A Qualitative Multi-Disciplinary Analysis of Employers’ Technology Competency Perceptions for Graduates Readiness to the Workforce

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A qualitative multi-disciplinary analysis of employers’ technology competency perceptions for graduates readiness to the workforce

M. Maghiar1* and C. Brown2

Abstract: To fully prepare college graduates to function competently and productively in their career, it is important to examine employers’ views of technology competency and graduates’ readiness. Using a qualitative approach by interviewing employers in South-eastern United States across a range of fields, the authors describe the major functions and dimensions of technology competency, compare similarities and differences across the disciplines, and integrate the results to inform theory and pedagogy. The main purpose of this research is to investigate how well new graduates from selected disciplines can transfer technological skills, how they learned and/or used these skills during their program of study. Investigators also introduced how a multi-disciplinary approach, which involved faculty from different backgrounds (Civil Engineering and Construction, Education and International Studies/Trade) through the Scholarship of Teaching and Learning (SoTL)—Faculty Learning Communities (FLCs), was used to explore perceptions of technology competency. Results showed that all participants were dependent on the use of technology, but the degree of sophistication varied widely. Study is providing valuable information to the investigators for use in improving or revising educational curricula and pedagogical strategies to advance outcomes involving technology skills of the respective fields.

1. Introduction

Using a qualitative approach by interviewing employers in South-eastern United States across a range of fields, the authors described the major functions and dimensions of technology competency, compared similarities and differences across the disciplines, and integrated the results to inform theory and pedagogy. This research investigates how well new graduates from selected disciplines can transfer technological skills learned during the program of study to their first professional employment opportunity. In this paper, the authors examine competency across two distinctly discrete disciplines: Construction and Civil Engineering (CCE) and International Studies and International Trade (ISIT). Obtaining employers’ perspectives not only engages employers in building skills of their potential employees, but also fills in a gap between academic program outcomes and workplace competencies or expectations. Because of the dependence on technology in the professional world, higher education must prepare students to be able to use both basic and specific technologies required for job performance in their selected professional
pursuits after graduation. However, there is a growing concern about the extent that students’ educational preparation may not be keeping pace with the demands and expectations of corporations and companies who will employ college graduates. Research is needed to examine how well graduates are prepared to be able to transfer/transport classroom learning to workplace applications and experiences.

1.1. Defining competency across disciplines
As technology is pervasive in all walks of life and almost every field of human endeavor, students’ technology competency becomes essential in all disciplinary areas in higher education (CAEP, 2013). The Office of Personnel Management (OPM) with the United States Government defines competency, as follows:

A competency is a measurable pattern of knowledge, skills, abilities, behaviors, and other characteristics that an individual needs to perform work roles or occupational functions successfully. Competencies specify the “how” of performing job tasks, or what the person needs to do the job successfully.


As a general concept, a competency must be viewed in terms of its context. Competencies are about having a range of acquired attributes necessary to completing some functional assignment. Each commission may have multiple “roles” associated with it and each role will have an array of potential expectations of competence assessed through training, employment hiring, and onboarding, and on-going compliance and performance evaluations. The benchmarks for most of the anticipated competencies emerge through practice, habit, and gained experience. When codified they become included within a tome of “standard operating procedures (SOPs)” presumably based on a given industry’s best practices. Competency can be both an objective skill, such as mastery of a particular software application or typing a certain minimum words per minute to join an administrative staff, or it can be somewhat more indefinite. In many cases, the presence of a subjective competency is often more apparent in its absence (i.e., leadership). In either circumstance, competency is something that is embedded with a particular social context. Nevertheless, the competency as a general concept lends itself quite well to operating across different fields.

The use of basic technology skills is referred to as a “hard” skill. However, the ability of new graduates to be “self-starters”, especially during their orientation and/or probationary period, set learning goals, work out a plan of how to gain the necessary skills, and monitor their own progress is lacking. These skills are referred to as “soft” skills. This factor increases the new employee’s orientation time, increases company expense, and results in lost productivity. Higher education needs to respond to these concerns and perhaps form partnerships with the institutions and companies that hire new graduates to work together more collaboratively. The study adopts a multi-disciplinary approach, which involves discrete disciplines in juxtaposition (e.g., Civil Engineering and Construction and International Studies and International Trade) in exploring technology competency. As specific theories, approaches and practices may be standard for one discipline but novel in other fields, integrating theories and knowledge in a multi-disciplinary manner provides a unique, informative angle to investigate technology competency. Understanding employers’ expectations of the use of technology in the workplace will assist in devising strategies for improved application and transfer of student knowledge as a new employee.

1.2. Competency modelling: A common heuristic
The United States Department of Labor’s Employment and Training Administration (DOLETA) established a Competency Modeling Initiative (CMI) that attempts to capture the complexities of assessing competency across occupations. Competency Models are comprised of “building blocks” where each block represents a competency. These blocks are then structured by tiers that highlight increasing levels of specialization for a given occupational class. Tiers are grouped into three
broader categories that reflect a trajectory of general skills upward to characteristics that are more relevant to specific occupations which acquire greater responsibility within a particular industry or corporation. From a holistic perspective, competency requires a person to be generally competent in social circumstances toward other people, and then be able to apply a particular expertise to perform well in a role within an industry. Mastery of this role permits a deeper level of specialization as well as a broader understanding of their place (and their industry's place) in the wider world. Lastly, specialization and expertise have allowed them to transcend to management within their particular field.

Competency Models (Figure 1) utilize a pyramid structure to demonstrate the ascending competencies (shown as blocks). Blocks are organized into tiers, and then again into broader sectors that provide the social context in which these competencies are given meaning. The first three tiers are labeled “Foundational” and include general competencies required in any given workplace, albeit there may be some variation by curriculum. Foundational Tiers 1–3 are what are referred to as “soft skills” (DOLETA, 2020, p. 6). Tier 1 consists of Personal Effectiveness Competencies, defined by ability to interact with others as part of the social structure regardless of job, role, or industry. Tier 2 are Academic Competencies on a very fundamental academic level that is designed to give people a “general educational” foundation that allows for more advanced understanding by career at a higher level. For example, while mathematics is required for a University's General Education Curriculum, engineers require different courses than fine art majors and both courses would still be considered Academic Competencies Tier 2. Tier 3 is comprised of Workplace Competencies. Foundational Tiers promote competencies that socialize...
individuals for a career in the workplace generally by establishing competencies supportive of and defined by the wider social structure of “work.”

Industry-Related Competencies (yellow tiers in Figure 1) represent competencies related to employment in a particular industry (Tier 4) and within a sub-set (Tier 5) of that particular industry (DOLETA, 2020, p. 14). At Georgia Southern, Graduates who complete their degree program in International Trade tend to find their first employment/internship in logistics owing to our proximity to a very large port in Savannah. These students have prepared by taking coursework in logistics and gaining a general academic familiarity with the occupational field. However, the internship/job gives them access to Tier 4 competencies so that they can learn about applied logistics as a part of their onboarding and ongoing workplace engagement. Since most of those students will be working for the Port of Savannah, they will also be gaining related Tier 5 Competencies (e.g., Maritime-Sector Technical Competencies). Depending upon their placement within the company, new graduates may gain more competencies in one area rather than another. Consider the competencies required of a sailor on an oil tanker and those of a shipping clerk. Both industry positions are important to the success of the Operations and Management of the freight company, but each sub-set requires different competencies. Lastly, the Occupation-Related Tiers (blue-colored tiers from Figure 1 and 2), are those related to a particular occupation within a subset of a given industry (DOLETA, p. 14). Generally, these may fall into two related occupational categories as depicted by the Competency Models: Occupation-Specific Requirements and Management Competencies (see Figure 3 and Figure 4).

The Occupation-Specific Requirements of the Upper Tiers represent the competencies necessary for a career in a particular position. These would be competencies expected of an expert, such as a Master Plumber. These competencies are both specific and abstract. Master Plumbers must be

Figure 2. Competency Model for International Trade and Logistics to demonstrate the Industry-Related Tiers (DOLETA, 2019).
very experienced with plumbing, but also must have a range of knowledge required to be able to think outside of that knowledge in order to resolve issues not addressed by run-of-the-mill plumbing issues. Management Competencies are for those employees who understood their roles in the lower tiers well enough to be able to take on a leadership role within a particular industry. While management positions often require some additional competencies, it is not always so clear that they are acquired from a profound knowledge of a particular industry or sub-set of industry. Management has become its own academic discipline and perhaps requires its own Competency Model given that education in particular fields often translates into a management position regardless of the industry. Graduates of programs in business will often find themselves as supervisors not by having worked their way up through an industry, but because of the training received in pursuit of a degree. In this situation, the industry-related competencies are acquired after finding their first management position within a particular industry. It stands to reason that many of the more prestigious graduate-level management programs prefer applicants to spend some time working in a supervisory role within a given industry prior to being admitted.

The DOLETA Competency Models provide a medium through which the abstract and diverse understanding surrounding competence can be viewed across disciplines, industries, and occupational roles. Of greater importance is that these models place these categories, tiers, and blocks within the social structure in which they are relevant, beginning with the individual in society all the way through managing policy or making decisions for that a specialized occupation. Given meaning by the social structure, actors are given agency to participate within the structure through demonstrating competencies that continue to reinforce those structures. This study assesses the success of Academic Competencies (Tier 2) of graduates or interns entering a workplace and their competency regarding technology transfer.

2. Undergraduate degree field—Construction and civil engineering
BIM or CIM (Building or Civil Information Modeling) represents now a major aspect in the future of the construction industry, and higher education will play a major part assisting to prepare graduates with the relevant skills required in the industry. However, the major question educators in this field need to address is that current structure of education we experience today through curriculum in place is sufficient to provide the industry with BIM-ready skills, or at least reasonably BIM skilled graduates today though and, if not, what challenges may higher education face? These
questions are essential and are needed to be addressed by all educators in construction and civil engineering programs.

One of the first challenges in the university and college environments is to increase awareness of BIM amongst the existing teaching staff within institutions. If BIM is to be developed and integrated into undergraduate courses, then members of staff who may not be directly impacted by BIM still need to be made aware of it and understand why institutions are pushing forward in the direction of BIM or CIM. Additionally, this more specialized and individual professional learning will more than likely be required by staff to ensure that all those involved in the delivery of BIM are competent and understand what they are advocating. This is an area where maybe the government needs to work together with higher education institutions and agree upon a clear plan which can then be deployed and conveyed to all higher education universities and colleges teaching in the built environment curriculums (McGough & Architecture, Technology & BIM, 2013). Even though the topics of BIM/CIM are quite unique and they may stay at the core of technology competence expected from graduates prepared in academic environment, it may be that the technical skills acquired to professionally address and analyze solutions to construction operations in this industry to be limited when judged through the lens of BIM only.

One of the issues which concerns educators is how BIM is integrated across the construction and civil engineering curriculum. Construction students should at least leave university with an awareness of what BIM/CIM represents and what it means to them; not only as an individual but also as a part in the overall spectrum of the industry. The difficulty will be in ensuring that the differing disciplines who are studying in their fields of expertise gain the appropriate number of skills which are needed, beyond that of an initial cognizance. This is something which needs to be continually developed and accessed as BIM in the industry naturally develops, education should follow the case and adapt its processes to ensure that the graduates are leaving with the right skills (McGough & Architecture, Technology & BIM, 2013).

Another issue in teaching BIM is dealing with the complexity of some BIM concepts. It is paramount that the skills and theory that are to be taught do not confuse students more than when they started. When something is hard to define it can also be difficult to teach, an aspect, which BIM can be guilty of sometimes. Teaching needs to be clear that BIM goes beyond that of the 3D model, with efficient information sharing a critical factor which needs to be adopted and understood (McGough & Architecture, Technology & BIM, 2013).

With all difficulties and challenges lying ahead, teaching possibilities in the BIM/CIM arena are growing over the entire Civil/Construction Engineering and Construction Management (CE and CM) curriculum within nation’s Universities. The way in which BIM/CIM can be taught and the impact it could have on teaching is always an important consideration with great implications on the technology related courses. Clearly, there is a broad spectrum of possibilities encasing the following aspects:

- the technology used in the course offering and the approach adopted
- the application(s) to enhance understanding of the process in which BIM is embedded
- the all-embracing pedagogy (Maghiar & Fu, 2015) to reach a learning curve towards the tier 3 and/or 4 in the competency model

In addition, specific CM and CE courses may be cross listed in the curriculum and they may have the potential of introducing students to modeling topics of interest within the taught curriculum to expand the overall BIM and CIM adoption in departments’ curriculum framework. These topics are of particular interest for academic instructors working closely with industry because they are challenged to certain recommendations the industry would like to get across the curriculum before hiring graduates:
• updating skills of the respective faculty to support the delivery of the desired learning outcomes
• efficient framework for learning to variety of students
• keeping the pace with the development of BIM/CIM in construction and software industry
• increasing student employability
• moving the classroom topics closely related to industry field-specific problems (Maghiar & Fu, 2015)

The specific objectives envisioned by Maghiar and Fu in 2015 for a possible standard framework to expand BIM and CIM adoption within taught curriculum are revolving around growth of BIM and CIM implementation and understanding of this trend in industry setting:

• focus on training and elevate the learning; also, research aspects of BIM and CIM and their implementation in industry
• mutual promotion of BIM and CIM (expand the trend to more trade-specific markets)
• establish open medium for communication, consequently sharing knowledge, experience, case studies, opinions, etc.
• collaboration for joint activities and research projects with industry
• research matters for teaching and learning in the BIM and CIM arena
• challenge to create standard practices for BIM and CIM incorporation across curriculum

Therefore, as the industry continues to implement BIM/CIM and gear itself to improve productivity and safety of all operations, the demand for CE and CM graduates will not only be disciplinary competences but also critical level of BIM/CIM knowledge and capability that will continue to increase (Maghiar et al., 2019). Also, students are becoming increasingly aware of the importance of this technology as further enhancing their employability skills in an emerging construction and civil engineering market and, along with accreditation, this is important in their choice of an appropriate curriculum.

3. International Studies and International Trade (ISIT)
ISIT are interdisciplinary fields of study based methodologically in the social sciences that seek to explain, understand, and otherwise make sense of phenomena in the contemporary and/or historical global context.1 As problem-driven fields, interdisciplinarity offers the best foundation for grappling with complex social issues and promoting a course of action that is feasible, effective, and efficient to improve the world. ISIT places greater significance on the language and social construction as ways of understanding how the world is made, the values ascribed to things in the world, and how humans interact with each other and with their environments. ISIT began with the assumption that “awareness is a prerequisite to understanding . . . Global literacy does not require in-depth experience . . . it means knowing enough about some global issues to intelligently analyze others (Hobbs et al., 2010, p. 8). As a course of study, ISIT seek to impart soft transferable skills (Tier 2) as its primary objective for facilitating graduates’ capacities for interpreting global events and issues. Conceptual knowledge will be better applicable to the rapidly changing and dynamic interplay of forces that drive the international system than mastery of any hard skill (Tier 3).

The way in which the word “technology” is used makes it difficult to define it in such a way that it can be applied in a meaningful way; however, the common element of technology is its human origin. Technology is the application of human knowledge (often through tools, created by humans) that often provides the foundation for social, behavioral, and/or cognitive change (Brown, 2017). With respect to the traditions of the past, ISIT adopts the position that change is the new norm: “there is an urgent recognition that technological innovation has been and continues to be the force that drives history, promotes progress, helps to demystify the universe, and makes our lives better and more enjoyable” (Brown, 2017). The key questions for ISIT revolve around how technology changes current processes (or tools) and/or about developing new processes to be able to improve the world (both material and ideational). Sometimes a new way of
doing things happens by chance discovery, but more often than not, technology is set to work on providing solutions to perceived inefficiencies.

More than ever, technology is critical to understanding human behavior. For students of ISIT programs, human understanding about the world is key to humanity's behavior—that the degree of people's understanding about the world, and their ability to manipulate that world determines their interactions with it and one another. This is the core of International Studies and International Trade: “A serious investigation of global problems and challenges demands that one deal conceptually with both change and interdependence. Together, these two concepts provide a baseline for developing global literacy” (Collins et al., 1996, 12). In essence, this is the equivalent of reaching a Tier 4 competency in ISIT.

3.1. Obstacles for teaching technology in ISIT

The first major obstacle for ISIT can be found in its efforts to transcend the disciplinarity of the modern Academy by recognizing the role of technology in human social interaction in its own right. ISIT must come to terms with the common-sense notion that in order to understand complex social issues, discipline boundaries must be fluid and beg to be blurred. Technology clearly impacts the structure of our world and influences the behavior of agents within the structure. And yet, “despite the ubiquity and critical importance of science and technology in international affairs, their role receives insufficient attention in traditional international relations criteria” (Weiss, 2012, p. 127). In order to understand the role of cyber-terrorism, climate change, epidemic disease, or any other policy area within ISIT, it is critical that graduates be in command of a broader curriculum: “Experience has shown that wherever a student starts to address almost any of these topics, (s)he is likely to trace out a web of interconnections among science, innovation, economics, business, political, and ethical and philosophical values that is enough to give students a feel for the basic patterns that apply to almost any topic in science and technology policy” (Weiss, 2012, p. 128). Students are already inclined to address issues from an interdisciplinary perspective but are often encouraged only to see real-world problems through limited disciplinary frameworks. The first challenge is to recognize the limited utility of traditional institutional attempts to grapple with complex interdependent global issue, and embrace interdisciplinary of our approach, particularly with regard to the “simple importance and ubiquity of science and technology as a dimension in international affairs” (Weiss, 2012, p. 129).

A second and related concern is addressing the larger distinctions between hard sciences and social sciences and humanities and the “division of labor between the history of science and technology, on the one hand, and policy-related studies, broadly conceived, on the other, with its compartmentalization of research questions” (Krige & Barth, 2006, p. 5). Policymakers need to “overcome their fear of science and technology,” which rests on being capable of “understanding lessons drawn from disciplines other than your own” (Weiss, 2012, p. 130). A key strength of being broadly trained is the ability to serve as an interpreter of one discipline to another and/or to a non-specialist audience. ISIT graduates ought to be proficient with informational/digital literacy so that they are capable of serving as interlocutors between esoteric global issues and a general population. To accomplish this, technology is incorporated not only as a dimension within the fields of ISIT, but soft skills are directly addressed in the scaffolded curriculum so as to provide a context for applying technology. Communication is an area of technological change that receives the most attention in ISIT, and yet it is seen largely as a tool rather than an object of study (Jackson, 2010, p. 1). ISIT and its embrace of interdisciplinarity have facilitated a wider range of inquiry into the human impact of these technologies, mainly as an aspect of economic development. Increasingly, the weaponization of communication technologies in the “culture wars” and cyber-terrorism cannot be understood without a broader curriculum (Krisha-Hensel, 2010, p. 12).

3.2. Developing ISIT Core programs: The case of Georgia Southern University

A) Informational/Digital Literacy: This requires that students develop informational literacy and that programs in ISIT must, “develop criteria for discriminating, evaluation, selecting, and responding to useful and relevant data in the communication flow of reports about conditions and developments in the international environment” (Collins et al., 1996, p. 4).
B) Topical Emphasis: As part of the existing degree program, students should focus on a particular concentration among the following “Topical Emphasis”: (a) Development, Aid, and Sustainability; (b) Security, Conflict, and Diplomacy; and (c) Societies, Cultures, and Traditions.

C) Regional Area Focus: As part of the existing degree program, students focus on a particular regional specialization among the following:

- Africa
- Asia
- Europe
- Latin America and the Caribbean
- Middle East and North Africa

D) Skill Scaffolding: Each core course in an academic program actively promotes a particularly useful skill that lends itself toward an overall trajectory that endorses transferability of knowledge for student beyond graduation.

3.2.1. Legend: A solid line indicates course prerequisite; dotted lines indicate concurrent enrollment

- INTS 2130: Introduction to International Studies (3 Credits)
- INTS 3130: Contemporary World Cultures (3 Credits)
- INTS 3230: Global Issues (3 Credits)
- INTS 3630: Research Methods in International Studies (3 Credits)
- INTS 4630: Seminar in International Studies (3 Credits)

The ISIT Core sequence reinforces particularly soft skills deemed as critical for graduates of the program. Introduction to International Studies explores general concepts and ways of thinking about International Studies and Trade, particularly working with Interdisciplinarity as a defining characteristic of ISIT as the “issues such as resource scarcity, environmental degradation, the promise and threats of new technologies such as robotics and artificial intelligence, and even traditional concerns such as the effect of nuclear weapons on world politics and statecraft require insight from a variety of academic disciplines and a range of experiences and backgrounds” (Gavin, 2018, p. 8). Contemporary World Cultures emphasizes Critical Reading and Understanding Cultural Perspectives. Global Issues prioritizes Public Policy and Crafting Policy using real-world cases/issues to help promote engaged scholarship. Research Methods engages students in How to Conduct Research in an interdisciplinary social science, digital literacy, and research technologies. Seminar or Senior Capstone courses help to “act as bridges between the worlds of thoughts and actions, among different generations and communities, and among the public, private, and nonprofit sectors” (Gavin, 2018, p. 2). Seminar in International Studies utilizes all the soft skills and students self-select their anticipated graduation track among the following career categories: Graduate School/Law School, Public Service/Government/Non-Profit, and Private Sector/Corporate. Each of these categories works toward a service-project (generations and communities) as a course but completes separate tasks unique to each of the categories. Graduate/Law students, those who plan to pursue advanced study, will complete the research designs from their Research Methods courses, and prepare to present and publish their scholarship. Public Service/Government/Non-Profit address more complicated policy and legal references in their field of interest. Private/Corporate student build their corporate portfolio for work using digital media resources, as well as to refine their person-to-person skills, using presentation technologies and interviewing preparation.

Upon graduation, ISIT students will be able to represent themselves, the program, and the university by meaningfully claiming to be knowledgeable in a content area and a regional
specialization. For example, students can confidently state that they have studied, “Sustainability in Africa” as undergraduates (Tier 3). Furthermore, they will be demonstrating this ability through their accumulated skillset of critical reading, reflection, real-world and theoretical awareness, and useful research (Tier 2). The program will help them to interpret other cultures and languages, experience global relations through study abroad opportunities, and successfully exit the programs with a clear path toward post-graduate study/work.

4. Methodology

Over this manuscript, investigators also introduced how a multi-disciplinary approach, which involved faculty from different backgrounds (Civil Engineering and Construction and International Trade) through the Scholarship of Teaching and Learning (SoTL)—Faculty Learning Communities (FLCs), was used to explore perceptions of technology competency. The entire project was subject to and approved by the Georgia Southern University’s institutional review board (IRB).

4.1. Data collection

Using the semi-structured interview protocol, the investigators interviewed four participants as company technology supervisors, two school principals and two other business managers. They interviewed company representatives/supervisors at companies/agencies that depend on the use of technology in the workplace for job performance that newly hired graduates are expected to use in their positions. The list of companies/agencies were obtained from each of the investigators involved in the study and represented companies that each investigator had familiarity with either through prior association, company reputation, or through known companies/agencies that hired graduates from the types of programs represented by the investigators. Participants in this investigation were contacted by phone or electronic means and asked if they would be willing to participate in the study. The study was explained in detail including the decision not to participate and any questions about the study will be answered at that time. Willingness to participate constitutes consent. A copy of the consent form was provided through either electronic transmission or through mail if the participating representative/supervisor of the company/agency wishes to have this for their records.

Identifying gaps in the transferability of technological skills, can serve to inform curricular changes/revisions to align educational outcomes with real-world expectations for both new graduates and their prospective employers. Researchers have looked specifically for perceived strengths, weaknesses, opportunities (either missed or captured by either the newly hired graduate or the company/agency that has hired the graduate) which may enhance job preparedness or threats that could/may retard the newly hired graduate’s ability to meet expectations for the use of the technology in the performance of the position s/he was hired to fulfill within the expected time frame of the company/agency.

4.2. Participants’ interviews

The synthesis of the interviews and their attributive data is exemplified in the qualitative analysis compiled into the large table. This data also includes details on specific employers’ responses for the questionnaire applied in each case. Each company/agency representative/supervisor was contacted and a time and place for each interview was arranged. Each investigator was then responsible for contacting and interviewing the representative/supervisor of the company/agency for which each has submitted company/agency names included on the list of participating companies. The semi-structured interview had taken place either by conference phone or in a face-to-face situation and a list of open-ended questions outlined on an Interview Guide (crafted and refined by investigators) was asked. The Interview Guide was designed to allow for the collection of data specifically concerning graduates of similar educational programs from outside of Georgia Southern University and, specifically, Georgia Southern University graduates. It was expected that each interview may take approximately 1 to 1 ¼ hours to complete.

The resulted data is placed in Table 1. Each participant was assigned also an unidentifiable numeration code placed in the header of this Table (e.g., participant Ed1, EN1, Trade1, etc.). It is to
be noted that education field participants were not internalized as concluding for the analysis, findings, and the final conclusions of the study.

5. Findings
Based on the results of the present study, students seem to understand the more abstract aspects of technology, but often have challenges with utilizing deeper functional of ubiquitous technologies, like Microsoft Office products. These are not taught in ISIT but are viewed by many programs (outside of Information Technology) as technologies that are so widely available, they have become acquired an assumed universality (Tier 2). Programs tend to assume that students already know how to utilize more universal technologies and that often leads to over-estimating the capabilities of graduates. Younger people, having grown up with a dizzying array of dynamic
applications and technologies, particularly for social media, are often painted with the stereotype of being tech-savvy, mainly by older employers/faculty. The recent transition to on-line learning brought about by the COVID-19 epidemic may have undermined these assumptions to some degree, as students struggled with completing their coursework remotely.

Another important observation from the study is that the students appear to be confident in their own abilities yet struggle in the realm of interpersonal relations (Tier 1). Considering these concerns, a follow-up survey was conducted as a Senior Seminar project for 2019–2020 under the supervision of tenured faculty who teach in the ISIT programs at Georgia Southern University (Senior Seminar in International Studies, 2020). The survey was constructed and revised throughout the approval process required of the Office of Alumni Relations. The survey was disbursed through official alumni networks by the university and on their social media pages. The survey results were analyzed and interpreted by the Department of Political Science and International Studies which houses the International Studies and International Trade programs (see Appendix).

The results of the survey reveal that alumni of the programs seemed to support the programs' outcomes and the emphasis on soft skills (Tiers 1–3). The results of the following question are below in Figure 5: Did any of the following skills taught in the ISIT program help you with your career aspirations? The targeted skills seem to serve students well in their career aspirations and
falls somewhat as anticipated by the Competency Models. The students scored Tier 2 (Academic Competencies) higher in general (Critical Thinking Skills, Analytical Skills, Writing Skills, and Presentation Skills). Tier 3 skills scored well but tended to fall into a slightly lower range (Group Work, Intercultural Skills, Knowledge of Global Issues, and Understanding of Global Interconnectedness). Tier 4 Skills fell slightly lower (Research Skills). These competencies fell somewhat as expected given that these are the objectives for the program, and as the level of the Tier increased, the relevance tended to decline. For ISIT graduates, this seems to be indicative of the absence of a vocation. ISIT, by design, does not lend itself to a particular vocation, but is a way of engaging the world from an interdisciplinary vantage point.

This stands in contrast to Civil and Construction Engineering (CCE) graduates who can seamlessly begin work as a Civil Engineer once they have met their professional requirements. ISIT graduates work across a wide range of occupations. The areas that tended to score lower on the survey question also reflect this reality (Foreign Language, Informational Literacy), because they are more Occupation-Specific Requirements (Upper Tier).

Informational literacy is a dense term and perhaps could use some disambiguation in the survey. However, it appears as though our students were comfortable at Tier 2 technology, but as the need to utilizing information within a particular position or industry, the demand outpaced their Academic Competencies. One final interesting response category was Leadership. Leadership is generally considered a Management Competency (or at least a pre-requisite for it), and alumni scored it well in the survey. When viewed through the lens of both surveys, it seems that graduates were confident in themselves as leaders; however, they lacked the industry-specific experience to be leaders in their fields.

5.1. General findings
Results showed that all participants were dependent on the use of technology, but the degree of sophistication varied widely. While the participants reported their new hires were able to use foundational technology, the actual usage varied among the disciplines and their discipline-specific technology knowledge was often limited. Overall, the study recommends that use of discipline-specific software should be incorporated into curriculum with more depth.

5.2. Reflections on the values of collaboration and multidisciplinarity
This research investigates three aspects of technological competency and skills transferability: 1) how students were trained in technological competency by their major discipline, 2) how student used technological skills while in their program of study, and 3) how well graduates were able to transfer learned technological skills from the university classroom into the workplace. This research embraced a multidisciplinary approach to data collection to examine similarities and differences across academic fields of study that often have very little cross-pollination, especially in their upper-division coursework in distinct colleges. Commonalities among the disciplines have been useful in highlighting some preliminary considerations for academic program design across the academy.

A) Foundational Technologies: Across all the companies, foundational technologies provided the baseline for employment. Among these included general operating system software and Microsoft Office Suite/Google, e-mail functionality, and use of social media platforms. Most students utilize this technology daily both privately and as critical media by which they function in the role of student and classmate. This is a universal skill for all the disciplines. The interviewees expectation of ISIT graduates being competent in office technology of an earlier era (i.e., copiers, fax machines, etc.) also reinforces the skills necessary are often wide-ranging, but not particularly deep. Listing them as important technologies for ISIT graduates underscores the lack of a clear job role outside of general office technology.

B) Non-Foundational Technologies: The degree which graduates are expected to master other types of technology rests fundamental on the technical vocational of their career path. In ISIT, students are trained to be able to find employment across a wide range of occupational types, i.e., one doesn’t graduate with a degree that transfers directly into a job category. Education majors tend to be trained
as educators generally and within a particular range of age/grade specifications designed by state certification requirements. So, there are hardware and software expectations that are appropriate to being an educator (i.e., classroom management software, education-specific social media platforms), so that graduates are not unfamiliar with their existence even if they have never used the proprietary technologies available at a particular school district (or individual school). Competency for educators needs to be a bit more specific, so that they can use their general knowledge of hard/software categories to be able to apply it to whichever brand/program is relevant for their institution. Civil and Construction Engineering students have an even closer major-occupation correlation, and so their competency requires a much more specific proficiency with technology for use on the job. Civil Engineering students earn a degree and become Civil Engineers. As a technical vocation, to be competent in that role, graduates should be trained well in the tools that are in daily use for that occupation. The lack of a unique fit for ISIT graduates means that competency has more general requirements. The closeness of occupation to degree determines the increased specificity of technical competency for educators, and even more so for civil engineers.

C) Disambiguated Technologies: Technology is used across the disciplines in similar ways. The general utility of technology skills transfer is ascribed four main purposes: 1) work, 2) communication, 3) administration, and 4) instructional. All the disciplines require basic levels of technical competency in their workplaces. Again, the basic functional level of competency varies, but only semantically. Each discipline must use technology over their day as a core component of doing a job for which one is tasked from Spreadsheets to Smartboards to BIM. Communication using technology is the how business is conducted internally and in relations with clients, parents, or suppliers. Administrative technologies include information and data management relevant to operations. Instructional technologies exist in all workplaces in the form of SOPs, reporting to supervisors or clients, and for training and recruitment purposes. It is little wonder why the expectations for new hires mirror the suggestions from the interviewers on post-secondary education.

D) Transcendent Technologies: ISIT produces generalists, civil engineering trains specialists. For majors who earn a job title upon completion, their positions will look generally the same throughout their career. Civil and Construction Engineers who are starting out and those who are experienced need only dedication to the career path and time to become professional. That is not to say that engineers are static positions; quite the contrary, experienced engineers are dynamic life-long learners. Nevertheless, the authors would expect that most of the people who earn the degree and make a career from education/engineers would have very little variation in their job title/role throughout their careers. ISIT graduates, lacking a clear degree-occupation have a shorter time until they are considered productive by our interview groups, but the expectations placed on their productivity is significantly lower than the other disciplines. Professionalism in ISIT fields is about acting professional in a general office setting. It is only when these graduates delve deeper into a more specific occupation, which they will require to become “productive” in that occupational role. Again, the degree to which ones’ academic career translates into an actual occupation matters.

E) Soft Skills: Performance and productivity are related, but the emphasis shifts from the technical to more “soft skills”. The challenges of overcoming a paucity of people skills and/or learning how to interact with others in a workplace can be daunting. For most graduates, interactions with people in the general population have been somewhat limited by how technology has replaced traditional social networking. Social media has become an easy, inexpensive, and time-saving substitute for face-to-face meetings, phone calls, or business lunches. Business practices are changing, however, and it is quite possible that the expectation of employees working together in the same space and being “good colleagues” will become a thing of the past. It seems far more likely in professional fields who can best utilize technology to complete work remotely. Covid-19 has gone a long way to normalizing a remote, socially distanced, and insulated workplace.
6. Conclusion: Takeaways for further research

There is an increasing need for higher education to focus on technical competency along with the recognition that how technical competency is operationalized rests in no small part on the expectations of the workplace. Academic programs would do well to design curriculum not by skill-building, but by beginning with the end in mind. Today, successful universities are measured by the ability for their graduates to gain employment. To better facilitate the transition from graduate to new employee, it is critical for academic program faculty and staff to access the marketability of their graduates. Technology competency and soft skills are two pillars of skills transferability that must be continually re-assessed at the program level to justify the effectiveness of post-secondary education. Institutes of higher education (IHE) need to continue fostering students’ soft-skills, such as teamwork and self-efficacy, so graduates will be better prepared in the workplace.

6.1. Five adaptive pedagogies

In addition, this research has identified five common “adaptive” pedagogical elements to be incorporated into the general curriculum. They are as follows:

(1) Technology Competency should be considered in two distinct ways: workplace competency and technical competency. Workplace competency should emphasize the social elements necessary from manage the office environment. Technical competency can be defined as having the capability to utilize anticipated occupational technologies upon hire.

(2) As the general utility of technology skills transfer is ascribed four primary purposes (work, communication, administration, and instructional), the study is providing valuable information to the investigators for use in strengthening, improving, or revising educational curricula and/or pedagogical strategies to improve outcomes of the educational process involving technology skills pertaining to the different fields.

(3) Employers are generally providing training about 6 months, and it is perceived as costly—this is an important finding as it may effectively be addressed into the later stages of a mature curriculum.

(4) Technology is a “strength” compared with other skills, in general. The qualitative results of the study are validating major functions and dimensions of technology competency across and within the disciplines. However, the authors are aware of the limited number of interviews for the qualitative analysis and the less peculiarity of the North American market for the entry-level jobs. The conclusions drawn herein are not intended to inform other national pedagogical systems or to be placed in different contextual and cultural markets.

(5) The need of higher education is to focus on technical competency, and the soft skills required for understanding how/when to use technology based on the meaning of technology in context.

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Disclosure statement

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Note
1. In particular, International Studies and International Trade identify and embrace the following perspectives as the foundations for inquiry: Political Science, Economics, Geography, Anthropology, Sociology, History, and Technology. History is often relegated to the humanities but is only separated from the social sciences in terms of methodological approach.

References


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Appendix

Results of the follow-up study for ISIT in which alumni were interviewed to assess the degree to which skills taught in the curriculum were useful in their occupations since completing their degree programs.

I. Did any of the following skills taught in the INTS program help you with your career aspirations?
<table>
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<tr>
<th>#</th>
<th>Field</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std Deviation</th>
<th>Variance</th>
<th>Count</th>
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<td>Critical Thinking Skills</td>
<td>1.00</td>
<td>2.00</td>
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<td>0.09</td>
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<td>2.00</td>
<td>1.10</td>
<td>0.29</td>
<td>0.09</td>
<td>73</td>
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<td>4.00</td>
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<td>0.24</td>
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<th>#</th>
<th>Question</th>
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<th>Somewhat</th>
<th>No</th>
<th>Don't Know or Not Applicable</th>
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