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IT Certification: Demand, Characteristics and Integration into Traditional University MIS Curriculum

Mohammad A. Rob

University of Houston-Clear Lake, rob@uhcl.edu

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IT Certification: Demand, Characteristics and Integration into Traditional University MIS Curriculum

Mohammad A. Rob
University of Houston-Clear Lake, USA
rob@uhcl.edu

ABSTRACT

The value of IT certification is a subject of debate. IT magazines suggest that certifications can provide opportunities for new positions, promotions or salary increases to existing employees. Research suggests that IT certification can boost a fresh graduate's profile to garner the attention of a hiring manager. Research also suggests that certification, education and experience are complimentary factors in the future job prospects of a candidate. For years, educators have been suggesting to include IT certifications in the traditional computing curricula of colleges and universities. However, due to a dearth of knowledge and commitment, faculty members have been reluctant to follow the suggested route. In this paper, we report the steps of integrating several IT certifications in the graduate MIS curriculum of a U.S. university over a period of six years. Certifications from the leading vendors such as Microsoft, Oracle, and Cisco were integrated into the programming, database, and networking courses. A Survey of past and present students suggests that almost all believe that IT certification can help them build a better career and they were prepared well for the certification exams. We recommend that educationists who have been faced with the dilemma of whether or not to adapt IT certifications in their computing curricula, should take the steps and do so. That will bring IT departments up to the par with IT industry standards.

Keywords: IT certification, IS curriculum, IT employment, IT skills, MIS curriculum.

INTRODUCTION

There has been a tremendous growth and attention to professional IT Certifications in recent years. These can be attributed to two major factors: (i) competitive IT job market for fresh graduates and (ii) generation of new revenue by certification companies. With the decline of the IT job market and abundance of IT graduates, candidates are looking to boost their professional profiles with IT certifications. Existing IT personnel use them to bolster their professional growth and new graduates use them to outshine other potential job candidates (Hitchcock, 2007; Wireschen & Zhang, 2010). IT magazines, e.g., *Computerworld, Certification, IT CareerFinder, NetworkWorld,* and *PC World,* have been suggesting that IT certifications boost a candidate's profile to land a job, promotion or salary increase (Arora, 2012; Bort, 2011, Gabelhouse, 2002; Tittel, 2013). Research suggests that hiring managers utilize IT certifications to screen candidates from a large pool of applicants (Anderson, Barrett, & Schwager, 2005; Hunsinger & Smith, 2005, 2008; Robin, 2011). Getting certified is the best way to distinguish oneself from competing job candidates and prove the attainment of contemporary skills to hiring managers

and prospective employers (ITCareerFinder, 2013). IT certification makes one stand apart, proves that skills are current, and provides higher salaries as well as gives respect and credibility among colleagues and employers. On the other hand, research on IT job postings suggests that only a small fraction of the advertised jobs require IT certification (Robin, 2011; Prabhakar, Litecky & Arnett, 2005; Lee & Lee, 2006).

IT companies such as Oracle, Microsoft and SAP created partnerships with educational institutions to gain loyalty to their products and technology by the instructors and future IT professionals. According to Microsoft, there are many benefits of IT certification for students: it validates proof of skills based on globally recognized standards, gives a competitive edge in the job market, sets individuals apart with the visual identity of certification and indicates that a candidate or employee is committed to the profession and the industry (Microsoft, 2013). In short, students can stand out, earn more, feel good and be productive. Faculty benefits for certification can include the following: aligning technical programs with required computing skills, and providing a reliable benchmark in addition to a college certification or degree. Institutions can benefit because certification gets students job-ready with the required computing skills, provides a reliable benchmark for technical programs and provides a tangible measure of faculty and staff skill sets.

For many years, educationists have been suggesting to integrate IT certifications into traditional computing curricula in colleges and universities (Jovanovic, Bently, Stein, & Nikakis, 2006; Nelson & Rice, 2001; Randall & Zirkle, 2005; Schlichting & Mason, 2004, 2005; Yuan, Moffitt, Bailey, Nix & Terrell, 2000). Many junior colleges have been offering courses specifically designed to prepare candidates to appear for IT certification exams. However, it is not clear how many four-year colleges or universities have integrated IT certifications into their core curriculum. The MIS program at the University of Houston-Clear Lake (UHCL) has integrated IT certifications in several of its core graduate courses. This paper attempts to discuss the steps of implementation, issues encountered in implementing certifications, current status of certifications, and the results from the students' point of view. To the best of our knowledge, this is the first report of comprehensive certification integration into a university IT curriculum.

In the following, we first discuss the recent literature on IT certifications, followed by an overview of IT certifications. We then discuss how IT certifications were integrated into the MIS curriculum, followed by research methodology and results.

LITERATURE REVIEW

Literature on IT certification may be grouped into two major areas: Demand of IT Certifications and Integration of IT Certifications into Traditional Academic Curricula. We discuss them briefly in the following.

Demand of IT Certifications

Many IT graduates are finding that in addition to a degree, they need experience and professional IT certifications to land a job, all of which cannot be achieved by fresh graduates. However,

there is a common belief that IT certification can boost a new graduate's chances to get an HR manager's attention (Anderson et al., 2005; Hunsinger & Smith, 2005, 2008; Wireschen & Zhang, 2010). IT certifications have become the standards by which employers distinguish serious, competent professionals from technical hobbyists (Arora, 2012). Many government agencies now require personnel who handle sensitive information to hold one or more IT certifications. The Department of Defense (DoD) is particularly stringent in its requirements for certified technical professionals (Messmer, 2012). A study of IT job postings in *Monster.com* over a period of three years suggested that even though most jobs do not post IT certification as a requirement, it does appear to give a candidate an edge within a tight job market (Prabhakar et al., 2005).

Novell networking is known to be the pioneering company in the certification industry (Randall & Zirkle, 2005). According to a recent report in *NetworkWorld*, a survey of 700 network professionals found that 60% of them landed a new job and 50% earned more with IT certifications (Bort, 2011). But those earning the most (more than $110,000) also had about 10 years of experience and 25% of them had a master's degree. According to *Certification* magazine, professionals who get certified feel secure in their profession (Gabelhouse, 2002). According to a recent salary survey based on the Microsoft certifications, an overwhelming 71 percent said that obtaining certification was a personal goal, while 48 percent said certification would help them distinguish their skills from others, and 32 percent said it worked as a leverage to get a better job (Microsoft, 2011). Eighty-six percent of hiring managers indicate that IT certifications are a high or medium priority during the candidate evaluation process (CompTIA, 2012). Ninety-one percent of hiring managers consider certification as part of their hiring criteria (Microsoft, 2013).

There has been some serious discussion about the value of IT certification in the hiring practices of IT professionals. Hunsinger and Smith (2005) investigated the factors that influence a given hiring manager's intention to use IT certification as part of employee selection. Their findings show that managers sometimes use certification to differentiate between job candidates with similar levels of education and experience; however, they also intend to use certification in the hiring process for mid-level and even high-level positions. Recently, Hunsinger and Smith (2008) extended their research and concluded that use of IT certification in the hiring decision depends on many related factors such as the overall labor market, characteristics of the firm, vendor and client pressures, the hiring manager's familiarity and experience with the certification, the volume of applicants, type of position, and the characteristics of the certification. Certifications are likely to be more important for positions in the lower-level of corporate hierarchy.

Anderson et al. (2005) also surveyed HR managers and found that IT certification, formal education and experience are imperfect substitutes for each other, and there ought to be a balance between the theoretical, technical and applied components in IS curricula. Wireschen and Zhang (2010) also looked at the value of certification from the employer's perspective in academic institutions. It is found that academic IT departments do value IT certification, and they either require IT certification or expect employees to be working towards certification; however, an overwhelming endorsement of IT certification was not evident. Lee and Lee (2006) analyzed 550 job postings for IT Managerial positions from Fortune 500 corporate websites spanning a three-

year period. They concluded that only 7.7 percent of advertisements mentioned IT project management certification as a plus in addition to education and experience.

Robin (2011) studied job vacancies advertised in companies listed in *Computerworld's Best Places to work in IT 2010* and analyzed in terms of education, experience and IT certification requirements. The results showed that 70 percent require a bachelor degree, 85 require experience, and about 14 percent require some sort of certification. A recent article on *Computerworld* mentions that some employers are beginning to require certifications for a wide range of jobs, and they often adjust salaries accordingly (Perkins, 2010). With so many job seekers to choose from, employers need quickly to identify those who have the skills they seek. For new college graduates, a certification in programming says, *"I know about more than just the theories and models we learned about in school."*

It is clear from the literature that IT certification may not be the major factor in the hiring process, but it gives an edge in the job prospect for fresh graduates, and it provides a significant salary benefit, promotion or better position to existing professionals. It is to be noted that none of the research targeted fresh IT graduates. Furthermore, most fresh graduates do not get an opportunity to earn IT certifications before graduation, and it is not clear how these job seekers feel about IT certification. In the following, we will try to address this issue through the survey results found from our IT graduates.

Integration of IT Certifications into Academic Curricula

Perhaps this is the most discussed and debated area found in the literature without any conclusion but with many questions yet to be answered. In a panel presentation titled, "*Degree or Certification: What do Faculty Think?*" Yuan et al. (2000) posed several important questions. Is certification more important than degree or vice versa? Does certification have a place in higher education? Should we integrate certifications into our IT curriculum? What does certification mean for community colleges and four-year institutions? As mentioned before, along with various professional certifications, IT certifications are offered by many junior colleges (HCC, 2012); however, research data are limited in corroboration. Nelson and Rice (2001) justified the need and value of IT certification along with the educational degree, and reported the integration of seven certifications in various courses in the associate and bachelor level curricula in the Computer Information Technology program of a small college. The two most popular certifications were focused on office productivity software and operating systems. In each case, they utilized a series of two required courses to implement Microsoft Office User Specialist (MOUS) and CompTIA A+ certifications. In order to implement Cisco CCNA certification, they had to design a four-course sequence of Cisco designated training materials over a two-semester period. While implementation of certifications at the associate level seemed to be successful, the more ambitious certifications such as MCSE and MCSD that require many exams and were implemented at the bachelor level were not as successful. The result was a constant revamping of courses and change of the certifications with new ones.

Schlichting and Mason (2004) argues that the academicians in computing programs tend to reject the path followed by IT industry, and even refuse to consider offering course credits that prepare traditional students for certification exams. Certification training is considered as "trade-school"

work that is below the dignity of a rigorous academic curriculum. Through a survey of the heads of MIS, CIS and CS programs, the authors found that most schools do not offer certification training for academic credit and do not anticipate offering any in the future; however, the majority of people think that certification would make their graduates more competitive in the job market. They further concluded that one of major difficulties in implementing certification in academic curricula is the lack of training and certification by most faculty members in computing curricula.

In a follow-up paper, Schlichting and Mason (2005) mentioned that academicians within the computing area are of a mixed mind when it comes to certification training. Although they generally believe that certification enhances students' employability, at the same time, they do not consider preparation of students for the certification exams to be the responsibility of computer departments. They even argued, "How can we in the computing world rationalize our generally negative view of training with the demands of the professional marketplace, particularly given the declining enrollments many departments have experienced over the last several years?" The authors further provided an example: if the academicians are to prepare students for careers in database development, they should provide substantial training with the leading database software *Oracle*, hence preparing them for the Oracle certification exams. However they also realized a few problems in such an approach, and one of them is accreditation. Finally, they have proposed that supplementing existing theoretical coverage of popular fields of study, including databases and networking, with certification training materials will enhance student learning as well as provide students with valuable job skills. In this paper, we will address some of the practical issues mentioned by these authors as well as results of implementing their proposal, as we have learned while implementing several IT certifications in our MIS curriculum.

Randall and Zirkle (2005) in their reviewed paper looked into various issues surrounding the use of IT certification in formal education setting. They mention that unlike community colleges, four year post-secondary institutions have been slow to offer students added benefit of pursuing an IT certification as a compliment to their degrees. This may be due to some legitimate concerns. Many certification programs are narrowly focused on a particular product or technology, they do not adequately prepare students to obtain mid-to high-level positions in the IT employment sector, and educational institutions using certification programs as a substantial part of their IT curriculum may not be able to respond to new skill demands of the ever-changing IT industry. Thus, many considerations need to be taken into account before implementing IT certification in a formal computing curriculum and to influence in a positive way. Hunsinger and Smith (2008) surveyed information system undergraduates to understand the factors that can influence them to pursue IT certification. They found that a lack of knowledge about certification and the faculty role to inform students about the value of certification and related course content are major factors of influence. In this paper, we will attempt to address some of these factors.

Ortiz (2003) describes an experience in developing a workshop specifically designed to prepare undergraduate students to take *Sun* Java certification exam. It is concluded that there are challenges in offering certification preparation course in a regular university class environment; however, the course provided a deeper understanding of Java language to students, which wouldn't happen otherwise. Jovanovic et al. (2006) outlined possible ways of implementing

multiple certifications programs such SAP, ITIL, I-Net+ and Microsoft into an IT curriculum of an Australian university. Frank and Werner (2010) outline the experience of preparing, taking and obtaining CSSLP certification by one of the authors who teaches software engineering-related courses. It is mentioned that a considerable amount of preparation was required that included a five-day training course and training books costing $2,495 along with an examination fee of $549. The multiple-choice test of 175 questions was quite challenging and necessitated careful reading. Recertification is required every three years that includes earning of 90 professional continuing education hours along with an annual maintenance fee of $100. It is concluded that preparing for and taking a certification exam can improve an educator's expertise and ability to successfully teach a course. This concurs with the experience found by Ortiz mentioned above. However, the authors remain skeptical about the inclusion of IT certifications in the traditional IT curriculum.

While the debate, challenges, and opportunities of including IT certification in the academic curriculum continues, we report in this paper the results of integration of several leading certifications from IT industry into our master's-level MIS curriculum. But first we provide an overview of IT certifications as we have learned while going through the process of integration over a period of about six years. It will be a valuable asset to those who may consider adapting similar certifications into their curriculum in the future.

AN OVERVIEW OF IT CERTIFICATIONS

Keeping up with the IT certification industry has been a challenge for professionals as well as academicians and students. It is constantly changing due to change of technology in almost every two years. *GoCertify.com* provides an alphabetic listing of hundreds of vendors offering IT certifications which include big tech names such as Apple, Cisco, Google, HP, IBM, IEEE, Linux, Oracle, McAfee, Microsoft, Nortel, Novell, PayPal, PMI, SAP, SAS, SEI, Teradata and etc. According to Hitchcock (2007), in 2000 there were about 300 discrete IT certifications and 1.6 million people earned approximately 2.4 million certifications. No current information could be found, but these numbers must be many folds. Because there are so many companies providing so many varieties of IT certifications, and there is no single organization to keep track of these certifications, it is hard to know the number of professionals holding IT certifications. According to Hunsinger and Smith (2005), this number might have reached 20 million by 2010.

IT certifications can be divided into two general groups: *vendor-specific* and *vendor-neutral*. Certifications related to products and services of technological companies such as Microsoft, Cisco, Oracle, and Novell are in the first group, and those related to IT professions such as project management, security, and business intelligence, offered by independent organizations such as CompTIA, (ISC)², PMI, and SEI are in the second group.

The Big Names in IT Certification Industry

Before one can adapt a certification into a course, it is important to know the companies that are well-known in certification industry as well as the intricacy of their certifications. The following is a brief discussion about the big names in certification industry.

Microsoft. Microsoft most probably has the largest number of IT certifications based on its wide variety of software products. According to a 2007 report by the tech-giant, since its inception of first certification Microsoft Certified Professional (MCP) in 1992, nearly three million people have obtained Microsoft certifications. Microsoft Learning website (Microsoft, 2012) provides up-to-date information about current technology certifications which include MCSA, MCSD, MCSE, MCSM, MOS, MCTS, MCITP, but it does not include retired certifications, such as MCP, MCPD, MCT, MCAD, MCSA, MCSD, MCDBA, MCDST, and countless acronyms termed as "alphabet soup" by tech writers of professional magazines (Wenzel, 2010). Each of these certifications further includes multiple examinations, creating several hundred examinations just for Microsoft alone. The 70-XXX series contains about 200 certifications (www.examcollection.com). Recently Microsoft launched a new Microsoft Technology Associate (MTA) 98-test series, which is somewhat technology independent. These are meant for beginners in various professions such as software development, networking, database, web development, security, and so on that use Microsoft technology. One can earn an MTA in any of the twelve areas just by taking one test.

Cisco. Cisco certifications carry significant weight due to software giant's role in software and hardware solutions for local area and wide area routed networks. Cisco certifications certify the skills of professionals who design, install, configure and manage these networks. The Cisco certification Program consists of certifications that are suitable for entry level as well as experienced networking professionals. Major certifications are CCENT, CCNA, CCDP, CCDE, and CCIE - while each of them has various levels and paths as well, creating a large collection of certifications and tests (Cisco, 2013). Cisco website reports more than 700,000 Cisco-certified professionals worldwide.

Oracle. When considering database, Java, UNIX, and Linux certifications, Oracle has the lead in the industry. Oracle also acquired ERP systems like PeopleSoft and JD Edwards, and together it offers several hundred certifications. Oracle MySQL, PL/SQL, Oracle Database Associate and Oracle Certified Professional (OCP) are well-known certifications (education.oracle.com).

CompTIA. The Computing Technology Industry Association or CompTIA, a non-profit trade organization is also a provider of many industry-independent IT certifications (www.comptia.org). In 1993, it started to offer **A**+ certification to demonstrate competency for computer technician and *Wikipedia* reports that there are over 800,000 people with A+ credential worldwide.

PMI. The Project Management Institute or PMI is a not-for-profit organization that provides services such as standards, education, research and publication for project management professionals (www.pmi.org). In 1984, PMI launched its first certification, Project Management Professional (PMP), and today around 370,000 people hold the PMP certification. The other important certification of PMI is Certified Associate in Project Management or CAPM.

(ISC)². The International Information Systems Security Certification Consortium or (ISC)² is a non-profit organization that specializes in information security education and certification (www.isc2.org). It has been described as "world's largest IT security organization." The most widely known certification offered by (ISC)² is a Certified Information Systems Security

Professional (CISSP) certification. As of January 2013, (ISC)² reports 85,285 members holding the CISSP certification worldwide in 143 countries.

Certifications Levels and Exams

Most vendor certificates can be divided into various levels and they are designed according to the educational level or job responsibilities of an individual. For example, *Cisco* certifications are organized in five different levels: Entry, Associate, Professional, Expert and Architect along with targeted certifications for Specialist and Technician. These are available in seven different subject areas: Routing & Switching, Design, Network Security, Service Provider, Storage Networking, Voice, and Wireless (www.cisco.com). *Oracle* offers three levels of certifications, Oracle Certified Associate (OCA), Oracle Certified Professional (OCP), and Oracle Certified Master (OCM) in several disciplines such as database, application server, forms, PL/SQL, e-Business, and so on that include several hundred tests (www.oracle.com). The newly revamped *Microsoft Office* certification path has five levels: Specialist, Expert, Master, Technology Specialist and Technology Professional (Microsoft, 2012).

Typically, one starts from the lower level and climbs upward by completing next-level certifications. In most cases, each level requires passing multiple certification exams. For example, much-known Cisco CCNA certification in the Associate level requires at least two exams, and to move on to the next level requires another exam. Each of the newly revamped eight *Microsoft Server* certification paths has three levels: Associate (MCSA), Expert (MCSE), and Master (MCSM). MCSA requires three tests, MCSE requires two more tests with a total of five, and MCSM requires two more with a total of seven tests. As of writing this paper, the last two tests of MCSM are not yet developed, and by the time they are developed, Microsoft will probably change its certification path with a new alphabet soup. Similar certification paths and scenarios follow in almost all technological companies. Furthermore, almost all IT certifications must be renewed periodically or may be valid for a specific period.

In-Demand Certifications

Many website rank IT certifications. These lists may vary as many certifications become outdated while companies change their certifications along with their technologies. Following are a few in-demand certifications (Dignan, 2008; ITCareerFinder, 2013; Schneider, 2012; Wenzel, 2010; Willmer, 2010).

Microsoft Certified Solution Expert (MCSE). Demonstrate one's ability to build innovative software solutions across multiple technologies, both on-premises and in the cloud. This certification most probably replaces long-lasting Microsoft Certified System Engineer (MCSE). This newly revamped certification can be earned through eight paths based on eight server technologies that Microsoft markets. For each path, an individual has to pass five exams (Microsoft, 2012).

Microsoft Certified Solutions Developer (MCSD). Validate one's ability to design and build software solutions that extend beyond traditional platform boundaries. The newly revamped

MCSD certification has three tracks: Windows Store Apps, Web Applications and Application Lifecycle Management. Each track requires an individual to pass five tests.

Project Management Professional (PMP). PMI's Project Management Professional (PMP) credential is the most important industry-recognized certification for project managers. Globally recognized and demanded, the PMP demonstrates that one has the experience, education and competency to lead and direct complex projects. One must have between three and five years of verifiable project management experience to take the exam, along with 35 hours of project management education and a degree (www.pmi.org).

Cisco Certified Network Associate (CCNA). This vendor-specific accreditation authenticates the bearer's ability to administer medium-size route and switched Cisco networks. To earn the certification, one can either pass the 640-802 CCNA exam or both the 640-822 Interconnecting Cisco Networking Devices Part 1 (ICND1) and 640-816 ICND2 exams. The CCNA designation is valid for three years, after which one must pass one of various possible exams for renewal.

Oracle Certified Professional (OCP). This certificate from Oracle validates the skills and experience required to manage, develop or implement enterprise-wide databases, middle-ware or applications. This certificate is appropriate for mid to senior level Oracle database administrators. Oracle also requires all candidates to complete an instructor-led hands-on course that involves significant real-world interaction and problem solving, in addition to standard multiple-choice exams. To achieve OCP, one has to complete the first exam, Oracle Certified Associate.

A+. The CompTIA A+ certification is designed for computer technicians and it covers topics such as hardware, operating system and networking. Six months of technician experience is recommended and two exams are required.

CISSP. Offered by the International Information Systems Security Certification Consortium (ISC)², CISSP certification is a globally recognized standard of achievement that confirms an individual's knowledge in the field of information security. CISSPs are information assurance professionals who define the architecture, design, management and/or controls that assure the security of business environments. It is the first certification in the field of information security to meet the stringent requirements of ISO/IEC Standard 17024. Candidates must have a minimum of five years of experience in two of the ten domains mentioned in (ISC)² website (www.isc2.org).

It should be clear from the above discussion that many demanding certifications require several exams or practical experience. Others can be easily integrated into junior college curriculum. Thus careful thoughts must be given before implementing any certification into traditional college or university degree curriculum.

Cost of Certification

IT certification does not come to be cheap. All certifications require a fee along with books and training materials. Certifications are available worldwide through test centers operated by

Prometric, *Certiport*, and *Pearson Vue*. Each Microsoft test requires a fee of $150 with a reduced fee for students, Cisco CCNA certification costs about $300 for two tests, Oracle OCP requires about $400 for two tests, A+ certification costs $183, and PMP test costs between $400 and $500 depending on the type of professional. Higher-level certifications cost more. Many times certification books published by the IT vendors are not very useful to pass an exam, and a whole breed of companies has grown that provide sample tests for IT certification exams in modest cost. For example, see *www.test-king.com, www.actualtests.com, www.thepass4sure.us* and *www.ucertify.com.* Furthermore, there are training companies that charge more than $2000 for a short course of 3-5 days. Also, almost all IT certifications must be renewed periodically that cost money. Considering all the companies involved in the certification process including testing, training and publishing, the worldwide IT certification industry is a billion dollar industry (Hitchcock, 2007).

INTEGRATION INTO GRADUATE MIS CURRICULUM

Over the past six years, several IT certifications were integrated into the graduate MIS curriculum at the University of Houston-Clear Lake. The initiative was not a planned or coordinated effort of the departmental faculty members, but an individual faculty member's quest to implement Oracle certifications in his graduate-level database courses. Soon he started to pursue other faculty members to implement certifications in their courses. Majority of the faculty members became excited about the new initiative and few showed resentment. Nevertheless, certifications from Microsoft, Cisco and Oracle were slowly implemented into programming, web development, networking and database courses. In the past few semesters, some instructors teaching undergraduate courses became interested to implement certifications in their courses as well. Some of our faculty members claimed that certification requirement produced increased enrollment in the graduate MIS program. Recently certification results from several courses are also used as benchmarks in the quality assurance process of AACSB for the MIS program (AACSB, 2012). For example, one of the goals in a subject area is that 70 percent of the students will pass the certification exam. The following is an account of our experience as faculty members while implementing IT certifications in traditional MIS courses.

The Change of Curriculum

Integration of certification exams required significant changes in course curriculum and teaching methodology. There were at least two textbooks in a course: one for the course content and the other for the certification materials. The certification books are available from the certification companies or other publishers depending on the type of certification. Technical certifications typically contain sample computer activities to understand the concepts presented. Also, there are sample certification materials available (for example, see: www.certkiller.com, www.thepass4sure.com, www.examcollection.com) to prepare for the certification exams.

It was mentioned by many authors (Frank & Werner, 2010; Nelson & Rice, 2001; Ortiz, 2003) that implementing certification in traditional college courses has been challenging and required revamping of courses or introduction of new courses. We did not plan for any significant modification to any existing course or introduce any new course, but integrate certification

materials into existing courses. Thus, it is important to plan for a semester-long course to complete the typical course content while preparing students to appear for the certification exam by the end of the semester. Figure 1 shows an example pattern of a syllabus accommodating both course contents and certification materials. It also shows the primary responsibility of course activities to faculty and/or student, although this might vary from instructor to instructor.

Time	Teaching/Learning Materials	Primary Responsibility	
		Faculty & Student in the Classroom	**Student outside the Classroom**
First 9 weeks	Course text and content	Lecture, demonstration, computer skills, test, quiz, etc.	Homework on course activity. Self-study on selected chapters on certification materials and complete skills or activities.
Second 4 weeks	Certification text and materials	Demonstration and student activity on certification materials.	Student activity on certification materials. Practice sample certification test questions.
Last 2 weeks	Sample certification exam questions	Review certification test questions.	Practice sample certification test questions. Schedule for the Certification exam

Table 1: A 15-week Course Schedule Listing Course Content and Certification Materials.

Students had to take the certification exam before the end of the semester and without passing the certification exam, students in general would not get an A in a course. In general, 10 percent of the overall grade comes from the certification score. Students passing the certification exams receive full 10 points, while those not passing the exams could receive partial points (0-8). The final exam is typically waived for the students who take the certification exam, but students who do not take the certification exam will have to take a final test similar to the certification exam. All of these are to put a pressure on the students to take certifications seriously.

Challenges Encountered

Many authors (Frank & Werner, 2010; Nelson & Rice, 2001; Ortiz, 2003) who tried to implement certifications in their regular college courses, mentioned various challenges, and we had to face them as well. Because there was no overall discussion or plan to implement specific certifications for specific courses, the result was challenging for faculty members. For example, *Exam 70-526: Microsoft® .NET Framework 2.0 Windows®-Based Client Development* was implemented in two programming courses, VB and C#, by two faculty members; although after few semesters it was used in VB course alone. Some faculty members had to implement two certification exams in two different courses in one semester, which was overwhelming. One faculty member became highly enthusiastic and implemented two certification exams in two different courses, in two different semesters, to complete a set of exams required to obtain a certificate. For example, to obtain Microsoft Certified Technology Specialist (MCTS) credential, one had to complete two exams: 70-505 and 70-536. After implementing this for a semester or two, the particular faculty member not only gave up the whole idea but stopped teaching the courses that involved certification exams.

In most cases, certification materials hardly matched the course content. For example, there is no certification exam on Visual Basic or C# programming language; but there is on Microsoft Visual Studio developmental tool that uses VB or C# as a language. The revamped Visual Studio certification *Exam 70-511: TS: Windows Applications Development with Microsoft .NET Framework 4.0* is on Windows Presentation Foundation (WPF) and it has hardly any connection to programming.

The biggest challenge was not to implement a particular certification in a particular course, but the changing nature of certifications in almost every two years just like the change of technology. As soon as a faculty member becomes comfortable in integrating certification materials with the course content, the certification company overhauls the certification process and related exams. Old certification exams become obsolete and a new set of certification exams becomes available.

Consider one of several paths to obtain MCTS certifications on Microsoft Visual Studio tool that required two exams for several years (Microsoft, 2010). In April 2006, Microsoft published *Exam 70-526: Microsoft® .NET Framework 2.0 Windows®-Based Client Development* for Visual Studio 2005. By the time a faculty member became familiar with the exam materials and implemented into the VB/C# course, in February 2009 Microsoft changed that certification to *Exam 70-505 - TS: Microsoft .NET Framework 3.5, Windows Forms Application Development* for Visual Studio 2008. While Microsoft changed the developmental tool from Visual Studio 2008 to 2010, a new certification became available in July 2010, *Exam 70-511: TS: Windows Applications Development with Microsoft .NET Framework 4.0*. The last exam hardly had any relationship to course materials, and all of the above certifications are retiring in July 2013. With Visual Studio 2012 already in implementation, Microsoft completely revamped its certification paths in October 2012 and there is no certification under Visual Studio that can be matched with VB or C# course and MCTS certification is not available anymore (Microsoft, 2012).

Fortunately starting from 2010, Microsoft developed a new 98-series of exams that provides Microsoft Technology Associate (MTA) certification just by completing any of the 12 exams; however, books and related materials are slowly being developed.

Similar scenarios can be presented in case of Oracle PL/SQL or OCP and Cisco CCNA certifications that are also employed in the MIS program. With a maze of certification paths and exams that changes so frequently, it becomes very challenging for a faculty member to implement a particular exam for his or her course and continue with it. However, this challenge opens new doors to knowledge and there will always be a certification suitable for a particular course.

Current Status

Nevertheless, with all the challenges, the certifications opened new doors to faculty and students alike and its long-term result is yet to be seen. Most people would spend more than $2000 to take a 3-5 day crash course to prepare for a certification exam (Frank & Werner, 2010); however, in our MIS program this training is free to students and faculty alike, and they get a whole semester to prepare for an exam. Many required courses have certifications now and some others have

optional certifications. Table-2 shows the latest certifications implemented in various courses and levels.

Course Name	Course Level	Certification Company	Exam Number and/or Name
Advanced Business Internet Applications Development	Undergraduate	Microsoft	Exam 70-480: Programming in HTML5 with JavaScript and CSS3
Advanced Business Spreadsheet Applications Development	Undergraduate	Microsoft	Exam 77-882: Microsoft Office Excel 2010
Advanced Business Database Applications Development	Undergraduate	Microsoft	Exam 77-885: Microsoft Office Access 2010
Advanced Applications Development with Visual Basic	Graduate	Microsoft	Exam 70-511: Windows Applications Develop. with .NET Framework 3
		Microsoft	Exam 98-361: Software Development Fundamentals
Advanced Internet Applications Development	Graduate	Microsoft	Exam 70-515: Web Applications Development with .NET Framework 4
Information Systems Project Management	Graduate	Microsoft	Exam 70-178: Microsoft Project 2010, Managing Projects
Advanced Database Applications Development	Graduate	Oracle	Exam 1Z0-147: Introduction to Oracle 9i: SQL
Oracle Database Administration	Graduate	Oracle	Exam 1z0-052: Oracle Database 11g Administrator Certified
Advanced Computer Networking	Graduate	CISCO	CCNA: Cisco Certified Network Associate
Information Systems Audit and Security	Graduate	ISACA	CISA: Certified Information Systems Auditor
Management of Information Technology	Graduate	ITIL	Foundation Certificate in IT Service Management

Table 2: Latest Certifications Implemented in Undergraduate and Graduate Courses.

As Schlichting and Mason (2004) pointed out, the major difficulty in implementing certification in academic curricula is the lack of training and certification by most faculty members; however, we took that challenge and broke that barrier. Currently, faculty members teaching a course that requires certification are certified themselves. More than 90% of the students appearing for the certification exams pass them successfully. However, it is not clear how the students felt in general about the value IT certifications, the method of integration into various courses, and their preparation for the exams. And that is the purpose of our study discussed in the following.

RESEARCH METHODOLOGY

As mentioned above, through informal discussions, we are aware how faculty members feel about certification; however, we do not know how students received this challenge. Did they find any value in it? Which certifications did they find to be most valuable? Did the MIS program prepare them well for the certification exams? We also wanted know whether certification played a role in graduate enrollment! These are a few important questions for which we wanted answers. Thus, we developed a survey instrument to be distributed mainly to the former and current students of our MIS program. We have used the SurveyMonkey

(www.surveymonkey.com), an online survey tool to post a free ten-question survey and collect analyzed data (Hunsinger & Smith, 2008). The survey questionnaire can be found in Appendix A. About half of the questionnaire is addressed to an IT person in general and the rest is focused on past and present students of our MIS program. The survey was distributed to past and present students through social media contacts like Facebook, e-mail and web links. So far 84 people completed the survey. It is expected that most previous students had few certifications and the new students may or may not have any certification yet.

As there was no overall plan to implement certifications in our MIS program, we felt that the students were overwhelmed by the number and types of certifications. Some students had to take three certification exams at the end of one semester. Also at the beginning of our certification implementation, the burden of preparing for the certification exams was left to the students. Furthermore, in most cases, the certification materials do not match with the course contents, and the actual exam questions are far different from the sample questions provided in the certification texts. Thus, we hypothesized that the students have not been enthusiastic about the certification in general. Additionally, based on our experience while teaching certification-related courses to our incoming students, we also hypothesized that most students did not know about the certification program before joining the MIS program.

Figure 1:
Can IT Certification Help Build a Better Career?

No 5%

Yes 95%
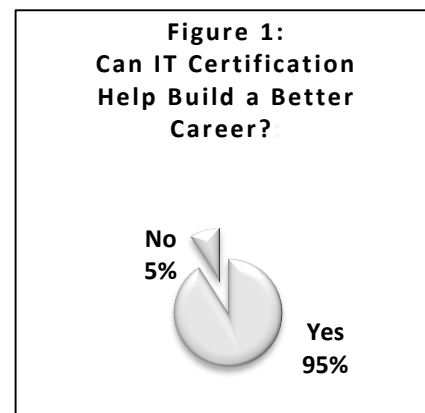
RESULTS and DISCUSSION

In responding to the Question No. 1, whether IT certification can help graduates build a better career, all respondents answered with a significantly 95 percent agreeing and merely 5 percent disagreeing. Refer to Figure 1. Contrary to our hypothesis, even though we did not have a well-thought plan to implement certifications, almost all graduates and current students seem to find a value to them.

In responding to Question No. 2 in regards to the number of certification one might hold, 83 people responded, of which 39 hold 107 certifications, with an average of about three certifications each; and 44 people do not hold any certification yet. Presumably, the latter are new students in their first semester. Table 3 shows the breakdown of the number of people holding the number of certifications mentioned. It is surprising that several people even hold more than four certifications. It might be due to our unplanned beginning of the certification program. However, at present we require certification in few core courses of programming, database, network and web development; and provide options in elective courses.

	Number of Certifications							Average
	0	1	2	3	4	5	6	2.74
Number of People	44	11	7	9	6	5	1	

Table 3: Number of Certifications held by the Number of People.

In responding to Question No. 3, with respect to various kinds of certifications people hold, 36 people answered and 44 skipped. Again, the latter group is most likely the new students who do not have any certification yet. However, according to the answer to Question No. 1, almost all value IT certification. Some people hold more than one type of certification. Table 4 shows the number of people holding certifications from the major companies. It is clear that *Oracle* and *Microsoft* are prevalent certifications, followed by Cisco and Novell. Ostensibly, network certifications are hard to pass compared to others used in the MIS program. This was also found through personal communication with some students. We did not ask for a specific certification or exam in this question; however, we went into specifics in Question No. 5. Other certifications held by 16 people are mentioned in Table 4 as well, and they must be obtained after the respondents graduated from our program or they are other IT individuals. This can also be correlated with the results of Question No. 6.

Type of Certification	Percent of People	Number of People
Oracle (SQL Expert, PL/SQL Expert, OCA, OCP, etc.)	70%	25
Microsoft MCTS (70-505, 70-511, 70-515, 70-526, 70- 536, 70-562, etc.)	61%	22
Cisco (CCENT, CCNA, CCNP, CCDA, etc.)	31%	11
Novell	14%	5
Other: MCP, ITIL, EXIN, SCJP, SAP, IBM DB2, GIS, Scrum, Salesforce ADM, Workday HCM, and MIS.		

Table 4: Number and Percent of People Holding Various Certifications.

Asking how many IT certifications one should have through Question No. 4, 75 people answered and 9 skipped. As shown in Table 5, responses varied between 0 and 10, with an average of about 3.5 certifications. Majority of the people says that one should have between two and five certifications; however, several people even suggested for more than five certifications.

	Number of Certifications									Average
	0	1	2	3	4	5	6	7	10	3.45
Number of People	2	5	20	17	8	16	4	1	2	

Table 5: Number of Certifications One Should Hold.

Question No. 5 was to get an opinion about the specific certifications that the respondents value. At maximum, 72 people answered this question and 12 skipped it. This means that the majority of the new students also have knowledge about certification industry. In responding to this question, people had to type the names of the certifications they felt mostly valuable in order of importance; however some people mentioned the company names that provide the certification. Thus, we organized the certifications along with their company in one group as shown in Table 6 below. *Oracle, Microsoft*, and *Cisco* topped the list in the first two choices; however, other

certifications received some importance as well. Because we do not offer any of the certifications in the "Other" category, they must be reported by existing IT personnel and MIS graduates. Recently, we have initiated CAPM certification in our project management course; and we will look into SAP certification in our ERP course.

First Choice	Number of People	Total Responded
Oracle (SQL, PL/SQL, SQL Expert)	31	
Microsoft (MCITP, MCSA, MCSD, MCTS, .NET, C#)	19	72
Cisco (CCNA, CCNP)	15	
Other: ITIL, BW, SAP, PMP, CAPM	7	
Second Choice	**Number of People**	**Total Responded**
Oracle (SQL, PL/SQL, OCA, OCP, OCA DBA)	28	
Microsoft (MCSE, MCTS, .NET)	20	68
Cisco (CCNA, CCNP)	11	
Other: A+, PMI, BO, ITIL, Java, SAS, SAP, SCJP, Salesforce	9	
Third Choice	**Number of People**	**Total Responded**
Microsoft (MCSA, MCTS, 70-542)	15	
Cisco (CCNA, CCNP)	14	49
Other: CISSP, Agile, PEGA, ECC, DW, QA, ITIL)	11	
Oracle (PL/SQL)	9	

Table 6: Respondents' Order of Importance of Certifications.

In finding the general status of the respondents in relation to our MIS program through Question No. 6, 81 people mentioned that they are current or past students of our MIS program, and thus three people may be considered as general IT professionals.

Question No. 7 was a follow-up question to Question No. 6, and it was to find out whether the past or present students of our MIS program knew about the certification program before joining the university. All 84 people responded with 63 percent saying that they knew about the IT certifications before joining the MIS program and 37 percent did not know. Refer to Figure 2. Obviously, our hypothesis was somewhat wrong. May be some of the earlier graduates did not know about IT certifications in our program, but the majority of the incoming students knew about the certifications

Figure 2: Knowledge about Certifications before Joinnig MIS Program.
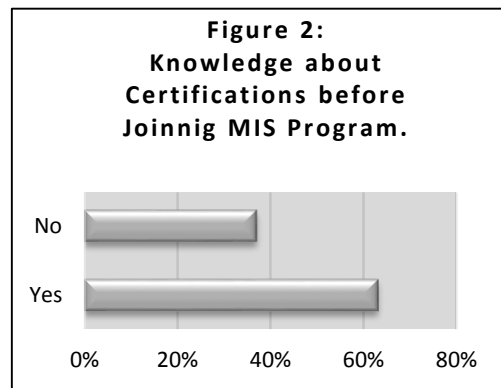
and that might be a good reason for them to join our MIS program. In the future, we may need to look into this further to understand whether IT certification has an impact on increased enrollment in our program. It is to be noted that the majority of our graduate students are from India, and there might have been significant communications among the new and the former students. However, India is a vast country; thus, it can be concluded that most of the students come from certain parts of the country, where they can have significant communications among

themselves even before they apply to various U. S. universities. We might study this further to market our program even though our graduate enrollment has quadrupled in recent semesters.

Question No. 8 was to find out whether our IT certification program prepared our students as a better candidate for IT career. Eighty-three people responded and Figure 3 shows the result. Even though this question was intended for the past MIS students, almost all choose to participate. Thus the majority felt that they were prepared or being prepared well for the IT career. This is a very positive sign for our MIS program. The neutral answer from about one-fifth of the respondents is probably from the new students who did not take any certification exam yet.

Figure 3: Preparation as a Better Candidate for IT Career.
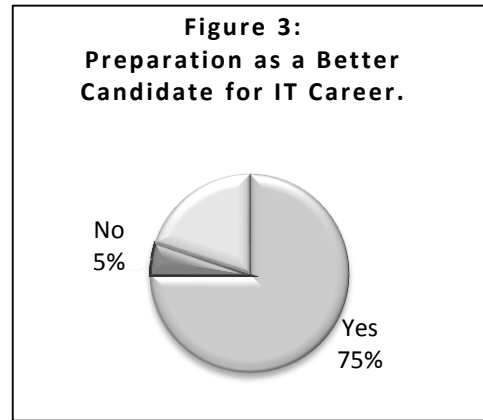
Question No 9 was to find out the satisfaction level of the students about the preparation for IT certification provided by the MIS program. Eighty-one people responded to this question and three skipped. Figure 4 shows the result as a percentage of respondents. It shows that the majority of the students are very satisfied the way our MIS program prepares them for the certification exams.
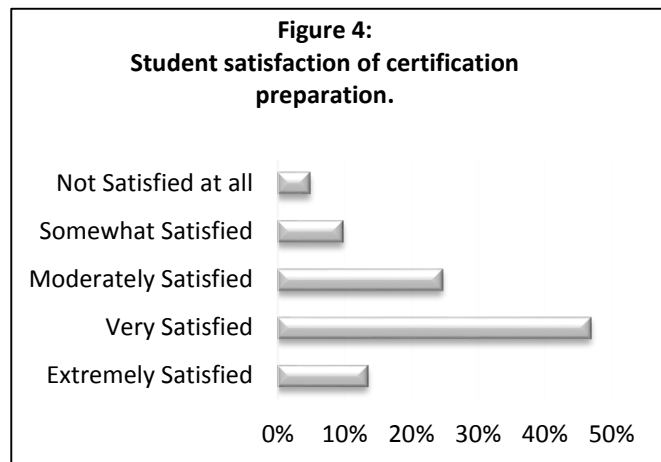
Question No. 10 provided the opportunity to the respondents to offer additional comments and suggestions. Some of them are summarized in the following reflecting pros and cons of our certification program:

Figure 4: Student satisfaction of certification preparation.

- Certifications help an individual to add value to his or her profile besides gaining knowledge. These help people to be unique when they interview. Certification is good for anyone with an IT career, and I think it gives an idea about someone's future or career.

- It is really a good idea for the MIS program to include certifications in its program. This program gives an awareness of all areas where an IT professional needs to have. MIS Certification preparation at UHCL provides one with structured and focused training. You really get to learn the material instead of just focusing on the test.

- Replace Visual Basic certification with any other like Java, C# or project management, which will be helpful for us in the future. If possible provide certification in SAP.

- The idea of certifications is good. But, the course structure could have been made better. Concentrate on few courses in particular and make students more knowledgeable about the course.

- Do not make certifications a part of the course grade or do not require them to be taken by the end of the semester. Allow an additional month after the semester to really prepare for the exams.

- Certification has value when we do it in one field and gain more knowledge in that one. There is no use having many certifications and have zero knowledge.

- Good to have certifications but need more industry oriented training at school. Certifications should be continued as a part of the curriculum. Certifications should be taken by one's interest not forcefully. Certification exams should not be required as part of any course.

- There is no need of all the certifications. It should be student's interest to take them. They should be optional and not mandatory. Students will be very thankful if you remove CCNA from the course work.

The above comments should help instructors to plan for future certification-related courses if they wish to do so.

CONCLUSION

We have discussed the value of IT certifications as found in the literature, and it is clear that certification becomes valuable along with an educational degree. It can boost a candidate's chance of garnering the attention of a hiring manager in a competitive IT job market. Many educationists have suggested to implement IT certifications in the computing curricula; however, few, if any university has actually done so. We have discussed how several IT certifications have been integrated into various courses of the MIS program at the University of Houston-Clear Lake.

As instructors, we became aware of the benefit as well as the complexity of offering certifications over a period of about six years; however, we did not know how our students felt about the certification program and the way they are prepared for the exams. Thus, we performed a survey on our past and present students to understand their perceived value towards IT certification. It is found that almost all believe that IT certification can help them build a better career. Certifications from Oracle, Microsoft and Cisco are found to be prevalent among them and the majority of the students suggested that one should have about three IT certifications. Survey also shows that about two-thirds of the students knew about the certification program before joining the MIS program. It also shows that the majority of the students have been satisfied the way they are being prepared for the certification exams.

We can conclude that educationists who have been facing the dilemma of whether or not to adapt IT certifications in their computing curricula, should take the steps of integrating IT certifications in their curricula. It may not be a smooth ride to start with, but once few hurdles are crossed, faculty members will find satisfaction through student success stories as well as their own professional achievements. It will attract new students in the program and they will be ready for

the job market with the latest technological knowledge. It will also keep IT departments up to the par with IT industries.

ACKNOWLEDGEMENT

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Appendix: A
IT Certification Survey

This Survey is to obtain your honest opinion about IT certification, if you had any. This is an anonymous survey and it will be used only for research purpose. Your response will be highly appreciated.

Please answer the following as they apply to you:

1	Do you believe that IT certification can help you build a better IT career?	☐ Yes	☐ No
2	How many IT Certifications do you have so far?	Number:	
3	Please check the companies that provided your IT certifications? Microsoft: ☐ Oracle: ☐ Cisco: ☐ Novell: ☐ Other (Type):		
4	In your opinion, how many IT Certifications one should have?	Number:	
5	In your opinion which IT certifications are mostly useful whether you have them or not? 1: 2: 3: 4:		

The Following questions are for Current or Former Students of MIS Program at UHCL ONLY

6	Are you a current or former student of MIS program at UHCL?	☐ Yes	☐ No
7	Did you know about IT Certifications in the MIS program before joining UHCL?	☐ Yes	☐ No
8	Do you believe that IT certifications in the MIS program prepared you as a better candidate for IT career? Yes: ☐ No: ☐ Not Sure: ☐		
9	Overall how satisfied are you about the IT Certification preparation provided by the MIS program? Very Satisfied: ☐ Moderately Satisfied: ☐ Not Satisfied at all: ☐		
10	Additional Comments & Suggestions:		

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