

Fortunately, in recent years, IT enrollment has been increasing. According to the CRA Taulbee Survey in 2007–2008 (Zweben, 2009), the United States experienced a 6.2% increase in the number of freshmen enrolled in computer science programs. The survey also showed an increased number of CS graduates and near 100% employment for new PhDs in CS. Although these numbers were encouraging, recruiting talented IT students, especially from underrepresented populations (i.e., female, minority, and low-income students), has been an ongoing challenge. Educational opportunities may not be available to minority students living in low-income areas. Moreover students with disabilities and minorities were the least likely to receive a college-level education or to choose IT as an undergraduate major. Moreover, the retention of students majoring in STEM areas was another important concern for educators. A report from U.S. Department of Education (Chen, 2013) showed a high attrition rate for students in STEM majors from the years 2003–2009, which was 48% by 2009. The attrition rate for students in computer/information sciences bachelor's degree programs was the highest among STEM programs, with 59% of students leaving the degree programs by 2009: 31% did not graduate, and the other 28% switched to non-STEM majors.

Under the Division of Undergraduate Education, the National Science Foundation (NSF) Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) program intends to address the need for a high-quality STEM workforce in the United States and motivates "low-income academically talented students with demonstrated financial need" (National Science Foundation, 2017, Synopsis section, para. 1) to pursue academic degrees in STEM disciplines. Responding to NSF S-STEM solicitation in fall 2009, we proposed the ISU CS/IS Scholarship Program (2010–2015) pursuing the following objectives: (a) to provide S-STEM scholarships to academically talented, financially disadvantaged students majoring in either Computer Science and Information Systems (CS/IS) or Mathematics with a CS/IS minor; (b) to enhance the educational experience and increase retention among the S-STEM scholars; and (c) to assist the S-STEM scholars in finding employment opportunities.

Our proposed project received the necessary funding from NSF during the period from March 2010 to 2015, and a 1-year no cost extension was granted until March 2016. The objectives of this article are: (a) to communicate to STEM educators the characteristics of our proposed project; (b) to evaluate the effectiveness of our recruitment, retention, and job placement strategies; and (c) to share our experience from managing an S-STEM scholarship program. The next section summarizes the unique characteristics of ISU CS/IS Scholarship Program.

2. CHARACTERISTICS OF THE ISU CS/IS SCHOLARSHIP PROGRAM

The focus of our proposed scholarship program was to encourage academically talented students with financial need, especially underrepresented students (i.e., female, financially disadvantaged, minority, or physically challenged students), to pursue a specialization in IT majors and to help reduce the financial burden of their college education by providing financial support through S-STEM scholarships. It was our goal that those who successfully graduated from our program would become an essential part of the IT workforce or pursue other graduate or professional degrees, fulfilling the national need for IT professionals.

We put our efforts into three categories: recruitment, retention, and job placement. Figure A1 (found in the Appendix) illustrates and summarizes the logistical phases of our recruitment, education/retention, and job placement activities during the funding period. These three activities helped measure the success of the ISU CS/IS Scholarship Program.

- *Recruitment*: Award at least 30% of S-STEM scholarships to underrepresented (i.e., female, minority, or physically challenged) students.
- *Education/Retention*: Retain at least 60% of the scholarship recipients within the IT majors.
- *Job Placement*: Place 85% of graduates in an IT career path or continuing graduate education.

Through the process of recruitment, retention, and placement, we originally proposed to offer a total of around 35 S-STEM scholarships to five cohorts of qualified students over the academic years 2011–2012 (fall 2010) through 2015–2016 (fall 2014). We awarded both *full scholarships* to qualified IT students for up to 4 academic years of full-time enrollment and *transfer scholarships* to qualified IT students for less than 4 academic years of full-time enrollment because nearly half of the IT students were transfer students from the local community colleges. We originally planned to provide approximately 18 full scholarships (4 academic years) and 12–36 transfer scholarships (less than four academic years to qualified current/transfer students). Using the average debt of $18,200 for our undergraduates (in fall 2009, after financial aid), each scholarship recipient—whom we refer to as an NSF scholar—would receive up to $5,000 per academic year and would continue to receive the same installment for up to 4 academic years of full-time enrollment as an IT major (or as a math major with an IT minor) while maintaining good academic standing (GPA > 3.0). Stipulated by NSF, the total amount of award payout to each NSF scholar is also determined by each individual's financial need, as determined by the cost of attendance (COA) minus the estimated family contribution (EFC). We anticipated that our targeted recruitment and retention strategies could reduce the number of student dropouts and would assist NSF scholars with educational expenses up to $20,000 over the 4-year period.

The next section describes the strategies of the ISU CS/IS Scholarship Program and the factors contributing to the success of our program.

3. RECRUITMENT, RETENTION, AND PLACEMENT EFFORTS AND OUTCOMES

Recruitment

We collaborated with the ISU Office of Admissions; the Center for Mathematics, Science, and Technology (CeMaST); the Chicago Public Schools system; and several local community colleges. They provided leads to our targeted populations. Throughout the funding period, open houses on the university's campus also provided an effective venue for us to meet with prospective students. Our recruitment strategy was also meant to change the perception of the IT profession as a weak job market (Lomerson & Pollacia, 2006; Panko, 2008); to educate students, parents, and counselors about IT career prospects (Carter, 2006; Panko, 2008; Zhang, 2007); and to encourage schools to increase students' exposure to computer science or information systems courses (Baker & Finn, 2008). Whenever there was opportunity, we also tried to address gender biases in IT, challenge stereotypes of IT professionals (Carter, 2006; Cory, Parzinger, & Reeves, 2006), and clarify misconceptions about the difficulty of IT programs (Carter, 2006; Zhang, 2007).

Retention

In a study of a scholarship program in Georgia, the researchers found that students majoring in science, engineering, and computing were "21 to 51% more likely to lose their . . . Scholarships than students in other disciplines" (Dee & Jackson, 1999, p. 381) as students from these technical disciplines had "fewer opportunities to earn high grades" (p. 381). To address the problem of attrition, we leveraged our existing support structures and instituted newer ones for our NSF scholars. Existing resources included debugging assistance (help with fixing an erroneous computer program), a department scholarship award reception, an IT student club, and several student-related academic services established by the university. The following student support activities were instituted for the ISU CS/IS Scholarship Program: faculty mentoring, peer mentoring, undergraduate research seminars, industry field trips, and face-to-face and online social networking, which included a list of current job openings from various online sources.

Job Placement

Through the online social networking website, NSF scholars received updates on internships and employment opportunities. Two industry advisory boards established by the School of IT provided up-to-date lists of marketable skills and job opportunities, which we conveyed back to our scholars. We also searched the Internet job sites and posted available positions on our online social networking website.

Table A1 (found in the Appendix) shows the list of previously existing and new student support activities corresponding to our recruitment, retention, and placement efforts.

Outcomes

The ISU CS/IS Scholarship Program had awarded 54 S-STEM scholarships to qualified students. As of this writing, 34 scholarship recipients had graduated from our program (63%), 17 had left the program (31%), and three remained active in the program (6%). Table 1 shows the status and percentages of our scholarship recipients.

Status	Count	%
Active	3	5.56%
Graduated	34	62.96%
Left Program	17	31.48%
Total Scholarship Recipients	54	100%

Table 1. Status and Percentages

Based on our measurable outcomes for success, we originally proposed to award at least 30% of S-STEM scholarships to underrepresented or disadvantaged students. Our recruitment efforts attracted 19 qualified underrepresented students (35.2%) into the scholarship program. Among the underrepresented students, there were 11 female, five minority, and six physically challenged students; there were three physically challenged students who were either female or belonged to a minority group. Importantly, 13 out of 19 underrepresented NSF scholars graduated from our program (68%). Unfortunately, we fell just short of fulfilling our job placement outcome: Only 28 out of 34 graduates (82%) pursued an IT profession (job placement for three graduated students was unavailable). Table 2 shows the results of our proposed efforts in recruitment, retention, and placement.

Strategies	Measurable Outcomes	Results
Recruitment	30% of S-STEM scholarships awarded to qualified underrepresented students	35% of S-STEM scholarships awarded
Retention	60% of S-STEM scholars graduated within their designated majors	63% of NSF scholars graduated
Placement	85% of graduates pursued an IT profession	82% of NSF scholars worked in field

Table 2. Recruitment, Retention, and Placement Efforts and Outcomes

4. EXPERIENCE FROM MANAGING THE SCHOLARSHIP PROGRAM

Recruitment

We leveraged our connection with CeMaST, the ISU Office of Admissions and the Financial Aid Office, the Chicago Public Schools system, and some local community colleges. We also targeted our efforts to the groups of potentially interested underrepresented students (i.e., female, minority, and physically challenged students) nominated by their high school advisors. In several cases, we personally met with potential students at their high schools in small discussion or workshop groups. During these meetings, we introduced them to the field of computer science and information systems, the future of IT occupational demands, and the nature of the IT profession and informed them about scholarship opportunities. The ISU Office of Admissions also helped distribute brochures and promotional materials to high school guidance counselors and computer science and mathematics teachers throughout Illinois.

Although the required average ACT score of 27 for the scholarship was the main barrier for many qualified underrepresented students, combining other practical experience (i.e., IT certification, computer aptitude test, or a brief personal statement) and high school class rank comparable with the top 20% of all enrolled students in our CS/IS majors with ACT score was beneficial to our recruitment efforts when a student's GPA was less than 27. To be eligible for an S-STEM scholarship each semester, students were required to be a full-time student, demonstrate financial need (as determined by FAFSA), and maintain at least a 3.0 GPA overall.

We originally proposed to award approximately 18 full scholarships and 12–36 transfer scholarships (see Section 2). Based on each individual's financial need, we awarded 30 full scholarships and 24 transfer scholarships to qualified students.

Retention

NSF scholars were required to maintain at least an overall 3.0 grade point average every semester or risk losing the scholarship. Therefore, retaining NSF scholars presented a new challenge. Many top 20% students from underrepresented high schools experienced "academic culture shock"—their academic performance was considered "average" when compared to other high achievers—and this effect was even more difficult for the physically challenged NSF scholars. General education courses and the required mathematics courses that are taken during freshmen and sophomore year added to the difficulty of retaining NSF scholars. For these courses, the first 2 years of undergraduate courses prove to be the major hurdle for STEM majors. Several of underrepresented scholars failed to receive the full 4-year scholarship because their academic performance disqualified them as NSF scholars, forcing them to quit the program within the first 2 years. Some of them switched to non-IT or non-STEM majors altogether.

For the IT majors, computer programming was another barrier that NSF scholars had to overcome. In order to retain STEM majors, Varma (2006) suggests that we must make technologies accessible to minorities, understand their specific needs and background, and allow open communication among their peers. Therefore, to motivate our NSF scholars with a sense of belonging in the cohorts, our award acceptance letter stipulated that NSF scholars must accept the statement of responsibilities, as shown in Figure 1, and participate in student support activities.

With additional monetary support from our college, we had a graduate administrative assistant working with us to keep track of student required responsibilities and participation. Most successful NSF scholars accepted their responsibilities and consistently participated in the prescribed student support activities.

However, only a few students expressed interest in the undergraduate research seminar, and none actually participated in it.

Statement of Responsibilities

1) Maintain full-time status toward the completion of a bachelor's degree in Information Technology
2) Maintain a 3.0 GPA in the major and overall
3) Meet with your faculty mentor at least twice (or as needed) each semester
4) Become a member of the IT Student Club/AITP and participate in scholarship community to share experiences, opinions, and knowledge about your education and the scholarship program
5) Participate in 3 out of 5 following professional/ academic activities during the year:
   - AITP Illinois State University - Student Chapter
   - CS/IS Scholarship Social Gathering
   - Industry On-Site Visit
   - ISU/IT Undergraduate Research Seminar
   - Mentoring other CS/IS Scholarship Recipients
6) Respect and abide by the University's non-negotiable student values of character, conscience, civility, citizenship, appreciation of diversity, and individual/social responsibilities.

Figure 1. Statement of Responsibilities

The following subsection describes the lessons learned from these retention strategies.

Faculty Mentoring. Each semester, the scholarship program had four faculty members serving as mentors to NSF scholars. Each faculty mentor represented one of the four disciplines related to the ISU CS/IS Scholarship Program (i.e., computer science, information systems, telecommunications management, or mathematics). Two of the PIs of the scholarship program served as faculty mentors, and the other two faculty members were volunteers from the department. Volunteer faculty mentors received a small summer stipend. The faculty mentors monitored a group of NSF scholars' academic and personal progress and provided personal career guidance and academic support as needed. They also reported to the project team if an NSF scholar's progress did not align with the objectives of the scholarship program. Faculty mentors were requested to advise these NSF scholars based on their technical interests and personality. They also encouraged the scholars to serve in key administrative positions in the IT student club (e.g., president, vice president, or treasurer).

IT Student Club. Throughout the funding period, our NSF scholars led the IT student club, building strong AITP/ACM student chapters. The scholarship program paid for the NSF scholars' membership fees and paid for students to attend professional or student conferences. Those NSF scholars who did not serve in an administrative role were instrumental in organizing club activities. Some of them became advocates for the club as well as the School of Information Technology.

Peer Mentoring. Successful NSF scholars who had been receiving continuous scholarship renewals were asked to voluntarily serve as peer mentors to several first-year NSF scholars. In addition to building good academic standing for newcomers, the purposes of peer mentor–mentee relationships were to establish close connection among cohorts, foster active participation in student support activities, and build leadership and academic confidence. Although a small monetary compensation was given to successful peer mentors—as determined by satisfactory academic performance and progress of their mentees—some peer mentors felt that the compensation was not necessary for their willingness to assist other scholars.

Industry On-Site Visits. At least once or twice per year, the scholarship program hosted on-site visits to different local IT companies. These industry field trips allowed NSF scholars to become more familiar with a variety of IT jobs so that they could better plan their future careers. These trips also gave them the opportunity to observe various IT operations, facilities, and data centers of major employers operating in central Illinois. Senior NSF scholars were encouraged to submit their resumes to these employers, and several of them received internship offers. Overall, the NSF scholars enjoyed and actively participated in the industry field trips.

Online Social Networking. Our private online social networking website received very little traffic although it provided valuable information, including up-to-date career information, new internships and job opportunities, newsletters, and scholarship program announcements (i.e., news about our scholarship program, peer mentoring, upcoming industry field trips and signups, the undergraduate symposium, and other professional development conferences and seminars). NSF scholars were encouraged to share or blog their experiences, opinions, thoughts, and feelings about their educational and scholarship experiences via the website. If the goal was to establish rapport among student cohorts, our website failed to establish close social bonds beyond any initial face-to-face meetings. Midway through our funding, we contemplated opening our private website to the IT student body as a whole by linking it to the other popular social networking websites (i.e., Facebook and Twitter). However, this change was not implemented due to privacy concerns and the resources required to monitor its content.

Undergraduate Research Symposia. Persuading NSF scholars to engage in undergraduate research was extremely difficult. None of our scholarship recipients were involved in the undergraduate research symposium. Faculty mentors tried to encourage the students to do undergraduate research, but most scholars were more interested in maintaining their scholarship statuses and academic performance or obtaining an IT internship position. Perhaps this retention strategy would be more effective for research-based universities or pure science disciplines.

Summary of Retention. Despite all of our efforts described above, 17 students (31%) left the program. Table 3 compares the difference between attrition in the two groups of NSF scholars: the majority group (White males) and the underrepresented minority group (physically challenged, female, or minority). It should be noted that the percent who left the program was nearly the same for both groups—11 out of 35 (31.43%) of the majority students and 6 out of 19 (31.58%) of the minority students—even though they left for different reasons.

Reasons for Leaving the Scholarship Program	Majority *n* = 11 (%)	Minority *n* = 6 (%)
No longer financially eligible	1 (9.09%)	1 (16.67%)
No longer a full-time student	2 (18.18%)	0 (0.00%)
No participation	1 (9.09%)	0 (0.00%)
Poor academic performance	0 (0.00%)	3 (50.00%)
Switched to a non-STEM major	5 (45.46%)	1 (16.67%)
Transferred to other institutions	1 (9.09%)	1 (16.66%)
Unknown	1 (9.09%)	0 (0.00%)

Table 3. Reasons for Attrition

Although there was greater attrition in the majority group, most students in this group left the scholarship program because they wanted to switch to non-STEM majors not because of poor academic performance. However, for underrepresented students, poor academic performance was the main reason for leaving the scholarship program—a GPA below 3.0 for two successive semesters would disqualified them from receiving a scholarship award, which was renewed on a semester basis. As a consequence of not receiving continuous financial support, they left the program or became part-time students.

Placement

Bloomington–Normal, Illinois has some of the largest IT employers. It is also home to the world headquarters for insurance companies and financial services. Bloomington–Normal is also home to a major automobile manufacturing plant and regional operations for major consulting and IT firms. These companies employ the majority of our IT graduates and are represented on the school's Business Industry Advisory Committee (see Table A1 in the Appendix), which helped direct the faculty in regard to curriculum changes, marketable skills, and technological trends. Faculty mentors also provided guidance and consultation to the scholars about their IT career paths. These factors enhanced our ability to find jobs for our scholars.

To keep track of our graduated NSF scholars, we contacted them directly or used LinkedIn—a popular professional networking website. Unfortunately, we did not utilize our private online social networking website for this purpose because it was not widely used during the program and lacked functionality. Table 4 reveals the current job positions of our graduate NSF scholars. As of this writing, two of three active, remaining NSF scholars had secured IT internship positions and were likely to enter the IT job market after graduation.

In summary, the ISU CS/IS Scholarship Program recruited academically talented, financially disadvantaged students from the Chicago Public Schools system and other urban areas served by Illinois State University. The project team had experience with similar recruitment efforts, and the School of Information Technology had the capacity to retain, graduate, and help place the scholars in the IT workforce. We successfully delivered S-STEM scholarships through our existing community–academic–industrial ties.

Majors of Graduated NSF Scholars	Job Types/Positions (count)
Computer Science* (*n* = 10)	Attending Graduate School (1), IT Services (1), IT Support Supervisor (1), Programmer Analyst (1) Software Developer (2), Systems Analyst (1), Unknown (3)
Information Systems* (*n* = 19)	Application/Software Developer (2), Application Performance Engineer (1), Business Analyst (1), Cyber Security Analyst (1), Development Operations (1), Information Security Specialist (1), Internet Analyst (1), IT Analyst (2), Network Engineer (1), Programmer Analyst (1), QA Engineer (1), Software Engineer (1), System Administrator (1), Systems Analyst (1), Unknown (2), Web Development (1)
Telecommunication Management (*n* = 4)	Application Developer (1), IT Support Specialist (1) Network Analyst (1), Switch Test Engineer (1)
Mathematics with CS minor (*n* = 1)	Liability Claim Specialist/Risk Management (1)
Total (*n* = 34)	* = ABET-Accredited Program

Table 4. Job Positions/Types held by Graduated NSF Scholars

5. CONCLUSION

To attract underrepresented students majoring in IT, our scholarship program consisted of three streamlined activities (i.e., recruitment, retention, and placement) that reflected the goal of the NSF-funded S-STEM scholarship program—to offer S-STEM scholarships to talented, financially disadvantaged students majoring in the IT discipline. The funded scholarship program recruited, educated, and retained multiple cohorts of qualified students through financial assistance and several student support activities. Retention success relied on substantial collaboration from various internal and external constituents, allowing the scholarship program to establish an active learning community with the assistance of faculty mentors, peer mentoring, and industry field trips. Other supportive strategies included community building through the IT student club, professional and social gatherings, and mandatory student–faculty interactions beyond typical educational settings. Educators can learn from our experience and incorporate any of the recruitment, education, and retention activities into their education strategies or scholarship programs. Researchers from various STEM disciplines can empirically explore the relationships between these activities and student retention.

6. ACKNOWLEDGEMENTS

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Appendix

Recruitment-Retention-Placement Supportive Strategies

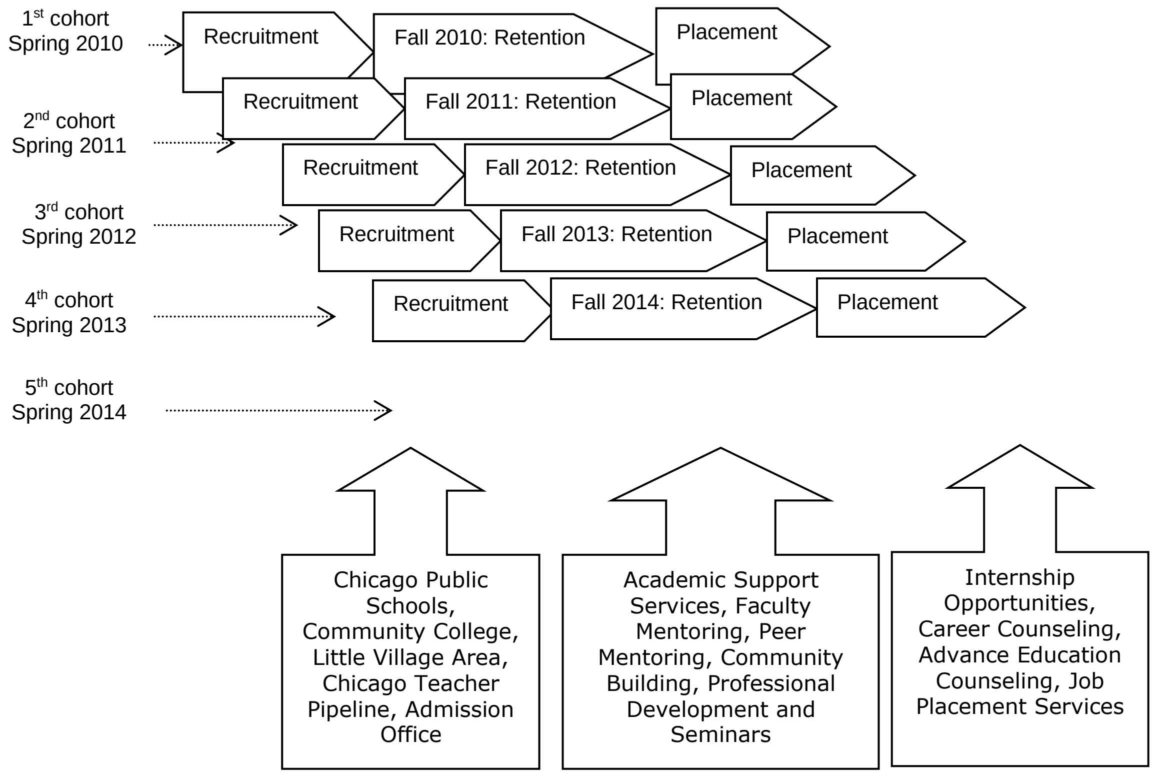

Figure A1. Recruitment-Retention-Placement Supportive Strategies

Summary of the Student Support Activities

S-STEM Support Services and Programs	School of Information Technology (IT)	Illinois State University (ISU)
Recruitment	As described in Section II	
Retention/Education		
Academic Support Services	Debugging Assistance	Disability Concerns, Student Affair Division Julia Visor Academic Center The University College The Minority Student Academic Center (MSAC) University Center for Learning Assistance (UCLA)
Academic Support Mentoring	IT Faculty Mentoring* Personality-IT Major Fit (part of IT Faculty Mentoring)* CS/IS as Minor Concentration* Peer Mentoring* Debugging Assistance	
Community Building	Scholarship Orientation* IT Academic Lifestyle Floor Spring IT Award Reception NSF Scholars Social Gathering* Online Networking Webpage/Weblog* Funded IT Student Club Membership*	Meeting During Preview/Open House Start of Semester & End of Semester Socials
Professional Development and Seminars	Industry On-site Visits* AITP/ACM Professional Conferences*	Undergraduate Research Symposia
Placement		
Internship Opportunities	IT Internships Business Industry Advisory Committee	N/A
Career Counseling	Faculty Mentoring* (See Education/Retention)	Student Counseling Services
Advanced Education Counseling	Continuing Education Counseling	
Job Placement	IT Job Opportunities and Internships via Online Networking webpage*	Office of Alumni and Student Placement Services ISU's Employment Job Fair

* = additional/enhanced services provided as part of the S-STEM Scholarships

Table A1. Summary of the Student Support Activities

Reaching and Retaining the Next Generation: Adapting to the Expectations of Gen Z in the Classroom

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Abstract

As the next generation of college students prepare to embark on institutions of higher education, colleges and universities are faced with significant budget cuts and state expectations for increased fiscal efficiencies and student graduation rates. A greater emphasis is being placed on improving methods for attracting new students and retaining those who are already enrolled. Institutions should examine characteristics of each phase of the process, including input, in process and output, in order to better attract and equip students to meet employer expectations. With these objectives in mind, this article examines current research on the characteristics of "Generation Z"—defined as individuals born between 1996 and 2012—as well as the employers' expectations of these technologically astute Post-Millennials. A model and recommendations are proposed to aid higher education efforts in attracting, preparing and retaining students for their future careers.

Keywords: Generation Z, Attract, Retention, Career Development, Teaching Strategies

1. INTRODUCTION

In 2007, Beard, Schwieger and Surendran examined the characteristics and educational nuances required to effectively educate incoming classes of millennial generation students. The authors found this group—comprised of individuals born between the early 1980s to mid-1990s—to have characteristics such as a sense of entitlement, a desire for customization and availability on demand, and a preference for immediate benefits. Generation "Y"ers also appear to be savvy technology multitaskers, are team oriented, and have a preference for hands-on activities. Millennials may be skeptical of the perceived "establishment," value peer opinions, show confidence in decision making, and possess a desire to make a difference in the world. Now, almost a decade later, colleges and universities face another set of unique characteristics and expectations as Generation Z— individuals born between 1996 and 2012—begins to descend upon campuses. Just like their Millennial predecessors, Gen Z has been raised with technology easily accessible; however, the level at which technology has been incorporated into their everyday lives has been unlike that of any prior generation. This article examines the characteristics of Generation Z and their personal expectations, as well as the expectations of their future employers and what colleges and universities can do to better prepare these students for the challenges ahead.

2. GENERATION Z

When discussing the upcoming generation born between 1996 and 2012, authors have referred to Generation Z as Tweens, Baby Boomers, The Founders, Plurals, Homeland Generation, Generation 9/11, iGeneration and Post-Millennials (Merriman, 2015; Williams, Page, Petrosky &, Hernandez; 2010). As might be expected from the diversity in monikers Generation Z has garnered, researchers are just beginning to examine and understand the nature and characteristics of this demographic cohort.

Gen Z Background

The world in which Gen Zers have been raised has been fraught with political tension, violence and societal instability post-9/11. Gen Zers have never known a world in which they could not instantly connect and have information and communication channels immediately at their fingertips. Thus, many in this generation prefer to socialize online rather than face-to-face, a change which is both positively and negatively affecting society.

A number of institutions are beginning to publish studies on this upcoming generation. Better understanding of the perspectives and expectations of Generation Z members is a key to aiding them in planning for successful futures. The following sections examine some of the generational characteristics identified in these studies.

Ernst and Young (EY) Reports on Gen Z

In 2016, Ernst and Young surveyed 3,200 Gen Zers in the countries of Brazil, China, Germany, India, Japan, Mexico, the UK and the US, to learn more about the next generation of workers (Ernst & Young, 2016). Some of the population characteristics they identified are described below.

Trust and Fairness: Researchers found that Gen Z members value "employers that provide equal opportunity for pay and promotion, along with opportunities to learn and advance professionally." Gen Z respondents cited their most important characteristics associated with future employers to include: treating people with respect, ethical behavior, fair compensation and promotion across all employees, open and transparent communication, and wise business decision-making.

However, 11% of global respondents and 18% of those from the U.S. indicated that their caretakers' work experience had a "very or somewhat negative" impact on the level of trust they would place in future employers. They noted employment factors such as poor quality of raises, a dislike of job, or a dislike or distrust of boss, colleagues or top-level executives (Ernst & Young, 2016).

Online and Personalized: In a second survey conducted by EY, the researchers surveyed 1000 adults and 400 teens to examine the mindset behind changing consumer behavior between Millennials and Post-Millennial Gen Z members (Merriman & Valerio, 2016). Although the study focused on retail consumption, the concepts can also apply to the consumption of educational resources.

The researchers found that Gen Zers desired more personalized micro-experiences and felt like "anything is possible" (Merriman, 2015). They also were more prone to purchase products online due to ease, efficiency, convenience, better selection, and lower prices (Merriman & Valerio, 2016). In addition, they expected their shopping experiences to be intuitive, seamless and error-free.

Entrepreneurial and Self-Sufficient: The researchers found Gen Z members to be very entrepreneurial, self-educated and self-sufficient; relying more on self-service tools to research products, as opposed to seeking an interaction with experts. This generation grew up having access to search engines and the habit of finding information for themselves. However, the authors further noted that coupling technology with physical location to meet functional needs and provide personal enjoyment could play a large part in re-establishing an emotional connection (Merriman & Valerio; 2016; 3).

Connected: In a report focusing upon Media and Entertainment (ME) conducted in 2016, EY found that 91% of teens studied have access to a smartphone, 69% have access to a tablet, and 90% watch YouTube daily (Ernst & Young, M&E, 2016). They also noted that Gen Zers are the most willing group to provide personal data, provided they receive something of value in return (i.e. personalized experience). They value seamless experiences and "engagement that builds into ongoing relationships" (Ernst & Young, M&E, 2016).

Immersive Storytelling: EY researchers noted that media companies (i.e. NBC Universal's Syfy

Channel) are collaborating with technology companies (i.e. Phillips) to integrate programming with Internet of Things (IoT) devices to provide a more immersive entertainment experience. The fact that Gen Zers value storytelling, as well as the integration of IoT devices, introduces another dimension (Ernst & Young, M&E, 2016).

Self-sufficient: In a 2015 study for EY examining the characteristics of Gen Z, Merriman found the generation to be self-aware, self-learners, self-reliant and entrepreneurial. Other characteristics included persistent, realists, innovative and carrying a desire to make things happen—like betterment of the environment (Merriman, 2015).

2015 Cassandra Report
In their 2015 Cassandra Report on Gen Z, Deep Focus interviewed 902 respondents between the ages of 7 and 17. The Deep Focus group found similar results to those of Merriman (2016).

Tenacious: Gen Zers are pragmatic. They realize that life will not always be easy, and that they are very likely to experience significant failure (71%) before achieving success; 40% viewed failure as an opportunity to try again (Deep Focus, 2015).

Skill Focused: Gen Zers realize the importance of building skills at a young age—89% of those surveyed indicated that part of their free time activities were devoted to productive and creative endeavors, rather than just "hanging out." Approximately 62% of respondents indicated a desire to be entrepreneurs, rather than working for established companies. Thus, due to their practical, forward-thinking mindset, many were developing skills in business (58%), graphic design (51%), video production (50%), and app development (50%) (Deep Focus, 2015).

In their advertising preferences, Deep Focus found similar results as Ernst and Young in that Gen Zers are interested in narratives and content using real people with realistic themes (2015). They also prefer their favorite brands communicate to them through YouTube than through other social media sites.

JWT Report
Digitally Connected: In 2012, Marketing Communications Company J. Walter Thompson Worldwide (JWT) examined the attitudes and tech habits of 200 tweens (8 – 12 years old), 200 teens (13 – 17 years old) and their parents in the U.S. and U.K. Approximately 90% would be reluctant to give up their Internet connection, and many of those respondents also valued their online connections more highly than real activities such as movies or eating out (JWT, 2012). Over 50% of the respondents indicated that it was easier to communicate digitally with friends and 40% were more comfortable talking online than in real life.

Beal's Report on Gen Z
Self-Starters: Beal (2016) compared Gen Zers to Millennials and described them as living in a "world of continuous updates" which might attribute in the negative to their lower attention spans, but in the positive, to a better ability to multitask. Beal also noted that they are early starters and are predicted to go straight into the workforce rather than taking the traditional path of finishing high school and moving on to a college degree. They are more likely to attend school online and, due to their independence, lean toward learning what they want to know on their own. Many (40%) identify themselves as digital device addicts and 92% have a digital footprint (Beal, 2016). Gen Zers seek uniqueness in all walks of life, especially their digital identity (Beal, 2016).

Adobe Study
In a 2016 study presented at EDUCAUSE2016, Adobe summarized findings of a survey conducted with 1000 U.S. students between the ages of 11 and 17 and 400 teachers of Gen Z. Both students (78%) and teachers (77%) surveyed felt that Gen Zers learned best by creating and hands-on experiences. In addition, 60% of the educators tried to incorporate more hands-on learning in their classrooms and 52% hoped to "evolve the teaching curriculum" (Morey & Mouratis, 2016). The five overall insights that Adobe emphasized from their study were:

1. Gen Z students see tech and creativity as important and intersecting aspects of their identities.
2. Gen Z students are excited but nervous for their futures. They do not feel fully prepared for the "real world".
3. Gen Z members learn best by doing and creating, and that students and teachers alike want more focus on creativity.
4. Creativity will play a critical role in the future workforce.
5. Technology will set Gen Z apart in the future workforce. (Adobe Gen Z Report, 2016)

The Center for Generational Kinetics Study
The Center's ongoing research into Gen Z has defined them as being "self-aware, self-reliant, innovative and goal oriented." They also note that Gen Z is very adept at learning things on their own using "web-based" research resources. They place a priority on how fast they can find the right information, rather than on actually knowing the right information. They also want to make a decent living working for a stable employer and have already started making plans for the future (TeamCGK, 2017).

Northeastern University Study
In a study conducted for Northeastern University of 1,015 Gen Zers in 2014, the study found that Gen Zers are:

- Self-starters with a strong desire to work for themselves, learn about entrepreneurship, and design their own programs of study in college;
- Self-directed and certain about the importance of higher education in achieving their goals;
- Concerned about their financial futures including the cost of college and accumulating student loan debt;
- Believe that college should provide some form of professional experience such as internships with employers;
- Have somewhat modest enthusiasm for technology, particularly with higher education—52% of those surveyed indicating that they felt an online degree would be accepted the same as a traditional degree; and
- Highly progressive when it comes to social policy. (Northeastern, 2014).

Other Gen Z Research
David and Jonah Stillman (2017) found Gen Z to be independent and competitive, and cognizant that they will have to pay their dues by starting at the bottom of a company and working their way up. They are also loyal with 60% of Gen Zers surveyed willing to stay at a company for at least 10 years. More than half would like to write their own job description, thus reflecting the bent towards personal customization noted in other studies (Stillman & Stillman, 2017).

Monster.com: A study by employment website Monster.com found Gen Zers to be ambitious and self-reliant. Monster's study found that 76% of Gen Zers had an entrepreneurial focus, envisioning themselves as driving their own careers and advancement.

Characteristic	Research
Creative	Adobe, 2016 CGK Study, 2017
Entrepreneurial	Beal 2016 Cassandra Report 2015 CGK Study, 2017 EY 2016 (M&E Report) Monster, 2016
Fairness	EY 2016
Goal-Oriented	CGK Study, 2017 Stillman & Stillman, 2017
Hands-On Experiences	Adobe, 2016
High Expectations	Beal 2016; EY 2016 (Merriman & Valerio)
Multitasking	Beal 2016, Merriman, 2015
Personalized Microexperiences	Beal, 2016 CGK Study, 2017 Merriman 2015 Monster 2016 Stillman & Stillman, 2017
Pragmatic	Cassandra Report 2015 EY 2016
Self-Informed	Beal, 2016; CGK Study, 2017 Merriman, 2015
Self-Reliant	Beal 2016 CGK Study, 2017 EY 2016 (M&E Report) Monster 2016 Stillman & Stillman 2016 EY 2017 (Merriman & Valerio)
Skill-focused	Cassandra Report 2015
Social-Media Connections	Cassandra Report 2015 CGK Study, 2017
Storytelling	Adobe Report Cassandra Report 2015 EY 2016 (M&E Report) Morey & Mouratis, 2016
Trust	EY 2016
Workplace Advancement	EY 2016 CGK Study, 2017

Table 2 Gen Z Characteristics

Gen Z was found to share many characteristics with the Boomer generation (early 1940s to early 1960s) in terms of expecting to work hard, saving toward the future, and valuing security and respect. Because Gen Zers are technologically savvy and accustomed to being "always on", they have an interest in determining their own schedules and creating their own career paths (Monsters, 2016).

Overall Findings
In examining the published literature to compile a list of characteristics (Table 1), several themes seemed to surface about Gen Zers:

- They value hard work that is duly rewarded.
- They are independent, resilient and realize they must work hard to achieve.
- They value trust, fairness, loyalty and respect from their employer.
- They are ambitious, self-starters and entrepreneurial.
- They are creative and appreciate personalization.
- They plan for the future and are willing to learn on their own.

As this population of students begin to think about entering higher education or the work force, colleges and universities need to prepare to attract, retain and educate the students to fill employer needs. The next section examines the skills emphasized and sought by employers of current and future graduates.

3. TOP SKILLS SOUGHT BY EMPLOYERS

Research indicates that employers for IT positions value both IT and non-IT graduates due to the lack of qualified IT-based applicants. Skill sets sought by employers include a mix of both technical skills and soft skills (Half, 2017). The U.S. Bureau of Labor Statistics identified the following skills as important to someone seeking a job in software development: analytical, ability to communicate, technical, creativity, detail oriented, concentration, interpersonal and problem-solving skills (BLS, 2017).

A 2017 study by Robert Half Technology noted that tech employers place significant value on mathematics and problem-solving skills (36%), business or marketing skills (31%), and soft skills and critical thinking capabilities (22%) (Half, 2017). In a study of 2500 CIOs from the U.S., respondents indicated that the skill sets in greatest demand in their organizations were database administration (41%) followed by desktop support and network administration (42%). The same study surveyed 270 Canadian CIOs who indicated that the skills in greatest demand in their organizations were network administration (62%), database management (61%) and wireless network management (58%) (SIA, 2017).

NACE, the National Association of Colleges and Employers, provides college career centers with research and information regarding employment of the college educated, hiring forecasts, and recruiting and employment practices. (Gray, K. & Koncz, 2017). In collecting data for their Job Outlook 2017 report, NACE compiled results from 169 surveys completed from employers between August 5, 2016 through October 4, 2016. The respondents indicated that the top three attributes sought in new hires included: the ability to work in a team (78% of respondents), problem-solving skills (77.3%), and written communication skills (75%). (See Table 2.)

Skill	Interest
Ability to work in a team	78.0%
Problem-solving skills	77.3%
Communication skills (written)	75.0%
Strong work ethic	72.0%
Communication skills (verbal)	70.5%
Leadership	68.9%
Initiative	65.9%
Analytical/Quantitative skills	64.4%
Flexibility/Adaptability	63.6%
Detail-oriented	62.1%
Interpersonal skills (relates well to others)	58.3%
Technical skills	56.8%
Computer skills	49.2%
Organizational ability	47.7%
Strategic planning skills	37.9%
Friendly/Outgoing Personality	25.8%
Tactfulness	25.8%
Creativity	21.2%
Entrepreneurial Skills/Risk-Taker	19.7%
Fluency in a foreign language	4.5%

Table 3 – Graduate Skills Preference
(Source: Job Outlook 2017, NACEWEB)

Concern has been raised across the U.S. about college graduate career readiness and skills gaps (Hora, 2017). In a two-year study collecting interview data from 17 institutions and 52 companies, Hora (2017) attempted to unearth the skills and career competencies sought by employers to address the skills gap. Employers identified the composite "ideal" employee as someone who is hard-working and possessing knowledge, technical abilities and hands-on experience; a problem-solver; good communicator; able to work in teams; able to adapt to new situations; and a willingness to commit to lifelong learning (Hora, 2017).

Hora (2017) also noted that some of the methods used to address identified skills gaps include:

development of new academic programs for "high-demand" jobs (i.e. nursing and computer programming); internships; skills-based boot camps; and alternative credentialing such as badges and certifications (Hora, 2017). In addition, knowledge is being gleaned through cross-sector partnerships with employers as gathered through their involvement in curriculum advisory boards and course curricula design (i.e. providing class projects oriented toward researching and solving employer problems) (Hora, 2017).

Several of these same skills were noted in research published in Forbes surveying 100 top HR managers, recruiters, and CEOs (Beason, 2017). Similar to previous studies, the author found that the most important skills for entry level job seekers were still the traditional soft skills including leadership, communication and collaboration (Beard, et al., 2008). However, additional skills that were noted (and mentioned by technology employers) included: trust (Prezi) attention to detail, conscientiousness, time management, follow-through (Updater), the ability to prioritize, curiosity, commitment to continuous learning, agility and adaptability (Adobe), ability to overcome under pressure (Adobe) and humility (Beason, 2017). In the next section, the authors propose two models for examining the skills sought by employers in light of the characteristics of the students and the educational requirements of the program.

4. SKILLS DEVELOPMENT MODEL

Providing educational value for both students and employers is important in maintaining ongoing growth for college and university programs. However, the value of the traditional four-year education is being called to question (Hora, 2017). In light of the characteristics of students currently entering college age classes, coupled with the expectations of the employers, the authors propose a skills-based infrastructure model (Figure 1) to attempt to bridge the skills gap to attract, retain, and prepare Gen Z for future employers—while, at the same time—maximizing utilization of computer science program resources. In developing the strategies, the authors utilized the input processing output (IPO) model to correlate characteristics.

IPO Characteristics: In comparing the expectations of employers with the characteristics of Gen Z, there is an overlap of skills that may be enhanced through the educational process. The underlying thought behind the IPO model in Figure 2 is that students (input) come with several desirable characteristics and personality traits. In the process of educating the students, higher learning institutions can build upon and enhance those characteristics (processing) in order to prepare the program graduates to better meet the expectations sought by future employers (output). Figure 2 shows the correlation of the summarized characteristics at each phase of the IPO educational framework.

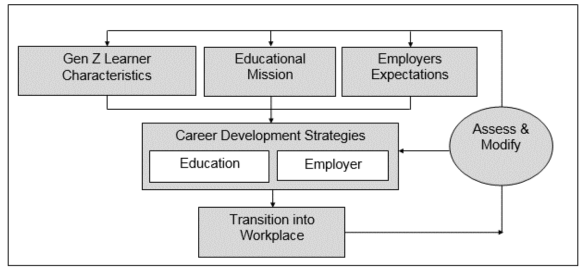

Figure 1 - Skills-based Infrastructure Model

In light of the IPO characteristics (Figure 2) and the skills-based infrastructure model (Figure 1), the next section offers program attraction and retention strategies (lower portion of Figure 2) to address the characteristics and personality traits present in Gen Z and desired by employees (Figure 2).

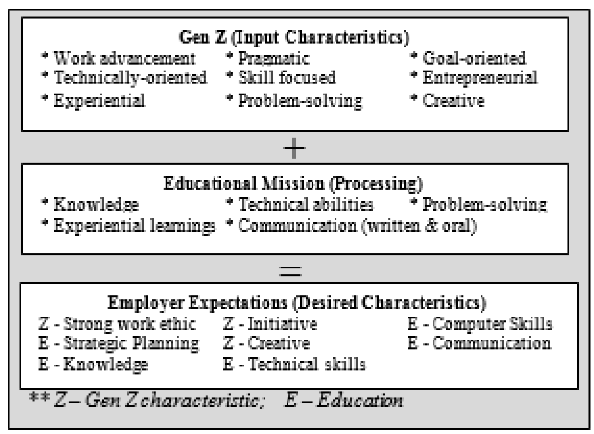

Figure 2 – Skills IPO Model

5. PROGRAM ATTRACTION AND RETENTION STRATEGIES

The research indicates that Gen Zers are self-starters, appreciate skills that are valued, have a long term focus, and are hard workers who are willing to learn on their own. In light of these characteristics, there are many strategies that programs may consider initiating to enhance their programs (Hora, 2017).

Attracting Students

Storytelling: Research indicated that Gen Z students are interested in the stories of their peers and that they prefer to get some of their information through YouTube. To attract students, programs can regularly develop and rotate through student video stories on their web site. These stories can focus on topics such as a student's internship, a competitive event, student organizations, a first year experience, or a graduate's first job or career path. Many universities are doing this at the institution or college level, but finding resources to provide this resource at the program level may be more difficult. Institutions' public relations departments may be able to provide a script, template or editing resources to help programs create their own videos.

High School Focus: Gen Z students are future focused and driven. Programs need to get their attention early by participating in high school events such as campus visits, regional high school competitive events, or assisting with corporate STEM-based initiatives. Because Zers prefer peer based information, hands-on experience and stories, providing prospective Gen Zers with opportunities to interact with current students may be beneficial. Several corporations have implemented STEM-based initiatives such as Microsoft's DigiGirlz, Lockheed Martin's GMIS (Great Minds In STEM) and Boeing's STEM Saturday aimed at young Gen Z girls. These corporations may have opportunities for college representatives to assist with events.

Early Program Interaction: Develop a freshmen level general studies course in which students are introduced to the computer science major or gain hands on skills in app development early. Such an introduction may draw students from other areas of the institution to select computer science as a major or minor, as well as develop a relationship with students who had already intended to take a computer science major.

Minors, Concentrations or Certificate Programs could be developed in cooperation with programs outside the computer science area to build upon the early program connection. Gen Zers are described as being very creative and entrepreneurial-focused. Researching possible concentration areas (i.e. entrepreneurship and arts programs, as Gen Zers exhibit these characteristics) may bring to light untapped student populations already associated with the institution. The authors' institution has worked with departments across campus to create new minor variants in business, math and entrepreneurship.

Employer Involvement in Curriculum Development: Hora (2017) noted that educational institutions are involving employers in programs through advisory boards, internships, curricula development, and classroom projects. Such involvement could correlate with Gen Z's goal orientation and future focus. The authors' institution has an advisory board that meets on a regular basis. Members of the board provide curricula input, serve as program sounding boards, offer classroom projects, provide internships, speak in classes and provide factory tours.

Career Development Strategies

These strategies focus upon the processing step of the model and are developed based upon the mission of the educational institution and influenced by the characteristics of the students and the expectations of the employers. Freeman, et al. (2014) published a meta-analysis of 225 studies comparing student performance in STEM courses utilizing traditional lecture versus active learning styles. The authors found that "average examination scores improved by about 6% in active learning sections" (Freeman, et al., 2013). The following are suggestions that could be incorporated into computer science programs and classrooms to attract, engage and retain students.

Experiential Learning Opportunities: Through co-ops, internships and classroom projects, Gen Zers gain hands-on experience, as well as develop important skills including those that are technically-oriented, collaborative and group centered work skills, analytical, problem solving, the ability to follow-through, coping, as well as oral and written communication skills. The authors' institution has had an on-going initiative to provide students with immersive experiences such as corporate sponsored group projects, internships, externships, corporate guest speakers, and participation in competitive events.

Online or Blended Courses: Gen Z students are self-starters who do not mind learning topics on their own. Online technology courses taught by adjunct professionals or current courses taught in a blended online/face-to-face format, may help to attract students while not significantly draining current resources. The authors' university is providing an increasing number of classes offered in multiple formats.

Competitive Events: Holding competitions such as hackathons or app development contests will challenge students as well as address their need for a personalized experience. Participation in collegiate level competitions also allows students to practice their skills and interact with like-minded students and professionals. The authors' institution encourages students to be involved in student organizations that participate in state, regional and national level competitions such as the Midwest Regional Collegiate Cyber Defense Qualification Competition and Phi Beta Lambda/FBLA.

Boot Camps: Gen Zers are self-starters who are interested in learning on their own. Boot camps, short run classes, or concentrated programs, similar to LaunchCode, can be developed to attract students from outside computer science majors to build their computer science skills. Certificates of completion may be provided to students to add to their professional portfolios, or designations may be provided on graduation diplomas.

Certificates and Badges: Gen Zers are driven individuals who expect to work hard and be rewarded for their efforts. They are also interested in technology and willing to learn on their own. Computer science programs can develop short online, face to face, or self-paced workshops utilizing homegrown materials, Massive Open Online Courses (MOOCs), certificate preparation resources, or some other pre-developed materials to encourage students to further their development on their own and to receive recognition for their work.

Professional Certification Programs: Encouraging students to prepare for professional certification exams as well as providing resources and recognition of their accomplishments addresses Gen Zers entrepreneurial bent and goal orientation. The authors' institution offers students opportunities to prepare and sit for Microsoft Office certifications.

Assess and Modify: As attraction, retention and development strategies are employed, programs need to evaluate their effectiveness to determine how they can be improved (Figure 2). Soliciting feedback from stakeholders including faculty, students, employers, recent graduates, admissions office personnel and high school career counselors may provide direction for enhancing and further developing recruitment, retention, and education efforts.

6. CONCLUSION

In this paper, the authors review relevant literature relating to the characteristics of Generation Z and the expectations of potential employers. A model is proposed that attempts to correlate those skills and expectations in order to generate course and program recommendations to attract, retain and guide students to prepare for their future careers.

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Increasing Advocacy for Information Systems Students with Disabilities through Disability Film Festivals at a Major Metropolitan University

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Abstract

College does not bestow enough engagement of computer science and information systems students with higher-functioning people with disabilities. Information systems students without disabilities do not have enough experiences in diversity with equivalently skilled students with disabilities. In this paper, the authors expand the knowledge of information systems students without disabilities through *Disability Film Festivals* depicting not the impairments but the intelligence of those with disabilities. The authors learn that features of the films are facilitating engagement and facilitating advocacy of the information systems students for the diversity of those with disabilities having inherent information systems skills. The findings of this study from 2015 will be beneficial to information systems professors and students in encouraging more receptivity to higher-functioning students with disabilities.

Keywords: disability film media, disabilities, information systems curricula, science, technology, engineering and mathematics (STEM), students with developmental and intellectual disabilities (IDD).

1. BACKGROUND

Colleges contain 2 million people with disabilities (Martin, 2012) from a community in the country of 54 million people with disabilities (Riley II, 2005) or 6 million people with cognitive disabilities – the common disorders of students with disabilities in computing (Tamer, 2017). Common among students with disabilities is diminishment directly or indirectly by bullying and harassment incidents (Carter & Spencer, 2006) by other students without disabilities - 63% of students with autism developmental disorders are impacted negatively by bullying from those without the disorders (Caiola, 2017). Students with disabilities, especially affected female students, lesbian, gay, bi-sexual and transgender (LGBT) students and students labeled with developmental and intellectual disabilities (IDD) (Obinna, Krueger, Osterbaan, Sadusky & DeVore, 2005), are impacted negatively by incidents of physical and sexual intimidation more than students without disabilities (Harrell, 2014). Even though most students without disabilities do not engage in the intimidations, their feelings for diversity and fairness can be flavored by fear or ignorance (European Commission, 2007) as they focus not infrequently on defects or identifiable impairments of "retard" students with disabilities (Heasley, 2017a), ignoring intimidations (Coloroso, 2002) and inevitably misjudging those with disabilities. The focus on impairments, instead of on the assets or the innate intelligence of intricate personalities, constrains perceptions of the potential of those with disabilities in fields of post-secondary education, such as in computer science and information systems and in STEM (science, technology engineering and mathematics), and in fields of industry.

The fields of computer science and information systems desire more students with or without disabilities in majors in STEM (Denning, Tedre, & Youngpradit, 2017). Firms, including Microsoft (Heasley, 2017b), are hiring higher-functioning (i.e. less impaired) millennial students with disabilities. Even if considered aloof, higher-functioning students with developmental and intellectual disabilities are eager to learn exciting fields and can be exceptional learners (Warm & Stander, 2011), and students with developmental disorders (e.g., Autism Spectrum Disorders [ASD] or Asperger's syndrome) with less impairments can be ideal for occupations in STEM (Eveleth, 2011 & Swinhoe, 2013), especially as savants (Piore, 2013), but only a limited number of them are indicated in the literature (Kuchment, 2013) to be in information systems programs at post-secondary institutions – only 11% of students with disabilities are in undergraduate programs, only 7% are in graduate programs, and only 1% are in doctorate programs, of STEM (Burrelli, 2012). The misjudged perceptions if real of the students without disabilities as to the diversity and potential of higher-functioning students with disabilities, and the perceptions of the higher-functioning students with disabilities if real and similar, as to their potential in information systems, may be explanations for the low number of those with disabilities in schools of information systems. The underrepresentation of students with disabilities in information systems (Ladner & Burgstahler, 2015) may be addressed minimally by changing the perceptions of the students without disabilities, the goal of the program introduced in this paper.

2. INTRODUCTION

Apart from current outreach programs for higher-functioning middle / high school students with disabilities, the authors of this paper introduced a *Celebration of Individuals with Disabilities in Film*: *Disability Film Festival* program (Figure 1 in Appendix), for largely students without disabilities in the Seidenberg School of Computer Science and Information Systems of Pace University. The program began in 2013 as a community engagement project for evaluating films from the disability film media, such as the *Reel Abilities Disabilities Film Festival* and the *Sprout Film Festival*, in New York City, and a few films developed by the students with people with disabilities, for annual film presentations at the school. The focus of the program is evaluating the films for the depiction of the diversity and the intelligence, not of the impairments, of higher-functioning peers with disabilities (Grandin & Panek, 2013 & Yuknis & Berstein, 2017), in inclusive positive scenarios in industry and in society, and including the information systems students without and with disabilities in the audiences at the Festival presentations. The more instances students without disabilities learn of other peers with disabilities with intricate but normal personalities – not the disabilities but the possibilities, the more positivism and recognition they may have of the potential of those with disabilities (Saito & Ishiyama, 2005); and even more that the students with disabilities in the school learn of other higher-functioning peers with disabilities, the more pride and respect they may have of their own strengths. The potential skills of higher-functioning people and peer students with disabilities evident in the festival films may influence the students without disabilities to be more positive for those with disabilities.

Annually the program consists of a chosen 5-7 festival films evaluated from 27-51 films furnished to the school, or 35 festival films from 173 films, since 2013. Each of the films is essentially 9-21 minutes of narrative stories, largely of millennial people with developmental and intellectual disabilities (IDD) (e.g., Autism Spectrum Disorders [ASD]) and other disabilities (e.g., paralytic physical disabilities).

For example, in 2017, *Anna* is depicting a higher-functioning peer student with Autism Spectrum Disorders (ASD) encountering students without disabilities not knowledgeable of ASD; *Children of God* is depicting an intellectually nimble youngster with a paralytic physical disability; *Dancing on Wheels* is depicting a determined highly-functioning woman encountering issues in life with non-genetic physical disabilities; *Four Quarters of Silence* is depicting highly-functioning young football students with hearing impairments engaging in game planning and playing; *Picked* is highlighting an independent young student encountering insensitivity of instructors; *Stutter* is highlighting an intellectually nimble parent and son student with impairments in speech encountering harassment of students without disabilities; and *The Quiet Ones* is highlighting smart students with impairments in speech encountering intimidations by policepersons.

Each of the films is followed by discussions with distinguished panelists in the field of disability empowerment. Films at the Festivals are inspirational short stories for students with and without disabilities. The program is played in 3 – 6 day periods of presentations to audiences averaging 129-274 people, including students without and with disabilities majoring or not majoring in STEM and those with disabilities in the neighborhood, since 2013.

The goal of the *Disability Film Festival* is in impacting the engagement and advocacy perceptions of the information systems students without disabilities in the Seidenberg School to be less fearful and more knowledgeable and more positive about those with disabilities. Is the Festival facilitating engagement in the positivity of the students without disabilities for those with disabilities?; Is the Festival facilitating advocacy in the positivity of the students without disabilities for those with disabilities? The Festival may or may not be forming a foundation for influencing perceptions of positivity of potential for those higher-functioning types with disabilities, a foundation important for inclusion of more of these students in a post-secondary institution (Kaweski, 2011). Though the goal of the program is impacting the students without disabilities, the higher-functioning information systems students with disabilities, or potential information systems students with disabilities, may be impacted tangibly to be in the field of information systems. The literature on film opportunities in addressing the underrepresentation of students with disabilities in information systems and in STEM is limited in scholarly study.

3. FOCUS OF PAPER

The focus of the paper is to evaluate the *Disability Film Festival* in its goal in impacting or not impacting the perceptions of information systems students without disabilities as to the potential of those with disabilities. The paper is evaluating the 2017, 2016 and 2015 *Disability Film Festival* programs from the 2014 *Disability Film Festival* program (Lawler, Iturralde, Goldstein, & Joseph, 2015)*. The evaluation in this paper is on factors from the 2014 program, but it is focusing on students without disabilities:

Engagement from Features of Disability Film Festivals –

Importance – Extent of impact from which the information systems students without disabilities perceived features of the films in proper representations of the potential of those with disabilities; and

Satisfaction – Extent of impact from which the information systems students without disabilities perceived features of the films in furnishing satisfaction from proper representations of the potential of those with disabilities.

Advocacy from Features of Disability Film Festivals –

Self-Efficacy – Extent of impact from which the information systems students without disabilities perceived the storytelling of the films in furnishing a foundation for them to be advocates for those with disabilities; and

Sociality – Extent of impact from which the information systems students without disabilities perceived the storytelling of the films in influencing a motivation for them to be involved in proactive programs of public service for those with disabilities.

The importance of this paper is that positivity of students without disabilities for higher-functioning students with disabilities, including the positivity of the students with disabilities for themselves, may have profound influence on the motivation of those higher-functioning types with disabilities to attain their potential (Espelage & Swearer, 2003) in the field of information systems and in STEM. The results of this study will be helpful to information systems professors in learning a media method for a more inclusive receptivity to higher-functioning students with disabilities in STEM.

*The 2013 *Disability Film Festival* program was a pilot program by the authors.

4. METHODOLOGY OF PAPER

The methodology of this paper consisted of evaluating 19 films from the 2017 (7 films), 2016 (5 films) and 2015 (7 films) *Celebration of Individuals with Disabilities in Film*: *Disability Film Festival* program (Figure 1), excluding the foundational 2014 (9 films) and the pilot 2013 (7 films) *Festivals*. The evaluations were done by 81 information systems students without disabilities in 2017 (27 students), 2016 (31 students) and 2015 (23 students), in the Seidenberg School of Computer Science and Information Systems of Pace University and in the New York University Tandon School of Engineering, in 3 month periods preceding the programs. The evaluations of the films were done from a checklist instrument of Likert-like questions, from which focus groups of the students without disabilities anonymously rated the films on the aforementioned factor perceptions of engagement – importance and satisfaction and advocacy – self-efficacy and sociality, on a scale of (5) – very high impact to (1) – very low impact, with (0) as a further option.

The approach to the methodology of this paper conformed largely to the methodology in the 2014 *Disability Film Festival* program (Lawler, Iturralde, Goldstein, & Joseph, 2015), except for the focus on students without disabilities in this study. The evaluations were moderated by the first author from focus group methodology (Krueger & Casey, 2009) in the 2015, 2016 and 2017 periods of this study. The instrument of this study was reviewed in the context of construct, content and face validity, including sampling validity, as in the 2014 study (Lawler, et.al., 2015).

The data interpretations of the resultant statistics (McClave & Sincich, 2014) was performed by the second author from the MAT LAB 7.10.0 Statistics Toolbox.

5. ANALYSIS AND DISCUSSION OF RESULTS

An analysis of the collected data from the focus groups is disclosing engagement (means = 3.52 / 5.00) and advocacy (3.02) perceptions of the students without disabilities in the 2015 – 2017 periods. Engagement in importance (3.55) and satisfaction (3.49) and advocacy in self-efficacy (3.47) and sociality (2.56) from the *Disability Film Festival* programs are generally highlighting perceptions of positivity of the information systems students without disabilities for the potential of those with disabilities, in the 2015 – 2017 periods of this study. Factors of engagement (importance and satisfaction) and advocacy (self-efficacy and sociality) are generally indicating perceptions of positivity in each of the years – 3.36 and 3.34 and 3.33 and 2.45 in 2015, 3.67 and 3.57 and 3.66 and 2.34 in 2016 and 3.60 and 3.56 and 3.43 and 2.85 in 2017 - of this study.

(The results in summary are in Tables 1a and 1b of the Appendix.)

Data on engagement (importance and satisfaction) and advocacy (self-efficacy and sociality) perceptions are generally notable from the films in the current 2017 program. Films in 2017 of *Anna* (3.56 [high] – 2.85 [low]), *Children of God* (4.00 – 3.11), *Dancing on Wheels* (3.26 – 2.37), *Four Quarters of Silence* (4.67 – 4.22), *Picked* (2.96 – 1.81), *Stutter* (2.93 – 2.04) and *The Quiet Ones* (4.22 – 3.52) are rated generally high in positivity of potential of the peers with disabilities by the students without disabilities. The films in the 2017 and 2016 programs are mostly averaging higher in perceptions than the films in the 2015 program. (The results in detail of the 2015, 2016 and 2017 study are in Tables 2a, 2b and 2c, along with correlations and frequencies in Tables 3 and 4, of the Appendix.)

The perception results from the information systems students are indicating that they are learning about the potential of those with disabilities to be continuing members in post-secondary institutions and in society. Though the films in the 2015 – 2017 programs are not depicting peer information systems students with disabilities, they are depicting diversity of those with disabilities in humanness similar to information systems students without disabilities. The depictions are not focusing on the impairments (e.g., deafness and Down syndrome) but on the inherent intelligence of those with disabilities to be in fields and majors, such as STEM, like other students without disabilities.

Most of the students without disabilities in the Seidenberg School are not encountering those with disabilities until they are engaging in the evaluations in the film programs and joining in the presentation sessions. In distanced film interactions with those with disabilities, including those with developmental and intellectual disabilities (IDD) and those with physical disabilities, those without disabilities are learning in the representations of the media more of the positive perspectives if not the skills of those with disabilities (Antonio et.al., 2004). The engagement perceptions of positivity are generally indicating that those without disabilities in the school are learning more about the potential of those higher-functioning types with disabilities (e.g., Autism Spectrum Disorders [ASD]), though the advocacy perceptions are not indicating equivalently more motivation to be in public service apart from STEM.

Moreover, notable is the potential of those higher-functioning types with disabilities to be properly in information systems with those students without disabilities.

Overall, the data results of this study are reassuring for the receptivity of those without disabilities for those higher-functioning types with disabilities to be in schools of information systems.

6. IMPLICATIONS OF PROGRAM

The films in the program are clearly deepening the knowledge of the students without disabilities about current and potential information systems students with disabilities. The films are different from mainstream media in depictions of diversity (DC Partners in Transition, 2013), especially in images of higher-functioning people with disabilities from their intelligence, not their impairments (Grandlin & Panek, 2013). The implication of the program is that perceptions of students without disabilities are important in influencing the continuance and inclusion of students with disabilities in majors in information systems and in STEM.

The focus on the intelligence not the impairments of the students with disabilities is enhancing the feasibility of increasing interactions of students with and without disabilities. Discussions and further interactions of the information systems students without disabilities however distanced in films increase their learning of the perspectives of those with disabilities (Astin, 1993). Interactions later in gender, orientation by sex and race intersectionality increase their learning of the perspectives of those who may also have disabilities (Vaccaro & Kimball, 2017), insuring that numerous student types are learning in a less intimating post-secondary institution. Increasing the interactions of student types may inform those with disabilities that they are members of the school like those without disabilities, with benefits to both types (Zirkel, 2008). The foundation for involvement of those with disabilities in the life of the Seidenberg School is an implication of the program.

The focus on increasing the knowledge of people with disabilities as people with potential is a foundation for helping anti-bullying initiatives in the school and the university. Students without disabilities are learning to be more than docile observers to discrimination based on disability McNamara, 2013), especially in harassment incidents with students with mental or physical disabilities – *it is our issue*, *and we will be the solution* is a motto in the school; and they may be learning to be more proactive about disability rights. The implication is the film program in the school is more propitious for those with disabilities if integrated with further programs of the university.

The initiation of the film program is a limited proposition if not integrated with other programs of the school and the university. Internal offices of disability and diversity, health resources and special needs technologies may be involved in services for students with disabilities, if requested in the semesters by them. They may be learning skills in sociability beyond technology skills from mentoring and networking programs, so that they are included not isolated in hospitable schools of information systems (Albanesi & Nusbaum, 2017), and so that they may be positioned for industrial internship programs if not jobs in STEM. They may be mentored by peer students without disabilities in programs of the school and may be members of networks sponsored by professors or students of the university. The implication of an integrated program is that those with disabilities may be reassured about diversity as a proposition of services to support them.

The final implication of this program is that the results in the Seidenberg School are justifying outreach to higher-functioning students with disabilities to be in post-secondary institutions. The perceptions of the students without disabilities as to the possibilities (Westling, Kelley, Cain & Prohn, 2013) are indicating the potential of those with disabilities, including developmental and intellectual disabilities (IDD), to be involved in a school of computer science and information systems. The inclusion of higher-functioning type students with disabilities insures diversity in a school of information systems and in an industry advocating for diversity of professionals in STEM.

7. LIMITATIONS OF STUDY AND OPPORTUNITIES IN RESEARCH

The paper is focused on a facet of an initiative for inclusiveness of more higher-functioning students with disabilities to be in schools of computer science and information systems. Increased initiatives in outreach to this niche population of potential students are a requisite responsibility for schools of information systems. Increased infrastructural and instructional services to students with disabilities, even if higher-functioning and less impaired, may be however a new responsibility for the schools.

Nevertheless, the results of this study will be helpful in informing professors on an opportunity for initially involving students without disabilities with current or potential students with disabilities who are higher-functioning in performance. The inclusiveness of a qualified but underrepresented population of students in schools of information systems of post-secondary institutions is a clear opportunity for more research and is a response to the underrepresentation.

8. CONCLUSION

The paper addresses the challenge of diversity in advocating for a least likely population to be in a post-secondary institution: people with disabilities.

The paper is contributing an approach for engaging students without disabilities with current and potential students with disabilities in a school of computer science and information systems at a major metropolitan university. The paper is describing a *Disability Film Festival* program that is focusing inspirationally on the intelligence, not the impairments, of those with disabilities, which is improving the perceptions of information systems students without disabilities of those with disabilities. In focus groups, the authors of the paper are learning that depictions of others with disabilities in films from the festival programs are facilitating engagement and advocacy of the students without disabilities in the possibilities of potential of those higher-functioning types with disabilities to be in industrial fields of information systems and STEM.

Most of the students without disabilities did not encounter those with disabilities until they were engaging in the festival programs in the school and had less positive stereotyping of them. The information systems students are however learning more of diversity and fairness in the potential of those higher-functioning and intellectually nimble types to be as productive in STEM as themselves. The program in the multiple semester study is offering an opportunity as to the possibilities of including more of the higher-functioning types to be in schools of information systems.

In short, this study is contributing a discussion for diversity of a qualified underrepresented population of students to join in the life of a university.

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APPENDIX

Figure 1: ***Celebration of Individuals with Disabilities in Film - 2017 Disability Film Festival***

Table 1a: Perceptions of Information Systems Students without Disabilities – Summary

	Means 2017 - 2015	**Standard Deviations 2017 - 2015**
Engagement from Film Program	3.52	1.67
Importance	3.55	1.71
Satisfaction	3.49	1.63
Advocacy from Film Program	3.02	1.96
Self-Efficacy	3.47	1.65
Satisfaction	2.56	2.14

Table 1b: Perceptions of Information Systems Students without Disabilities – Summary

	Means			**Standard Deviations**		
	2017	**2016**	**2015**	**2017**	**2016**	**2015**
Engagement from Film Program						
Importance	3.60	3.67	3.36	1.69	1.57	1.85
Satisfaction	3.56	3.57	3.34	1.61	1.58	1.71
Advocacy from Film Program						
Self-Efficacy	3.43	3.66	3.33	1.63	1.51	1.78
Sociality	2.85	2.34	2.45	2.09	2.17	2.14

Table 2a: Perceptions of Information Systems Students without Disabilities – Detail

	Means	Standard Deviations	Means	Standard Deviations
	2017		2017	
Engagement from Film Program				
	Importance		Satisfaction	
Film 1 – *Anna*	3.56	1.45	3.33	1.54
Film 2 – *Children of God*	4.00	1.47	3.93	1.33
Film 3 – *Dancing on Wheels*	3.22	1.95	3.26	1.87
Film 4 – *Four Quarters of Silence*	4.67	1.07	4.56	1.09
Film 5 – *Picked*	2.78	1.50	2.96	1.53
Film 6 – *Stutter*	2.78	2.06	2.74	1.81
Film 7 – *The Quiet Ones*	4.22	1.25	4.11	1.25
Advocacy from Film Program				
	Self-Efficacy		Sociality	
Film 1 – *Anna*	3.37	1.84	2.85	2.05
Film 2 – *Children of God*	3.67	1.54	3.11	1.95
Film 3 – *Dancing on Wheels*	3.04	1.87	2.37	2.11
Film 4 – *Four Quarters of Silence*	4.52	0.89	4.22	1.63

Film 5 – *Picked*	2.67	1.73	1.81	1.92
Film 6 – *Stutter*	2.93	1.52	2.04	2.12
Film 7 – *The Quiet Ones*	3.85	1.20	3.52	1.91

Table 2b: Perceptions of information Systems Students without Disabilities – Detail

	Means	**Standard Deviations 2016**	**Means**	**Standard Deviations 2016**
Engagement from Film Program	**Importance**		**Satisfaction**	
Film 1	3.44	1.55	3.22	1.55
Film 2	3.57	1.42	3.29	1.47
Film 3	4.10	1.56	4.13	1.57
Film 4	3.94	1.65	3.77	1.61
Film 5	3.39	1.62	3.45	1.63
Advocacy from Film Program	**Self-Efficacy**		**Sociality**	
Film 1	3.48	1.40	2.41	2.32
Film 2	3.37	1.72	2.00	2.22
Film 3	3.94	1.48	2.26	2.32
Film 4	4.00	1.29	3.06	1.84
Film 5	3.55	1.59	2.00	2.07

Table 2c: Perceptions of Information Systems Students without Disabilities – Detail

	Means Standard Deviations 2015		Means Standard Deviations 2015	
Engagement from Film Program	**Importance**		**Satisfaction**	
Film 1	3.43	1.65	3.43	1.27
Film 2	2.70	2.01	2.35	1.94
Film 3	4.57	0.84	4.43	0.90
Film 4	1.78	1.48	2.17	1.64
Film 5	4.74	0.86	4.48	1.20
Film 6	3.39	2.02	3.43	1.90
Film 7	2.91	1.88	3.04	1.43
Advocacy from Film Program	**Self-Efficacy**		**Sociality**	
Film 1	3.61	1.70	2.48	1.93
Film 2	2.65	1.82	1.35	1.80
Film 3	4.35	0.93	2.96	2.16
Film 4	1.83	1.53	0.70	1.46
Film 5	4.70	0.93	4.30	1.52
Film 6	3.26	1.96	3.04	2.08
Film 7	2.91	1.70	2.35	2.08

Table 3: Kendall's Tau Non-Parametric Correlation of Factor Pairs – 2017 – 2015 – Summary

Factors of Study	Importance Ratings	Satisfaction Ratings	Self-Efficacy Ratings	Sociality Ratings
Satisfaction Ratings	.967*			
Self-Efficacy Ratings	.971*	.955*		
Sociality Ratings	.960*	.964*	.965*	

*Correlation is significant at the 0.01 level – 2-tailed.

Table 4: Frequency Distributions of Factors – 2017 – 2015 – Summary

Factors of Study	Importance	Satisfaction	Self-Efficacy	Sociality
Ratings				
5 – Very High Impact	238 47.1%	211 41.8%	213 42.2%	174 34.5%
4 – High Impact	40 7.9%	55 10.9%	39 7.7%	10 2.0%
3 – Intermediate	126 25.0%	128 25.3%	158 31.3%	118 23.4%
2 – Low Impact	16 3.2%	43 8.5%	15 3.0%	11 2.2%
1 – Very Low Impact	31 6.1%	18 3.6%	28 5.5%	9 1.8%
0 – No Impact	54 10.7%	50 9.9%	52 10.3%	183 36.2%