

IS2020:Competency-Based Information Systems Curriculum Guidelines

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Abstract—The Association of Computing Machinery (ACM) and the Association for Information Systems (AIS) engaged in a project to revise the Information Systems Curriculum. The IS2010 model curriculum has been widely used for nearly a decade. However, its value may be decreasing as new approaches to model curricula have been introduced. The AIS and ACM established an exploratory taskforce which found there have been substantial changes in the IS field, and that current graduates' technical skills do not appear to meet industry needs. The IS discipline must express its core in terms of a standard curriculum that meet stakeholder demands. A joint ACM/AIS taskforce on the Information Systems Model Curriculum (IS2020) was created to develop new IS curriculum guidelines. This panel will introduce the work of the IS2020 taskforce. Panelists will present the key points from the final report. This session should be of interest to faculty and administrators developing college-level curricula in IS.

Keywords—information systems, IS2020, model curriculum, education

I. INTRODUCTION

The Association of Computing Machinery (ACM) and the Association for Information Systems (AIS), two global professional and academic societies with a stake in Information Systems (IS) education, are engaged in a project to revise the Information Systems Curriculum for bachelor's degrees. The IS2010 model curriculum [1] has been widely used to develop, update, and assess IS programs. However, its value may be decreasing due to its age. Also, new approaches to structuring model curricula have been introduced recently, including MSIS2016 [2], [3] and [4]. Therefore, the AIS and ACM established a joint exploratory taskforce to assess IS2010's utility and validity based on current trends in the IS field. The taskforce found that a significant amount of time had passed since IS2010 was released and that there have been substantial changes in the IS field. One specific recurring theme is that current graduates' technical skills do not appear to meet industry needs. The IS discipline must express its core in terms of a standard curriculum to provide a foundation upon which to develop and offer undergraduate IS programs that meet stakeholder demands. Therefore a joint ACM/AIS taskforce on the Information Systems (IS2020) Model

Curriculum was created to address these issues and develop new IS curriculum guidelines.

This panel will introduce the work of the joint IS2020 taskforce, as well as engage the IEEE FIE community in the continued follow up effort. Panellists will summarize the details contained in the final report and engage with the audience and address the challenges in implementing the curriculum in their respective schools. This session should be of interest to all attendees, especially faculty and administrators developing college-level curricula in IS.

II. ISSUES

The field of Information Systems (IS) is dynamic in nature and is confronted with a seemingly continuous stream of technological developments, opportunities and trends. Organizations are also deploying technologies in new ways and for new purposes. This dynamic context poses a significant challenge for faculty and administrators that are tasked to educate future generations of IS professionals. Furthermore, it forms an important basis for the assessment of current and future curricula development efforts. There have been a significant number of studies since the publication of the IS2010 model curriculum [1] that report a lack of adherence to the model's core recommendations. A reoccurring theme is that industry is looking for stronger technical skills than current graduates appear to possess. This panel, moderated by the taskforce co-chairs, Paul Leidig and Hannu Salmela, will provide a high-level outline of the current field of IS, the nature of the IS discipline and relevant changes necessary in further development of an IS model curriculum. The primary purpose of the panel is to elicit feedback and input in the process of developing IS2020. Some of the key issues that will need to be addressed when developing the IS2020 include the following.

A. Trends in technological innovations

Technological innovations have been a constant factor since the inception of the IS discipline over 60 years ago. The past decade has seen many technological trends and innovations that have and are still influencing the way individuals and organizations create value. For example, automated personal assistants and other forms of artificial

intelligent (AI) agents such as AI robots, VR/AR, and ambient computing have emerged as commercially viable technologies to support some basic individual and team-based problem solving. Autonomous vehicles and drones are changing the way in which we transport goods and people and the way in which we collect environmental, geographical, and logistical information. Big data and data science provide the foundation for an analytics perspective in IS, consisting of computational methods and technologies to perform quantitative and text-based semantic analyses to support evidence-based decision-making. The Internet of Things (IoT) connects physical devices such that they can exchange data. Social media technologies have not only changed the way in which individuals connect and interact, they have also changed the way in which organizations build their brand and relationships with their customers. Furthermore, social media have fuelled the emergence of new business models in the so-called sharing economy by enabling individuals to directly market goods and services. While this sample overview is by no means exhaustive, it illustrates the vast array of technological developments that have matured or emerged in the field of IS during the past decennium.

B. Trends in the IS Job Market

A recent report from AIS on the IS Job Market, the 2019 Information Systems Job Index, shows that the demand for IS professionals remains strong [5]. There continues to be a steady increase in starting salaries for IS graduates, both on the undergraduate and graduate level. Overall, IS salaries are outpacing all other business school salaries. While the report states a 70% job placement rate for undergraduates upon graduation, many programs across the US report near 100% placement ratios.

In addition to the strong trends in terms of initial job placement, there is a sentiment of increased job mobility in the IS market. IS professionals seem to change jobs at an increasing rate, which often leads to increased demands for continuous or certificate training. Another new trend in the IS market is the so-called free agent model: professionals that work independently for different employers, often in the context of start-ups or through crowdsourcing relationships. In 2019, the primary job offers for IS majors were in data analytics, with 42% of all job offers in IS. Software development had the second most jobs, yet pay the most for both bachelor's and master's IS graduates.

C. Model Curricula Past efforts

The first IS model curriculum was published in the early 1970s [6] and the work has continued ever since both at the undergraduate and master's levels. The Association for Computing Machinery (ACM) has sponsored the reports from the beginning. Since the Association for Information Systems (AIS) was established in the mid-1990s, the two organizations have collaborated on the production of curriculum recommendations for the IS discipline. These amount to a total of eight efforts: IS'97, IS2002, and IS2010 at the undergraduate level; MSIS2000, MSIS2006, and MSIS2016 at the graduate level; and CC2005 [7] and the ongoing Computing Curricula 2020 (CC2020) initiative integrating the disciplines [8]. At the undergraduate level, both the Information Technology Professionals EDSIG and the International Federation for Information Processing (IFIP) have also made significant contributions to the curriculum recommendations.

Both ACM and AIS are global organizations that work to advance computing and its transformative uses. ACM's membership includes industry professionals, academics, and students worldwide, and it works in a broad spectrum of areas in computing. AIS is the premier global society for faculty members affiliated with IS, and it serves students through a student chapter structure. The organizations complement each other's strengths and they have been strong partners in educational initiatives since the 1990s.

Even though IS as a discipline has existed around the world since 1960s, MSIS2016 was the first curriculum guidance document in IS that has been developed with a truly global process for a global audience. Earlier reports have been used around the world, but a U.S.-based taskforce developed the reports with assumptions that were mostly aligned with the North American educational system. MSIS2016 is also the first document of its kind that does not provide a predefined curriculum model (and thus, it is not called a curriculum recommendation). Instead, it focuses on articulating competencies that graduates should have attained upon completing their degree programs. The taskforce believes that this approach particularly suits a document that is designed to serve a broad range of degree programs around the world.

D. The value of model curricula and competency models

The latest work on computing competencies is described in the ongoing CC2020 project [8], an endeavor supported by the ACM and the IEEE Computer Society. The taskforce supports this competency-based approach as it is well suited for constructing learning environments and assists program architects in dealing with the challenge of developing, describing and including competencies relevant to IS professionals. Competencies include abilities to use knowledge, skills, and attitudes to perform specified tasks successfully. In IS, the MSIS2016 presents a competency model, specifying competency areas as the highest-level categorization of competencies. The areas, in turn, include competency categories, and within these categories, the actual competencies can be specified. Competency areas and competency categories are much more stable and depend less on technology than the competencies themselves.

Model curricula and competency models have a variety of uses. For some institutions, they can provide detailed guidance and a specific foundation for a curriculum. For others, they may serve in a variety of supporting roles: they can be starting points for internal conversations, a source of ideas in situations when new perspectives are necessary, a benchmark for an internal development effort, and a structural guide. This competency-based model helps in articulating the unique contributions of IS graduates. The CC2020 project includes the IS discipline and describes its distinctive contributions in context with other computing disciplines [2]. There are additional reasons to do so: the competency-based approach is centered on students and their learning instead of what faculty teach, or what degree programs require. This approach recognizes the essential role of not only knowledge and skills but also attitudes or dispositions as highly relevant outcomes of degree programs.

E. Assessment of IS2010 (Gap Analysis)

There have been a significant number of studies since the publication of IS2010 that report a lack of adherence to the model curriculum's core recommendations. A reoccurring theme is that industry is looking for stronger technical skills

than current graduates appear to possess. While this may not be directly associated with the model, any such recommendation should be reflective of industry needs. Specifically, skills expectations demand programming abilities from graduates of computing related programs. While most IS programs require some programming, and many IS programs have multiple courses in programming, the latest model does not list this as a required component. Therefore, this taskforce recommends a model curriculum articulating an adequate depth of coverage to ensure technical competence. Rapid technology changes have ushered in new IS fields and specialties, and the IS discipline continues to evolve. To provide an updated and relevant recommendation, a review of the gap between the IS2010 recommendation and current industry demands and existing academic programs is included.

III. IS2020 REPORT

Overall, the IS2020 report [9] identifies nineteen competency areas, defining ten of them as required and nine as elective. To manage the increasing number and variety of IS competencies, IS2020 groups competency areas into six broad IS competency realms: IS foundations; data; technology; development; organizational, and integration competencies. The following figure depicts the competency realms and areas in IS2020.

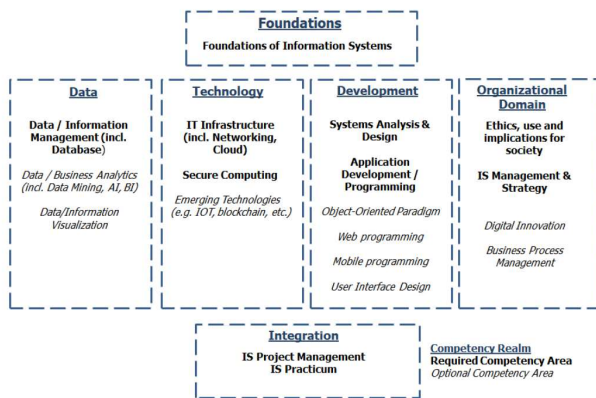


Fig. 1. IS2020 1 Competency Based IS2020 Curriculum Guidelines

The IS2020 report is reflective of the IS discipline and is among the undergraduate curriculum volumes that define the computing disciplines.

The IS2020 curriculum report can be downloaded from the ACM Curriculum Recommendations website (ACM, 2020). Recognizing the rapid and frequent change that is inherent in computing fields, guidelines are being updated on a regular basis. It is our intent that IS2020 become one of the first guidelines that will continue as a living document, with changes regularly propagated to a publicly available website.

As discussed in more detail within the report, IS2020 follows and extends the competency thinking initiated in the IS2010 report, and further refined in IT2017, MSIS2016 and CC2020. The recommendations proffered in the report also articulate competencies that graduates should have upon completion of an IS undergraduate program. The specified competencies are divided into groupings of requisite competencies (that should be delivered in all IS programs) and elective competencies that students may receive depending on the specific profile of each program. By explicating associated pairings of knowledge elements and skill levels for both

required and elective competencies, it is the belief that the recommendations of this report will be conducive to the design of learning objectives for IS undergraduate programs and course design. However, like the MSIS2016 report, the IS2020 report does not offer a prescriptive set of core and elective courses. This omission is purposeful and is intended to avoid the various problems that arise with such rigid course specifications when applied to diverse educational contexts and modes of delivery.

Overall, a guiding principle, and challenge, in the preparation of this report is to balance the increasing variety of competency needs for IS graduates and increasing diversity in the profiles and design of IS undergraduate programs with respect to their goals, profiles, and educational contexts. While these two trends make it more difficult to define universal curricular guidelines, it may be the case that generic guidelines are no longer practical, let alone feasible: one-size-fits-all is no longer prudent. Rather, the competency-based approach taken in this report will better support the evaluation of IS programs and their resource needs by academic heads or accrediting bodies, the design of programs and courses by IS faculty and teachers, and the alignment of IS graduate competencies with the needs of employers.

IV. PANEL STRUCTURE

The panel will extend over a period of 80 minutes and follow this proposed structure:

- Introduction (5 minutes) – an introduction to the goals of the IS2020 taskforce, key principles and process used for defining the guidelines.
- Model curricula and competency models (10 minutes) – an explanation of current model curriculum trends and movement towards the use of competency models.
- IS2020 Competencies (10 min) – required and elective competencies; sample competency statement, knowledge/skills and dispositions
- The need for a continuous and community based approach – key arguments for adopting a continuous and open community approach in refining and enriching the guidelines (5 minutes)
- Digital platforms and tools – description of tools and platforms developed for sustaining a library of computing competencies and related documents (10 minutes)
- Open community governance – Examples of OSS communities and SFIA, preliminary ideas for open curriculum community governance (5 minutes)
- Conferences and journals – An overview of prior IS curriculum literature, and preliminary ideas for connecting work in digital platforms to conferences and journals (5 minutes)
- Open discussion (30 minutes) – time for questions, opinions, and feedback.

The panel will be delivered in an interactive manner. A set of questions will be embedded in the presentation slides and the participants will be asked to give their feedback during the presentation by answering these questions using Google Docs. The live feedback will be shared and used by the panel members to drive the discussion. Furthermore, at the end of

the presentation, an open discussion will be facilitated by two of the panel members.

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