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Integrating IT Professional Certifications into Graduate CS/MIS Programs: a Blueprint for Success

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Abstract -- Computer Science (CS) and Management Information Systems (MIS) Programs constantly face the challenge of enhancing the employment prospects of their graduates in a job market that requires ever increasing IT skills. To meet this requirement and give their students a competitive edge in securing employment, CS/MIS faculty have been increasingly incorporating IT professionals certifications into their programs. Successful integration of certifications into the curriculum, however, requires significant planning and appropriate strategies. Specifically, decisions need to be made along various dimensions that include: (1) nature of the test, (2) timing of the test, (3) student preparation for the test, (4) curricular considerations and (5) environmental considerations. This paper describes these dimensions and presents alternatives strategies for successfully incorporating IT certifications into graduate course requirements and gives practical guidance for logical and orderly certification integration.

Index Terms -- MIS/CS Curriculum, IT Professional Certifications, Enhancing MIS/CS Curriculum, Integrating IT Professional Certifications into MIS/CS Curriculum.

I. INTRODUCTION

U.S. colleges and universities constantly face the challenges of equipping students with readily marketable IT skills to enhance their employment prospects [4], [10], [15]. This challenge has assumed urgency due to persistent softness in the job market and greater competition for coveted IT jobs. Therefore, to enhance the job prospects of their students, CS and MIS programs employ various strategies that primarily include the following: (1) determine the high demand computing skills and equip students with these skills [11], [18]; (2) enhance practical IT knowledge and skills through internships, industry projects, on-campus work projects or simulated projects [2], [5], [16], [18]; and (3) enhance student knowledge and skills by integrating IT professional certifications into the curriculum [1], [6], [12], [15].

The first two approaches are forthright and well-understood as they have been extensively utilized in other, established, fields of study. However, the third, integrating IT professional certifications into the curriculum, can prove challenging and therefore requires careful planning and appropriate integration approaches. While the existing information systems literature recognizes the merits and significance of integrating IT professional certifications into the CS/MIS curriculum, it hardly offers any practical guidelines towards accomplishing this task. This paper attempts to fill this gap; it discusses certification categories, their relevance, and alternative integration approaches.

II. IT PROFESSIONAL CERTIFICATIONS CATEGORIES

IT professional certifications fall into one of two categories. The first category consists of certifications that are technology independent and deal with general, non-proprietary skills and concepts. This category comprises certifications such as Project Management Professional (PMP), Certified Usability Analyst (CUA) and Certified E-Commerce Consultant (CEC). The second category of certifications, which are technology-based, measure knowledge and skills related to a specific technology and computing platform. Additionally, this category includes (1) individual one-test based certifications, such as Microsoft Certified Professional in Developing and Implementing Windows-based Applications with C#.NET, Oracle SQL Expert Certification, and Certified Cisco Network Associate (CCNA); and (2) multiple-tests certifications that require successful completion of two or more tests such as Microsoft Certified IT Professional Database Administrator (MCITP: Database Administrator), Certified Cisco Network Professional (CCNP), etc.

III. RELEVANCE OF PROFESSIONAL CERTIFICATIONS

IT professional certifications are relevant from multiple perspectives: employers, faculty, and students. Institutions of higher education are not alone in trying to impart and assess skills and expertise that are best suited for the evolving information technology job market. Major IT industry leaders, such as Microsoft, IBM,



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Oracle, Cisco, etc. also expect high levels of professional expertise in the information technologies products marketed and supported by them. Consequently, these companies actively promote various certification programs designed to gauge the understanding of concepts and skills critical to the effective use of their products [2], [9], [17].

The companies that support certification programs deal with large diverse populations and have access to the latest changes in the information technologies, and, therefore, are in a better position to design comprehensive, validated tests and keep them current. Needless to say, this affords the faculty valuable, extra time to focus on teaching of the material, instead of the incessant struggle to prepare comprehensive, current tests.

Incorporating professional certifications into academic programs holds significant implications for both the employers and students. Prospective employers can expect an earlier payoff from hiring students from certifications-based programs, as the graduates from such programs are more likely to possess the knowledge and skills to make immediate contributions to the workplace [6], [12], [16]. Furthermore, IT certifications are increasingly considered important by organizations in making hiring and retention decisions about IT personnel [3], [7], [14]. For the students, the certifications provide external, objective evidence of their knowledge and expertise in a technological area which gives them an edge in the competitive job market [13], [16]. Moreover, for the faculty, the certification tests provide an externally validated measure of the level of proficiency and depth of material covered within the courses [8]. Thus, the professional certifications present significant relevance for the students and faculty as well as employers.

IV. STEPS TO INCORPORATING PROFESSIONAL CERTIFICATIONS INTO CS/MIS PROGRAMS

Incorporating a professional certification into a course requires decisions regarding five key elements: (1) **nature of the test requirement** – is the test to be an optional or a required component of the course; (2) **timing of the test** - will students take the test at the end of one course or a sequence of courses, (3) **student preparation for the test** - will students prepare for the test at their own pace or will the test material be covered as part of the course, (4) **curricular considerations** – what coursework adjustments might be required to integrate a certification requirement into a course, and (5) **environmental considerations** – what extra-curricular factors must be addressed to successfully incorporate certifications into courses. It is important to realize that a mere understanding of the nature and impact of each of these key elements is not sufficient to ensure the successful integration of certifications into an academic program. They must be considered in a phased-in implementation approach which is described in detail in the following sections.

A. Faculty Considerations

First, before introducing certifications into a program, faculty must buy into the merits of this approach and be willing to undertake the amount of effort involved. Faculty teaching the courses which are candidates for certification must acquire the certification themselves and then keep it current. Faculty may approach this reluctantly to begin with due to the fear of failure, the existence of prior commitments, or resource issues as there is a financial cost associated with securing and maintaining certification. Institutions and programs must find ways to deal with these types of issues within the confines of their policies and procedures. Secondly, faculty must be willing to do the curriculum work and housekeeping chores that go along with certification integration. Courses may need to be realigned and covered topics adjusted for correspondence between the certification and course content. Course syllabi must be modified to include complete information about the certification such as the certification test cost, faculty expectations regarding certifications, and grading schemes. Inadequate information will cause student confusion and the integration of certifications will be poorly received. Additionally, course catalog descriptions, and notations to semester class offerings may need to be updated to include the certification information, and such revision will have to take place numerous times as certifications are phased in and as certifications change over time.

B. Timing of the Test

Decisions must be made relative to when the students in a course are expected to take the test for the IT certification incorporated in the course. The timing of the test is really dependent upon the nature of material covered in the exam and the structure of the curriculum. A test may be taken at the end of one course or following multiple courses. In the **one-course** approach, the students take the test at the completion of one



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course. This approach is appropriate if the course is fully contained and the test topics are **fully** covered within the coursework and students prepare for the test as they go through the course. In the **multi-course approach**, the students take the test at the conclusion of a sequence of courses. This methodology is suitable if the test entails topics that cannot be covered within one semester, or if a major portion of the first course covers topics that don't deal with the certification test or serves as a foundation for a more advanced course upon which the certification is based.

C. Nature of the Test Requirement

Certification tests may be incorporated into courses as **optional** or **mandatory** components. When **optional**, the student does not have to take the test. However, if they do, some number of points must be factored into the course grading scheme, usually as bonus points counting toward the final course grade. As **mandatory** components, students must take the certification tests (usually very near the end of the term) and test performance is a defined portion of their course grades. This approach is feasible only if all certification testing topics are adequately covered in classes. It must be stressed that the mandatory requirement of professional certification examinations is **not** a substitute or replacement for the normal course tests and other types of course assignments and hands-on exercises. For either of the testing methodologies, grades on certification tests can replace the actual grades the student earned in the course. However, this approach is only academically sound if the certification test is broad enough to cover all of the course topics and learning objectives. It may be desirable to incorporate certifications as optional course components for several semesters so that both faculty and students can adjust to the change and any unforeseen issues can be dealt with.

D. Student Preparation for the Test

Whether a test is an optional or mandatory, taken at the conclusion of one or multiple courses, there are two alternatives available for preparing students for the test: (1) **self-paced** preparation and (2) **instructor-led** preparation for the test over one or multiple courses. In the **self-paced** approach, the test topics are **partially** or fully covered as part of the course, and the students are encouraged, but not required, to take the test later. This approach is relevant when the course itself is an elective, rather than required, or if many of the students in the course are not CS/MIS majors. In the **instructor-led** approach, the course instructor takes the lead or guides the students in preparing for the test. This alternative is appropriate when topics covered in one or more courses closely match the topics covered on the test, and thus the instructor effort required for guiding the students will not compromise the course objectives. Furthermore, this approach would also be more appropriate when the professional test is a required, and not an optional, component of the course.

E. Curricular Considerations

Course curricular considerations must ensure that the incorporated certification remains just a **component**, not the **focus** of the course; furthermore, it must **enhance, not diminish**, the overall student learning objectives of the course. The depth and breadth of the topics covered in a course may need to be expanded in order to cover the material included on the certification test. Additionally, it may also call for some adjustments in the course group projects or research papers, in order to ensure that the overall coursework remains balanced; otherwise, the inclusion of the certification may render the course requirements excessive and thus become counter-productive.

F. Environmental Considerations

Various institutional **environmental factors** can affect successful integration of a certification into a course, depending upon organizational structure, especially with respect to those units dealing with student interaction. All entities dealing with a student from pre-admission through enrollment must be educated on the incorporation of the certifications, the benefits of the certifications, and the additional student costs involved in taking the certification tests. Program academic advisors must be appropriately briefed, and if necessary, provided assistance to make sure that changes have been made to all academic advising materials to appropriately note certifications. Additionally, appropriate course sequencing should be developed to ensure students have an optimal experience. Otherwise, students may enroll in multiple certification-required classes simultaneously which in turn can adversely affect their performance in the courses. Consequently, successful incorporation of certifications in the courses mandates careful planning to ensure a supportive university environment for the undertaking.



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V. EXPERIENTIAL INSIGHTS FROM A SUCCESSFUL INTEGRATION

The authors of this paper are faculty at a medium-sized public university where the MIS Department is housed within the School of Business. The courses offered within the Management Information Systems curriculum combine general concepts and specific IT skills. The specific skills training is geared toward immediate employment considerations and general concepts are taught to enhance the long-term professional success of the students. Mandatory certifications have been integrated throughout the curriculum. However, this did not happen without planning, and some trials and errors along the way.

A. Faculty Considerations

First, before we introduced certifications into courses, the course faculty acquired the certifications and then kept them current. This did not progress as quickly as originally thought, due to prior commitments of the faculty agreed upon prior to the commencement of this initiative. Second, since some faculty had to acquire several certifications and keep them current, a plan had to be worked out with school administrators to compensate faculty for this cost upon successful completion of tests.

B. Timing of the Test

For sequenced courses, with an introductory and an advanced level course, we learned that it worked the best to have the IT certification as part of the advanced course. Furthermore, if the introductory and advanced courses are taught by different faculty members, it is essential that they work together closely to ensure that all necessary material is adequately covered.

C. Nature of the Test Requirement

While certifications are mandatory now in all appropriate required courses, all tests were introduced as optional for at least two long semesters. This approach gives the faculty the flexibility to make the optimal choices along the nature, timing and student preparation dimensions of the certification test.

D. Student Preparation for the Test

Courses are designed so that all necessary materials are presented in class; however, students do spend additional study time prior to sitting for an exam. To enhance student understanding and demands of the requirement of professional certifications, it is essential to give them adequate information and support. Therefore, course catalog descriptions, notations to semester class offerings, and course syllabi all had to be modified to include the information that professional certifications exams were a requirement of the select classes and the student was financially responsible for the cost of these tests. Additionally, in a two-course sequence, where the second course included a certification, the students were advised to take the second course in the following semester. Otherwise, the students had to spend considerably more time in reviewing the material from the first course.

E. Curricular Considerations

The depth and breadth of the topics covered in each course had to be expanded in order to cover the material included on the certification test. However, it requires careful consideration and creativity so as to not diminish student experiences in group projects, research papers, and programming complex scenarios in order to ensure that the overall coursework remains balanced. It is essential that the integration of certifications does not diminish the instruction to that of simply a certification review course.

F. Environmental Considerations

To enhance student understanding and demands of the requirement of professional certifications, it is essential to give them adequate information and support about the incorporated certification at all steps of the application, admission, and enrollment processes. Therefore, the staff that interacts with the students in each of these functions had to be informed as appropriate. Additionally, all university literature (catalogs, syllabi, advising materials, etc.) have been adjusted to include certification requirements, costs, and testing locations. Finally, in a two-course sequence, where the second course included a certification, the students were advised to take the second course in the following semester. Otherwise, the students had to spend considerably more time in reviewing the material from the first course.



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VI. CONCLUSION

Universities and colleges in the US face the challenge of equipping their CS/MIS students with the background and skills to give them an edge in the job market. One strategy employed by the faculty and programs towards this end is incorporation of professional certifications in the coursework. Professional certifications offer an external, objective mechanism for assessing the knowledge and skills of a student in one or more information technologies. Professional certifications offer significant merits from the employer, student as well as faculty perspective. Students acquire readily marketable skills and gain an edge in the job market. Employers find candidates with verified skills above and beyond a normal graduate from such programs. Faculty gain an external assessment of student learning in their courses. It must be noted that the orderly integration of professional certification into the curriculum did not diminish the overall student learning objectives; rather, it enhanced them. Furthermore, the certifications are just a component, not the focus of the courses. Typically, the depth and breadth of the topics studied in courses were expanded in order to cover the material included on the certification test. Thus, invariably, the faculty felt that incorporating a certification into courses resulted in the overall qualitative enhancement of the curriculum. Furthermore, the informal feedback from the students overwhelmingly suggested that achieving professional certifications helped the students in securing an internship or employment. Thus, the certifications appeared to have positively impacted the course quality and internship/job prospects of the students.

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