Continuous Improvement of Information Systems Curricula and Accreditation of Programs

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Abstract

The recent publication of the *IS2020 Competency Model for Undergraduate Programs in Information Systems* concludes a once-in-a-decade process. Meanwhile, accreditation criteria for such programs need to remain current and relevant. With ABET accreditation, students, administrators, and employers receive confidence that a program meets the standards that produce graduates prepared to enter a global workforce. In this presentation, the co-chair of the IS2020 Competency Model, and co-chair of the criteria committee for ABET accreditation of computing programs, presents the connection between the competencies recommended in the model curriculum and the required criteria for accreditation. The continuous process of improving model curricula and contemporary accreditation criteria is demonstrated with the results of a survey of information systems program heads and accreditation program evaluators. The value of the contributions of program evaluators is discussed and the process of becoming a program accreditation expert.

Keywords: Model Curriculum, Accreditation, Program Evaluator

1. INTRODUCTION

The Association of Computing Machinery (ACM), the Association of Information Systems (AIS), along with the Information Systems and Computing Academic Professionals Education Special Interest Group (EDSIG) recently published IS2020: Competency Model for Undergraduate Programs in Information Systems. The IS2020 report (Leidig et al., 2021) is the latest iteration of model curriculum work for the Information Systems (IS) discipline that dates to the early 1970s. The production of this model curriculum concluded a once-in-a-decade process. Meanwhile, computing education continues to evolve along with rapidly changing technology. Therefore, maintaining appropriate accreditation criteria for such programs that remain current and relevant requires experts to continuously assess and provide feedback.

With ABET accreditation of a program, students, administrators, and employers receive confidence that a program meets the standards that produce graduates prepared to enter a global workforce. In this paper, the co-chair of the IS2020 Competency Model, and co-chair of the criteria committee for ABET accreditation of computing programs, presents the connection between the competencies recommended in the model curriculum and the required criteria for accreditation. The continuous process of improving model curricula and contemporary accreditation criteria is demonstrated with the results of a survey of information systems program heads and accreditation program evaluators. The value of the contributions of program evaluators in this continuous feedback is discussed and the process of becoming a program accreditation expert is espoused.

2. MODEL CURRICULA AND IS2020

A defining characteristic of IS education is that IS programs co-exist in a wide variety of faculties and institutions. IS programs are often structured

differently with different views of what to emphasize or include in an IS degree. A larger challenge from the perspective of offering guidelines is that the number of courses available or allowed for a major differs considerably. Undergraduate IS programs in many business schools offer a limited number of courses, while programs housed in other units such as computing schools, normally do not have restrictions that come with the broader coverage required from other contexts are therefore able to offer many more courses in information systems. The IS2020 taskforce addressed this diversity of programs when deciding whether to define a list of core and elective courses? The initial question was is it even possible to identify a set of courses that would be appropriate for the variety of programs that adequately matches the mission of each institution. The taskforce chose to move away from defining a model curriculum with courses, and instead defined a competency model. The model defines what graduates should attain upon completion of a program instead of what specific courses are offered. These models are more flexible and can be adapted to fit individual institutions. For this effort, the taskforce defined a competency as the graduate's ability to apply knowledge, skills, and dispositions to effectively complete tasks. The knowledge component includes the core concepts of the discipline of study. Elaborations on knowledge units have been the mainstay of most curricular models. Moving to a broader competency model is intended to provide a more flexible model that is adaptable to the fast-changing technologies and skills desired in graduates from information systems programs. The competency model allows institutions to map competencies to courses independent of a one-to-one relationship. (Leidig & Salmela, 2022)

IS2020 identifies a common core of required competency areas, while also identifying possibilities to profile a program adding electives. (See Table 1) At the highest level, we identify six competency realms. By grouping competency areas into broader realms, it intends to promote program-level discussions on profile, specializations electives. In particular, the four competency realms (Data, Technology, Development, and Organizational Domain) aim at providing depth by allowing sequencing, thus also providing a possibility profile the program with a specialization. For each realm, however, at least one competency area is identified as required, thus ensuring the breadth of coverage that characterizes the IS degree. The ability to integrate knowledge across four realms is further strengthened in the Foundations and Integration realms, thus preparing a more holistic understanding of the discipline, improving the ability of students to first identify required competencies (in Foundations), and the ability to combine and deploy acquired knowledge and skills as needed (Integration).

Adoption of competency thinking raises questions outside the scope of curriculum guideline work,

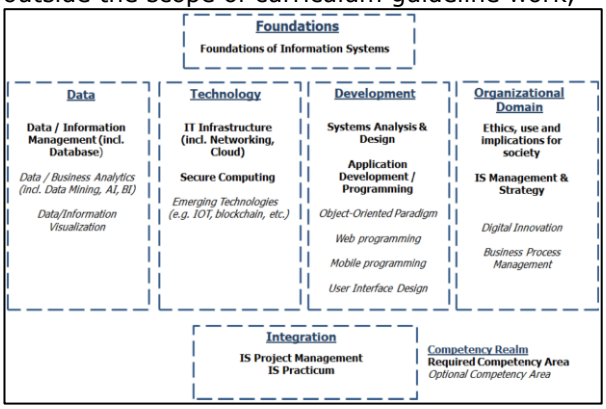

Table 1 – IS2020 Competencies

such as methods for measuring students' competencies. Also, the number of competencies can become very high, leading to a large number of details. Proposing a traditional curriculum model with a fixed set of core and elective courses might have been easier to adopt. The tension between flexibility to adapt guidelines to different contexts and ease of adoption and application was one element in the call for a more continuous and community-based effort in updating the guidelines.

Efforts to create a living document approach to keep the model curricula and competencies current are ongoing. Parallel efforts are also ongoing to maintain current and relevant criteria for accreditation of IS programs within the ABET community. A formal ABET criterial process contributes to the continuous improvement of the implementation of these curricula models.

2. ACCREDITATION OF IS PROGRAMS

Program accreditation might not be appropriate for every computing program, but accreditation does provide value to its stakeholders and to institutions. It helps maintain standards through an honest self-reflection of the program under a formal structure of an unbiased structure. Accreditation helps provide and maintain accountability to constituents. In a period where many questions exist regarding the value of higher education, accreditation helps provide

needed program validation thorough a formal review process.

Accreditation does not indicate that a degree from one accredited institution is identical to a degree from another accredited institution. Accreditation criteria enables programs to identify their own niche and to deliver the program within the required criteria. Program-level accreditation is intended to ensure that degree programs meet established standards for curriculum, appropriate faculty expertise, student admission and graduation requirements, adequate facilities, and financial resources. Matching accreditation curriculum criteria to established model curriculum guidelines is an ongoing process, just like the ongoing process required of institutions in assessing their institution's programs.

The Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers Computer Society (IEEE-CS) worked together to create the Computing Sciences Accreditation Board (now called CSAB) in 1984. In 2021, the American Statistical Association (ASA) joined CSAB along with the addition of data science accreditation. CSAB is currently the lead ABET society for computer science, cybersecurity, information systems, information technology, software engineering, and data science. As the lead society CSAB has responsibility for the accreditation criteria and the selection, training, and assignment of program evaluators. CSAB serves as the sole society of the Computing Accreditation Commission (CAC) of ABET.

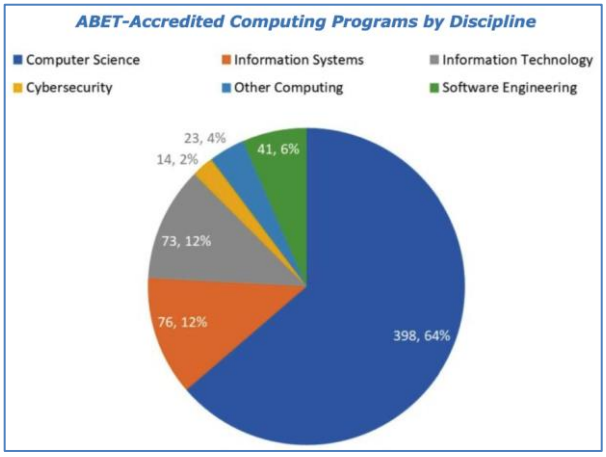

Figure 1 – ABET-Accredited Computing Programs
While Computer Science programs make up the majority of accredited computing disciplines, the number of accredited newer computing disciplines are increasing. (See Figure 1)

ABET is recognized as the accrediting body for programs in computing, engineering, engineering technology, and applied and natural science. It is the gold standard for accreditation. Within ABET, the CAC is charged with accrediting computer science, information systems, and other computing programs. In the computing disciplines, program accreditation has been viewed as optional. Despite the lack of mandatory accreditation expectations, an increasing number of institutions seek accreditation for their computing programs each year, suggesting a perceived value of accreditation. ABET is recognized by the Council on Higher Education Accreditation (CHEA). [Oudshoorn et. al., 2018]

With the rapid increase in the number of computing programs, we are experiencing a similar rise in the desire for accreditation of those programs. As an organization dedicated to quality assurance in STEM education, ABET accreditation criteria has evolved to provide confidence that these programs meet the quality standards that produce graduates prepared to enter the workforce.

The CAC of ABET is responsible for accreditation activities in all disciplines involved in the development and use of technology related to computers. All members of the computing community have the opportunity to influence computing accreditation criteria by providing feedback on the proposed program criteria while it is still open for public review and comment.

The four commissions of ABET (computing, engineering, engineering technology, and applied natural sciences) follow a harmonized set of accreditation requirements. The computing accreditation criteria have eight criterion categories that all computing disciplines share. In addition, each discipline can have program-specific criteria. Currently, there are additional program criteria for computer science, information systems, information technology, cybersecurity, and data science.
ABET CAC General Criteria

1) Students
2) Program Educational Objectives
3) Student Outcomes
4) Continuous Improvement
5) Curriculum
6) Faculty
7) Facilities
8) Institutional Support

Plus additional specific Program Criteria for each discipline.

IS Criterion 3 – Student Outcomes

The program must have documented and publicly stated student outcomes that include (1) through (5) above and any outcomes required by applicable Program Criteria…
Graduates of the program will have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. (Information Systems) - Support the delivery, use, and management of information systems within an information systems environment. [IS]

IS Criterion 5 – Curriculum
The computing topics must include:

1. Techniques, skills, and tools necessary for computing practice.
2. Principles and practices for secure computing.
3. Local and global impacts of computing solutions on individuals, organizations, and society.
4. Information Systems:
    a. At least 30 semester credit hours that include coverage of fundamentals and applied practice in application development; data and information management; information technology infrastructure; systems analysis, design and acquisition; project management; and the role of information systems in organizations.
    b. Information Systems Environment: At least 15 additional semester credit hours (or equivalent) of a cohesive set of topics that provide an understanding of an information systems environment.
    c. Quantitative analysis or methods that must include statistics.

Continuous Improvement Process of Criteria
As discussed earlier, all members of the computing community have the opportunity to influence computing accreditation criteria by providing feedback on the proposed program criteria while it is still open for public review and comment. The joint CSAB/CAC Criteria Committee regularly seeks input on necessary changes. With the release of IS2020 and the associated recommended changes in competencies as different from the previous requirements in IS2010 (Topi et.al., 2010) the question arises as to whether ABET IS Criteria are in line with the evolving model curriculum and required core competencies.

A survey was sent to 72 IS Program Evaluators (PEV) and chairs of accredited IS programs. We received 29 responses (40%). Respondents were asked specific questions regarding the changes in IS2020. They told us:

- Relevance (High/somewhat) - Adding a high-level programming language (68%) and major project (72%) was very positively received and supported.
- Current Criteria 5 items were still found to be relevant by more than 64% of respondents, as being relevant and in line with the recommendations of IS2020.
- IS 2020 required competencies of IS management and an IS Practicum (not currently required in ABET Criterion 5) received mixed responses as whether to add these elements to Criterion 5.
- IS2020 added several optional competencies, but there was no consensus on adding to the requirements.

Additional feedback elicited responses such "*Thanks for bringing this topic/discussion to the ABET IS community. It's nice to see that our opinions are important to ABET*"

The results of this survey and additional feedback is used by the CSAB/CAC Criteria Committee to keep IS program criteria relevant to our constituencies.

3 - Importance of Program Evaluators in Improving Model Curricula and Accreditation Criteria

ABET accreditation would not be possible without ABET Experts — professionals from industry, academia and government dedicated to contributing to their professions through the ongoing improvement of the quality of computing education. ABET relies on experts to evaluate program materials, visit campuses and participate in accreditation decisions. Most begin their service as Program Evaluators, or PEVs, who do the hands-on work of accrediting programs. Those with the strongest leadership abilities are promoted into the ranks of the Commissions, each serving as a Team Chair – responsible for leading teams of evaluators.

Why Become A Program Evaluator?

Thousands of technical professionals give their time and expertise because they care deeply about the quality of education and believe the accreditation process enhances both individual programs and the professions. There are many reasons to become a PEV.

The experience of serving on a review team can be both personally and professionally rewarding because it offers opportunities to:

- Help assure ABET accreditation criteria reflect contemporary practice and the expectations of the technical professions and their key constituents.
- Gain insight into "best practices" and trends in technical education and the particular characteristics of individual schools and programs; and
- Benefit from interaction and networking with committed peers.

As one of ABET's Experts, you serve the profession by contributing your professional experience, judgment, and time. You have a direct impact on the quality of technical education in your field.

Academic programs are evaluated against a set of criteria. These criteria outline the requirements for student support, quality and appropriateness of faculty and facilities, relevance of curriculum, continuous quality improvement processes, and other key program areas. Volunteering as an ABET Expert makes you an essential contributor to this process. PEV training strengthens your expertise to determine if programs in your field are meeting the criteria for preparing graduates to enter their professions.

Program evaluators are the heart and soul of quality assurance and the heart and soul of CSAB. These volunteers don't shuffle papers–they visit campuses around the country and the world to help improve computing education. They tour labs, talk to faculty, meet students and alumni, and work closely with their fellow evaluators and team leader along the way. PEVs are a diverse group, but they all have one thing in common: They care about computing education.

4 - CONCLUSIONS

This paper attempts to explain the purpose and basis of information systems model curricula and competencies, the process and value of program accreditation in validating and implementing current and relevant curricula. An example of the process used to keep both model curricula and accreditation criteria consistent was presented, along with the value of becoming an expert in the process as an CSAB/ABET Program Evaluator.

5. REFERENCES

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