Even So With the Pieces Borrowed From Others: Dressing an IS Program in IT Clothing

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ABSTRACT
This paper describes the background, the decision-making processes, and the curricular philosophy of a new four-year degree in the Computer Science & Information Systems department at Mount Royal University. The program created could be described as a hybrid between the Information Systems 2002 Model Curriculum and the Information Technology 2008 Curriculum Guidelines (IT2008). The approach described here may be of interest to other departments with existing IS programs that would like to take advantage of the strengths of the IT approach without abandoning some of the unique strengths of the IS curricula. The paper also argues that instead of trying to erect clear disciplinary boundaries around IT, we should instead think of IT as the computing discipline whose focus is the practical integration of the other computing disciplines.

Categories and Subject Descriptors
K.3.2 [Computers and Education]: Computer & Information Science Education – information systems education.

General Terms
Experimentation, Design.

Keywords
IT, IS, Education, Curriculum.

1. INTRODUCTION
“Even so with the pieces borrowed from others; one will transform and blend them to make a work that is all one’s own, that is, one’s judgment. Education, work, and study aim only at forming this.” – Montaigne [15]

Academic curricular fashions tend to swing back and forth, and the debates between broad inter-disciplinarians versus focused disciplinarians have arguably been around since the eighteenth century of Montaigne. More recently, computing education has faced similar debates, especially since the 1990s and 2000s during which computing education became more specialized as educators and practitioners developed more nuanced understandings of the many different types of computing professions. The computer science discipline is now joined by information systems, computer engineering, software engineering, and, since 2005, information technology. Academic specialization has always been a bit of a double-edged sword. On the one hand, fixed boundaries and clearly-defined content make it easier to establish a new discipline and its research program as well as maintain the discipline’s quality [11]. Clear disciplinary boundaries may also prevent confusion amongst students, employers, and university administrators [4]. On the other hand, too much specialization and boundary setting may ossify a discipline and prevent it from quickly adapting to changing realities; it may also prevent students from learning some of the knowledge necessary for achieving success after university if that knowledge is deemed to “belong” to a different discipline. Some universities have attempted to lessen the potential downsides of academic specialization through the addition of general education breadth requirements [17]. However, within a given discipline, the assumption is that the department faculty will enforce the proper breadth of specialist knowledge for their domain through the design of their own curriculum.

As the newest of the ACM-recognized computing disciplines, IT has had, and perhaps still does have, the strongest incentive to articulate its disciplinary boundaries. Examining some of the example IT curriculum papers from its principal research conference (SIGITE), one can clearly see a stress on IT’s uniqueness and its distinctness from the other computing disciplines [7,10,12,13,14]. While IT obviously deals with a different set of concerns than computer engineering and software engineering, it is not obvious to everyone how IT differs from computer science on the one hand and information systems on the other. Denning, for instance, sees IT as mainly a practical specialization within computer science [8]. In the Courte and Bishop-Clark survey of undergraduates, both computing major and non-major students found it especially difficult to distinguish between IT and IS [6], a finding that has been replicated by Battig and Shariq [5]. This seeming overlap between the two disciplines has also been identified by other researchers [11, 21].

One approach to these overlaps is to articulate more carefully and disseminate more aggressively the differences between CS, IS, and IT [4]. The other approach – and the focus of this paper – is to recognize that these overlaps are potentially the precise strength of an IT degree. As the Montaigne quote at the beginning of this paper recognized in the context of a parent raising a child, proper education consists in combining, blending, and
transforming different beliefs and approaches to education, a belief that also applies to the construction of new computer degrees. The rest of this paper describes the blending process our department took in the design of a new four year degree in Computer Information Systems.

2. DEGREE DEVELOPMENT PROCESS

In 1999 Mount Royal University (then College) started operating an applied degree in Computer Information Systems and Business (CISB). In the province of Alberta, an applied degree consists of three academic years combined with one year of work experience. The academic content of the CISB had fourteen computer courses, nine business courses, and seven general courses. Initially the CISB had strong enrolments but like most other computer programs in North America, enrolments declined in the first half of the 2000s. We believed that one potential avenue for increasing enrollments would be to transform our three-year applied degree into a full four-year degree. Indeed, during that decade, Mount Royal was transitioning to university status and as part of that initiative it had asked departments to develop standard university-level four-year bachelor degrees. With the strong support of our Industry Advisory Committee (IAC) we decided to create a new bachelor degree in Computer Information Systems (BCIS).

From the outset we wanted the new degree to continue to reflect what were considered by our IAC to be the strengths of our existing applied degree, namely, its combination of technical computer courses with practical business and communications courses. To ensure that the new degree had sound academic credentials, we decided to base the new proposed degree on a published model curriculum. Since the degree was ostensibly to be a Bachelor of Information Systems, we naturally began with the IS2002 model curriculum [1]. However, we found IS2002 to lack the technical rigor we desired. The technical components of the Information Technology model curriculum [3] better matched our needs, though we did feel that we would need to add in some elements from the IS curriculum.

The end result, described in the next section, is a curriculum that can be considered either an IS degree with a very significant amount of IT content, or an IT degree with a very significant amount of IS content. Because we used the IT model curriculum as our primary design paradigm and the IS model curriculum as the secondary inspiration, the end result is a bit of technical wolf (IT) in business sheep clothing (IS). The inevitable question (and the one that we probably get asked most often by our students) is why is our degree a BCIS and not a BCIT? The answer to that question lies in our local educational politics. Academic credentials in Canada are regulated by the provincial governments. Our city already has a polytechnic institute, and for that reason we believed that the education department of the province would be reluctant to let Mount Royal University offer a credential with the word “Technology” in it.

After getting preliminary approval to submit a proposal for a new degree, the next step was approval from an external body. Rather than relying on independent accreditation bodies like ABET, our province relies on its own Campus Alberta Quality Council (CAQC) to evaluate new degrees. The CAQC approval process had two major steps. In the first step, the applicant must assure the council that there is industry and student demand for the proposed degree. An additional important consideration is that there be no duplication with another institution in the province; since the local polytechnic had an existing applied computer technology degree this was yet another reason for us to ask for a BCIS and not a BCIT. The second step in the CAQC approval process is to demonstrate that the curriculum is robust and able to achieve the described profile of the graduate. The existence of the IT model curriculum was invaluable in satisfying this step. Our department was then subject to a site review conducted by a four person team of external evaluators. CAQC approved the BCIS in late 2008 allowing us to gain ministry permission to start the degree in Fall 2009.

3. DEGREE DESCRIPTION

The diversity of possible computing work posed a challenge for us in defining the new degree’s curriculum. Multi-tasking among technology professionals is quite typical and it is common for an IT practitioner to take on several roles within an organization, especially a small or medium-sized one. We wanted our graduates to understand both technical and organizational factors and to be able to serve as a bridge between technical and management communities within an organization.

To help us in this curriculum design process for our new degree, we actually began with a visual metaphor adapted from the IT model curriculum. We visualized our curriculum as two pillars (technical expertise and business fundamentals) supported upon a foundation provided by analytic thinking and communication (see Figure 1). The pillars are crowned by a package of competencies (such as team work, ethics, and interpersonal skills) we call professionalism, which is built upon the two pillars but is distinct from them.

![Figure 1. Our Curriculum Visualized](image)

Our university operates on a semester system with each three-credit course being one semester long (about twelve weeks plus exam period). A four-year degree consists of 40 courses. Four of those must be free student electives. Our university requires that all degree programs must contain twelve general education courses. This left us with 24 “core” courses. We decided that the students could slightly bias their program towards the business side or to the computer/technical side. As a result, a student can select 15 to 17 core computer courses and seven to nine business
core courses. This course work is supplemented by one mandatory non-credit work term.

Our department and our IAC strongly believe that IT graduates require a variety of abilities beyond technical skills, a belief also articulated in chapter eight of IT2008. In that chapter it is recommended that IT students “must have a certain level of mathematical sophistication, familiarity with the methods of science, a sense of how computing is applied in practice, effective communication skills … and the ability to work productively in teams” [3]. We believed that we could cover the first, second, fourth, and fifth of these abilities through prescribed options and general education courses. It is with the third ability – how computing is applied in practice – where, depending upon one’s interpretation, our curriculum either varied dramatically from the IT model curriculum or most closely followed it. In IT2008, the authors recommend that “all Information Technology students should engage in an in-depth study of some subject that uses computing in a substantial way” and then suggest internships, case studies, or minor programs as a way of satisfying this recommendation. Rather than just hoping students enroll in a minor in some other non-IT discipline, we made non-IT domain knowledge a requirement by forcing students to select from seven to nine business courses.

One could certainly argue that other academic areas besides business would be able to achieve the requirement for non-IT domain knowledge. Some commentators have noted that “with a good rationale, almost any discipline can become of interest to IT majors” [18; see also 8] Indeed our department does have some hopes for eventually allowing precisely this possibility. Yet there are nonetheless a number of advantages to explicitly specifying business as that area. The most obvious reason is that IT and business “are no longer separate functions but have become integrated and pervasive in the traditional functional areas of business” [21]. That is, business courses act as a kind of learning proxy for understanding organizational life in general. So whether one works for a large corporation, a small startup business, a labour union, a government agency, or a charity, the typical suite of introductory business courses (finance, human resources, marketing, accounting, organizational behavior, etc) will have a relevance and applicability for the IT graduate regardless of the particular sector they eventually work within. And given that graduates not infrequently change course paths, having students take a suite of generalized courses about the organizational systems in which IT is embedded provides the student with perhaps the most long-term useful and applicable non-IT domain knowledge. Morneau and Talley have reached a similar conclusion: “business expertise needs to be integrated into the core [IT] Curriculum” [16].

Table 1 in this paper’s appendix lists the courses in our degree. The path through our degree is shown in Figure 2. Arrows show prerequisites; bolded courses are mandatory. Our plan is to provide at least two technical streams: an infrastructure/networking stream and a development stream. Until enrolments reach a sufficient level, however, our “options” are not really optional for the students.

4. IMPLICATIONS
At the beginning of this paper we discussed some of the issues surrounding the differentiation between CS, IS, and IT. In particular, the distinction between IS and IT is at present not always clear, and perhaps for that reason, as the newest ACM computing discipline, IT academics have the strongest desire to keep the boundaries between the disciplines clear and distinct. Indeed, a few years ago, the single paragraph abstract submission of an earlier version of this paper for SIGITE was rejected by one of the reviewers with the lone sentence “IT and IS should always be kept separate.”

What then are the main differences between the two disciplines? ACM defines IS as the discipline that focuses on integrating computing into an organizational context with an emphasis on information, while IT focuses on selecting, integrating and supporting computing infrastructure [2]. According to some, IS is focused on computing within organizations, while IT is focused on meeting the computing needs of individuals within organizations [6]; others see IS as focused on the early steps in the system life cycle (requirement gathering and analysis) while IT is more focused on the later stages (rollout and production) [11].

Of course, in actual practice this separation of tasks is somewhat arbitrary. Infrastructural computing decisions are always made within an organizational context. Individual computing users are always working within an organization. Production and roll-out decisions are often part of systems and business analysis. Artificially divorcing IT from the larger organizational and analysis context in fact makes it difficult to achieve in any meaningful way one of the purported pervasive themes of IT, namely, systems integration. Reynolds and Goda argue that computing education has yet to fully develop and appreciate the importance of systems integration and the fact that more and more of an IT professional’s activities (regardless of whether he or she has had a CS, IS, or IT education) now (and in the foreseeable future) involves the integration of IT [19].

It was our department’s belief that this integrative aspect of IT education can only be achieved when the students combine strong technical skills with structured knowledge of organizational contexts (which is achieved through a suite of business foundation courses). Both authors of this paper have been involved in a variety of large-scale and small-scale integration projects in the corporate sector, and as anyone else involved in real-world IT integration projects can probably attest, successful system integration is quite often more of an analysis-type activity rather

![Figure 2. CIS Degree Path](image-url)
than solely a technological deployment issue. That is, system integration requires skills typically associated with IS, namely requirements gathering, systems analysis, and business analysis.

It is our belief that this real-world overlap between CS, IS, and IT activities can in fact be somewhat mirrored in the IT curriculum by integrating cross-disciplinary knowledge into it. Wagner, Boisvert and Kuilboer have noted that within business schools, the trend has been towards integrating rather than separating the sub-disciplines in response to the reality of the business world [21]. Other commentators have made similar recommendations in regards to IT. Hislop has noted from “the perspective of IT as a discipline, association with IS might be a positive alliance” [11]. Ekstrom and Lunt have also noted that of “all the computing disciplines, IT is the one most affected by the evolution of the adjacent disciplines” [9].

5. CONCLUSION
Comte and Bishop-Clark in their study of the inability of students to successfully differentiate between computing disciplines (especially between IT and IS) conclude by arguing that educators must more carefully articulate to the students the precise nature and characterization of each computing discipline. We feel that this is perhaps not the best way to interpret their results. The alternate approach is to recognize something that students and employers already know: that the distinctions between computing disciplines are somewhat artificial, perhaps analogous to carefully categorizing music. Is this song folk, rock, alternative, folk-rock, or alternative-folk-rock? Is that song hip-hop, rap, or pop? Unless you are attempting to rigorously categorize your music in iTunes (which only allows a song to have a single genre label), these genre distinctions are ultimately somewhat irrelevant because of course a given piece of music can span multiple genres. Likewise, many computing jobs and tasks also span multiple disciplines; across a computing career, one’s jobs will also likely span multiple computing disciplines.

This paper described the germination and design of a new BCIS degree that is also genre-spanning and multidisciplinary in that it combines the IS and IT curricula with the goal of better preparing our graduates for a changing computing future. It also argued that IT as a discipline should perhaps be conceptualized as the computing discipline whose task is not only the implementation of technological infrastructure, but also the integration of the other computing disciplines, especially CS and IS.

If this perspective is embraced, then the IT curriculum should more actively engage in the encroachment over disciplinary boundaries rather than the erection of higher artificial boundaries. IT as a discipline should embrace the pervasive theme and ideal of system integration and endeavor to be the discipline that integrates the different computing areas defined by the ACM. We believe that our curriculum has taken some preliminary steps towards this ideal.

6. APPENDIX

Table 1. BCIS Curriculum

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