7-9-2019

Mapping industry standards and integration opportunities in business management curricula

Margaret Phillips
Purdue University, phill201@purdue.edu

Heather Howard
Purdue University, howar198@purdue.edu

Alyson Vaaler
Texas A&M University, asvaaler@library.tamu.edu

David E. Hubbard
Texas A&M University, hubbardd@library.tamu.edu

Mapping Industry Standards and Integration Opportunities in Business Management Curricula

Abstract:

Industry standards have a significant impact on business as a means to eliminate waste, reduce costs, market products (e.g., for quality, safety, interoperability) and lessen liability (Thompson, 2011). Consequently, an understanding and the ability to use standards, agreed upon practices among interested or vested parties, is a critical workplace competency for those engaged in business and industry. To have a workforce competent in the use of standards, higher education curricula must be developed to integrate standards education at appropriate points within the curriculum. Despite the importance of standards, they are not universally integrated into the college and university curricula.

Given the widespread use of standards in business and industry, a study was undertaken by four academic librarians (two business librarians and two engineering librarians) to explore the use and potential integration of standards in undergraduate business management curricula. This was accomplished through curriculum mapping of two top-ranked undergraduate business management programs. Syllabi of the two undergraduate business management programs were examined for pre-established terms (e.g., ISO, standards), as well as potential opportunities for integration of standards in the future. Of the 62 courses examined only five (or 8%) specifically mentioned standards; however, half of the courses examined were found to have potential for the integration of standards across nine business curriculum areas: business and management strategy, business law, ethics and social responsibility, human resources, information systems, international/global, marketing, process/product development, and project management. This study found that few undergraduate business management courses specifically taught or used standards based on the syllabi, but considerable potential exists for the integration of standards into undergraduate business management courses.

Keywords: industry standards, workplace preparedness, business education, information literacy, curriculum mapping

Introduction

The word “standard” is used in many contexts to establish and facilitate agreed upon practices among interested or vested parties. Standards are widely recognized and discussed in many settings, such as education, with the United States Common Core State Standards Initiative (“Common Core State Standards Initiative,” 2018) for primary and secondary education being a well-known example. A less familiar, but ubiquitous and globally significant, setting for standards is industry.

Many industry standards are created by recognized standards developing organizations, such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), which provide this definition of a standard (ISO/IEC, 2004):

> “document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.”

Thompson (2011) offers a simpler explanation of a standard, as essentially “an agreed way of doing something, the same way each time.”

Industry standards are also referred to by other terms, such as management, technical, and engineering standards. Additionally, they are discussed and categorized in many different ways, such as if they are mandatory or voluntary (Greulich & Jawad, 2018; Thompson Diane C, 2011) to comply with, as many standards are referenced in federal, state, and local government regulations.

Thompson (2011) provides several other ways standards are classified, which are not mutually exclusive, including whether they are de jure or de facto, design or performance based, what function they serve (e.g., management, process, service, terminology, testing), and by the entity that develops or uses the standards (e.g., international, regional, national, government). In regards to industry standards, "de jure" refers to standards that are products of a recognized standards body (e.g., ISO) or government unit, whereas "de facto" refers to standards that are widely utilized and accepted but not created through formal standards development processes (Thompson, 2011). Additionally, Gruelich & Jawad (2018) discuss types of standards by the particular purpose (e.g., quality, safety, interchangeability) they serve or by their subject content.

Standards have significant impacts on businesses as a means to eliminate waste, reduce costs, market products (e.g., for quality, safety, interoperability) and lessen liability (Thompson, 2011). Additionally, they have a tremendous economic effect internationally, as it has been reported that standards and technical regulations have connections to more than 93% of global trade (Okun-Kozlowicki, 2016). An example of groups of standards with global applicability are the Universal Serial Bus (USB) standards ("USB-IF," n.d.) which provide internationally accepted standard connection protocols for computers and other electronic devices. USB standards makes it possible for manufacturers to know how to design and consumers to use devices, like flash drives, seamlessly around the world.

Despite the importance of industry standards to business practices, the integration of standards into university and college curricula for majors that will use and potentially participate in the development of standards after graduation, such as engineering, technology, and business, is not universal. Standards education does have a required presence in engineering and engineering technology curricula. ABET (Accreditation Board for Engineering and Technology),

a major accrediting body of engineering and engineering technology programs, states in their Engineering Accreditation Commission (EAC) criteria that "students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and *incorporating appropriate engineering standards* and multiple realistic constraints (ABET, 2017a)," and in their Engineering Technology Accreditation Commission (ETAC) accreditation criteria the student outcome, "an ability to conduct *standard* tests and measurements" (3.c) (ABET, 2017b). Additionally, the ETAC Mechanical Engineering Technology program criteria requires "basic familiarity and use of industry codes, specifications, and *standards*," for graduates (e) and the Electrical Engineering Technology program criteria, the "application of…*engineering standards*" (a) in curriculum (ABET 2017b). However, in spite of these requirements, Khan, Karim, and McClain's (2013) survey of engineering technology faculty found that nearly 30% of respondents do not teach standards in their programs and nearly 50% reported "lack of expertise on the application of standards" as an impediment to teaching standards, as the traditional academic trajectory does not typically deeply expose faculty to standards.

Standards education is not traditionally integrated into business education. The Association to Advance Collegiate Schools of Business (AACSB) accreditation guidelines for business schools do not include any specific language for including standards education in the business curriculum. Guidance for curriculum content from the AACSB Accreditation Guidelines are understandably generalized as to allow flexibility for various business school curricula. However, a general business knowledge area that the AACSB guidelines expect business degree programs to cover includes knowledge of "systems and processes in organizations, including planning and design, production/operations, supply chains, marketing,

and distribution" (AACSB, 2013). Teaching standards in business courses would support this required knowledge area.

The National Business Education Association (NBEA) National Standards for Business Education, typically referenced at the secondary school level but not widely discussed in post-secondary education, do include standards knowledge as performance expectations at the college level. Specifically, the NBEA standards include being able to "Describe the role and purpose of the International Organization for Standardization", "Describe an ISO standard" and "Assess the impact of quality management standards, especially ISO 9000, QS 9000, ISO 5000, ISO 26000, and ISO 1400, on the international business community" (National Business Education Association, 2013) as performance expectations for college level students studying international business. However, even with this given knowledge expectation, there is little evidence that standards are routinely being taught in business education at the college level.

Given the wide use of standards in industry and the lack of discussion of standards integration into business education, the authors of this study seek to determine if and where industry standards are integrated into college and university business management curricula, and to identify potential opportunities for incorporating, or further incorporating, standards into business management curricula and library instruction. The specific research questions are:

- Are industry standards being taught in undergraduate business management curricula? If so, in which types of courses?
- What opportunities are there to integrate (or further integrate) industry standards into undergraduate business management courses?

To carry out this study, the authors, four libraries' faculty members, performed curriculum mapping of undergraduate business management course syllabi from two universities, both large, public research institutions in the United States. Librarians have particular interest in this work as they collect and teach identifying, locating, and using resources important for students' academic, professional, and personal success. This paper intends to promote the integration of industry standards into business curricula to business faculty and librarians in order to better prepare students for their future work in business.

Literature review

Standards in business education

There is very little literature on integrating standards into the business curriculum. Existing examples of standards integration into business education have been the result of project funding awarded by the National Institute of Standards and Technology (NIST) Standards Services Curricula Development Cooperative Agreement Program. This program awards funding in order to support the development of learning materials that integrate standards into business and engineering curricula. Starting in 2012, the program has funded 33 projects, but only two have been explicitly focused on standards integration into business education (NIST, 2018).

One of these projects, authored by two San Jose State University professors, developed standards teaching materials to be integrated into an existing business systems and policy course at their institution (Kwan & Aggarwal, 2014). The developers of these materials surveyed various business textbooks in order to identify trends and commons themes in business systems courses. After they had done this, the project authors wrote case studies involving standardization that centered around these common themes. They then trialed these case studies

in several classes. They found that through the discussion of case studies, many students recognized issues relating to standardization, even if they were not highlighted by the professor. This led to discussions about standardization and how standards worked within the selected case study. The authors of this project called this approach a "stealth" approach because it utilized existing business curriculum in order to discuss the role standardization might play in commonly discussed themes in business courses.

The other NIST project awardee was affiliated with Northwestern University. This project developed modules for classroom use that included slides, suggested readings, and teaching notes designed to be fully adaptable for other teachers to use (Strauss, 2013). The project also created a role-playing exercise revolving around the negotiation process involved in developing a new standard. Module topics tied to standardization include the development of a smart grid, international politics, healthcare innovation, as well as an overarching introduction and definition of standards and standard developing bodies (Strauss, 2015).

Internationally, more examples of standards being integrated into business curricula exist, but are far from routine. In the Netherlands, the Rotterdam School of Management at Erasmus University hosts a Chair of Standardization. This chair is held by someone who has deep knowledge of standards and works to integrate standards knowledge into the curriculum. The school integrates standards education into its curriculum, as well as offers standalone courses on standardization. Examples of standards integration include an option to write an undergraduate thesis on a standardization topic, an innovation course that examines issues typically affected by standards, and a graduate course "Business Process Excellence" that addresses standardization topics for management systems and supply chains (de Vries, 2009).

The University of Geneva offers a unique master's program, the Master in Standardization, Social Regulation and Sustainable Development, that combines standardization courses taught by the ISO with curriculum involving sustainable development and participatory governance. Its aim is to train future sustainability managers for both the private and public sectors. Some of the ISO led courses directly speak to management topics such as "Management Systems for Sustainability" and "Strategic Planning for Sustainable Business." Students enrolled in this program have various backgrounds ranging from law, humanities, theology, and business (Baccaro, 2012).

Curriculum mapping in business

With a history dating back to the 1500s (Triche & McKnight, 2004), curriculum mapping has been regularly used in K-12 schools since late 1980's to communicate and coordinate curriculum development, identify gaps, align course content with educational standards, and standardize core curriculums (Jacobs, 1997; Koppang, 2004). This method was quickly adopted by higher education, where academics realized the value of looking at the curriculum holistically to determine if key concepts were being addressed throughout a student's educational career (Archambault & Masunaga, 2015). Librarians have recognized the importance and usefulness of this method since the early 2000s, using curriculum mapping in relation to information literacy (Booth & Mathews, 2012; Hinchliffe, Mark, & Merz, 2003; Lampert, 2007; Moser, Heisel, Jacob, & McNeill, 2011; Nash, 2004; UNLV University Libraries, 2011).

Within the business school curriculum, librarians have analyzed syllabi to find instances of library use and information literacy in order to facilitate faculty outreach and support (Boss & Drabinski, 2014; Dewald, 2003). Business librarian Nataly Blas explained a process for thinking about curriculum mapping at her institution (2015), and business librarians used curriculum

mapping in an effort to validate a set of business research competencies (Howard, Wood, & Stonebraker, 2018). Comparing existing curriculum with learning outcomes has long been a practice in business education. Studies have been performed using curriculum mapping, but refer to different terms, such as benchmarking, threshold standards, and business intelligence to discuss directed development of business curriculum (Amin & Amin, 2003; Levy & Ronco, 2012).

Methods

Business and engineering librarians at Purdue University and Texas A&M University mapped the curriculum in the Purdue University Undergraduate Management Program and the Texas A&M University Bachelor of Business Administration Management Program to a list of pre-established terms, including: standard(s), standardize, standardization, NIST, NISO (National Information Standards Organization), ANSI (American National Standards Institute), ISO, ASQ (American Society for Quality), and PMI (Project Management Institute). The syllabi of record were collected for each course in the core management curriculum and examined to determine if standards were being integrated into the curriculum in any capacity.

Additionally, the authors reviewed the syllabi for subjects and content areas where standards could potentially be integrated in the future. This included 38 syllabi for 26 courses from Purdue University, and 49 syllabi for 36 courses from Texas A&M University. In most cases, determinations were made based solely on the content in the course syllabi, however in a few cases, librarians were involved in planning or instruction for a course, so had a clearer knowledge of course content. Each syllabus was evaluated by both a business librarian and an engineering librarian in order to norm the evaluation and ensure consistency. Once all courses

were reviewed, the authors were able to evaluate any occurrences of industry standards within the curricula, as well as opportunities for potential integrations.

Results

Syllabi review for pre-established terms

Of the 62 courses examined only five (or 8%) specifically mentioned standards; however, half of the courses examined were found to have potential for the integration of standards. At Purdue University, the authors found the pre-established terms for industry standards listed in four of the undergraduate courses in the core business management curriculum (see Table 1). In all of these cases, authors identified the words standard(s), standardize, or standardization. None of the Purdue University syllabi incorporated the standards organizations (e.g., ISO) identified by the authors. At Texas A&M University, the authors found the pre-established terms for industry standards mentioned in one of the core business management curriculum syllabi: ACCT 229 *Introductory Accounting*. In this case, the authors identified the phrase "accounting standards."

Syllabi review for opportunities for standards integration

The authors identified nine business management curriculum areas as potential opportunities for industry standards integration at Purdue University and Texas A&M University. The nine curriculum areas are business and management strategy, business law, ethics and social responsibility, human resources, information systems, international/global, marketing, process/product development, and project management. While there were only five courses that specifically mentioned standards within the syllabi, 14 Purdue University courses and 17 Texas A&M University courses (31 of 62 courses) were found to have potential for the

integration of standards based on language in the syllabi (Table 2). Most of the courses aligned within a single curriculum area, but there were six courses at Purdue University and four courses at Texas A&M University that were assigned to two or more categories.

Discussion

The results of this study show the topic of industry standards currently has little integration into the undergraduate business management curricula at Purdue University and Texas A&M University, two highly ranked U.S. business schools (Purdue University Krannert School of Management, n.d.; Texas A&M Mays Business School, n.d.), which is consistent with the authors' search of the literature in this area. One reason for this could be the openness and flexibility of the AACSB accreditation guidelines (AACSB, 2013), which as previously mentioned, do not require standards education in undergraduate business programs. Additionally, similar to many engineering and technology faculty (Khan et al., 2013), business faculty may not feel they have the expertise to meaningfully integrate standards content into curricula. Industry standards are heavily utilized in "real world" applications, but are not as familiar as scholarly publications to faculty who have taken traditional academic paths.

In Table 2 the authors identified several curricula areas that are potential opportunities for standards integration into undergraduate business education at Purdue University and Texas A&M University. For example, in courses focused on business law, instructors could incorporate the concept of mandatory and voluntary standards as they relate to product liability, product safety, consumer protection, and regulations. In some cases, products are required by law to be tested in a specific way and/or meet certain performance requirements detailed in standards. In other cases, meeting established industries standards in a given area may reduce a business' liability, even if they are not legally bound to do so. Additionally, in courses focused on human

resources, instructors could integrate specific international standards under the purview of the ISO/TC (technical committee) 260 - Human Resource Management, such as: ISO 30405 (Human resource management - guidelines on recruitment) and ISO/TR 30406 (Human resource management -- Sustainable employability management for organizations). Marketing courses could introduce that standards can be used to promote how products meet or exceed standards, such as for quality, safety, sustainability, social responsibility, and/or efficiency.

Academic librarians in business and engineering disciplines can help with these efforts, as their information literacy instruction routinely teaches students about discovering, evaluating, and using various resource types for their work, as well as how resources are developed. Several studies have discussed academic librarians teaching about standards in engineering (Hanlan, Ziino, & Hoffman, 2014; Leachman & Leachman, 2015) and engineering technology (Phillips & McPherson, 2016) curricula. Many academic libraries maintain standards collections and/or offer services for purchasing needed standards for students and faculty (Phillips, 2019). Librarians can also highlight low-cost and freely available options for obtaining standards (Phillips & Huber, 2017), since they are widely known as costly resources (Phillips, 2019).

Limitations

The present study has a few limitations. While the authors attempted to standardize mapping results by having one business librarian and one engineering librarian evaluate each set of syllabi, this study lacks inter-rater reliability. The course syllabi contain contextual information, such as institution and school specific jargon, that sometimes proved challenging for the authors to evaluate and interpret. Additionally, due to scope and time constraints, this study did not look beyond the syllabi to evaluate resources such as required readings, interviewing faculty, etc. This study only evaluates core programs at Purdue University and

Texas A&M University and did not take into account additional educational activities such as co-ops, internships, outside professional development, internships, competitions, or club activities. This study also only examined current curriculum, and not past or future programs of study. Looking outside of the core curriculum at these other areas could prove useful in identifying additional opportunities for standards education. Also, the study only reviewed syllabi from two institutions, which is locally beneficial, but the results cannot be widely generalized.

Conclusion

Standards can have a direct impact on the success of businesses. The implementation of standards allows businesses to streamline operations in multiple avenues, such as the procurement of supplies and the productions of items. After a product is made, standards can have further impact on the marketing of the product, such as to show that a product meets certain safety or quality standards. In addition to local impact on businesses, internationally, standards help businesses set a baseline for multiple operations to ensure that products are interoperable and created uniformly. The use of standards can also lead to faster market expansion because businesses have a guide to use in order to facilitate technology transfer to different markets.

Despite all the advantages to businesses adopting standards, very little official standardization is being taught in higher education business classrooms. Business students will likely interact with standards in their future careers, thus, it is important to consider the presence of standards in business curriculum and how they might best be integrated.

The authors' next steps are to share their findings with the affiliated business departments and with the wider library community. It is the authors' hope that the curriculum mapping model of industry standards and the mapped results and opportunities for standards integration

will prove useful not only to librarians, but to faculty in business schools hoping to address workplace competencies for their students.

References

AACSB. (2013). 2013 Eligibility procedures and accreditation standards for business accreditation. Retrieved from https://www.aacsb.edu/-/media/aacsb/docs/accreditation/business/standards-and-tables/2018-business-standards.ashx?la=en&hash=B9AF18F3FA0DF19B352B605CBCE17959E32445D9

ABET. (2017a). Criteria for accrediting engineering programs, 2018 – 2019. Retrieved from https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2018-2019/

ABET. (2017b). Criteria for accrediting engineering technology programs, 2018 – 2019. Retrieved from https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-technology-programs-2018-2019/

Amin, M. R., & Amin, N. A. (2003). Benchmarking learning outcomes of undergraduate business education. *Benchmarking: An International Journal*, *10*(6), 538–558. https://doi.org/10.1108/14635770310505175

Archambault, S. G., & Masunaga, J. (2015). Curriculum mapping as a strategic planning tool. *Journal of Library Administration*, *55*(6), 503–519. https://doi.org/10.1080/01930826.2015.1054770

Baccaro, L. (2012). Master in standardization, social regulation and sustainable development. Retrieved from https://www.unece.org/fileadmin/DAM/trade/wp6/documents/2012/PPTs/015_LucioBaccaro.pdf

Blas, N. (2015). It's your business: Evaluating the business curriculum to target information literacy in the discipline. Retrieved from http://www.ala.org/rusa/sites/ala.org.rusa/files/content/sections/brass/Publications/Acad_BRASS/2015_spring_blas.pdf

Booth, C., & Mathews, B. (2012). *Understanding the learner experience: Threshold concepts and curriculum mapping.* Paper presented at California Academic & Research Libraries Conference, San Diego, CA. Retrieved from http://www.carl-acrl.org/conference2012/2012CARLproceedings/Understanding%20the%20Learner%20Experience_BoothMathews2012.pdf

Boss, K., & Drabinski, E. (2014). Evidence-based instruction integration: A syllabus analysis project. *Reference Services Review, 42*(2), 263–276. https://doi.org/10.1108/RSR-07-2013-0038

Common Core State Standards Initiative. (2018). Retrieved from http://www.corestandards.org/

de Vries, H. J. (2009). The Netherlands: A business approach to standards. Retrieved from https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso-award2009-netherlands.pdf

Dewald, N. H. (2003). Anticipating library use by business students: The uses of a syllabus study. *Research Strategies*, *19*(1), 33–45. https://doi.org/10.1016/j.resstr.2003.09.003

Greulich, O., & Jawad, M. (2018). *Primer on engineering standards, expanded textbook edition*. Hoboken, NJ: ASME Press and John Wiley & Sons, Ltd. https://doi.org/10.1115/1.861PRI

Hanlan, L. R., Ziino, R. A., & Hoffman, A. H. (2014). *Student attitudes and measures of success in information seeking in an introductory mechanical engineering design course.* Paper presented at the 2014 IEEE Frontiers in Education Conference (FIE), Madrid, Spain. https://doi.org/10.1109/FIE.2014.7044201

Hinchliffe, L., Mark, B. L., & Merz, L. H. (2003). *Bridging the gap between information literacy and campus curricula: Using curriculum mapping to achieve a holistic information*

literacy program. Paper presented at the Workshop on Instruction in Library Use (WILU), Windsor, Ont.

Howard, H. A., Wood, N., & Stonebraker, I. (2018). Mapping information literacy using the business research competencies. *Reference Services Review*, *46*(4), 543–564. https://doi.org/10.1108/RSR-12-2017-0048

ISO/IEC. (2004). *Guide 2 Standardization and related activities - General vocabulary*. Geneva, Switzerland: ISO. Retrieved from http://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/standard/03/99/39976.htm

Jacobs, H. H. (1997). *Mapping the big picture. Integrating curriculum & assessment K-12*. Alexandria, VA: Association for Supervision and Curriculum Development.

Khan, A. S., Karim, A., & McClain, J. A. (2013). *The state of the use of standards in engineering and technology education.* Paper presented at the 2013 ASEE Annual Conference & Exposition, Atlanta, GA. Retrieved from https://peer.asee.org/22618

Koppang, A. (2004). Curriculum mapping: Building collaboration and communication. *Intervention in School & Clinic*, *39*(3), 154–161. https://doi.org/10.1177/10534512040390030401

Kwan, S. K., & Aggarwal, N. (2014). Integrating standards education in the business school curriculum. Retrieved from https://www.northwestern.edu/standards-management/teaching/SKNA-IntegratingStandards-1of2.docx

Lampert, L. D. (2007). Academic librarians' role in curriculum development. In S.C. Curzon & L.D. Lampert (Eds.), P*roven strategies for building an information literacy program* (pp. 95–111). Retrieved from http://scholarworks.csun.edu/bitstream/handle/10211.2/1996/LampertLynn200701.pdf?sequence=3

Leachman, C., & Leachman, J. W. (2015). *If the engineering literature fits, use it! Student*

application of grey literature and engineering standards. Paper presented at the 2015 ASEE Annual Conference & Exposition, Seattle, WA. Retrieved from https://peer.asee.org/24218

Levy, G. D., & Ronco, S. L. (2012). How benchmarking and higher education came together. *New Directions for Institutional Research*, *2012*(156), 5–13. https://doi.org/10.1002/ir.20026

Moser, M., Heisel, A., Jacob, N., & McNeill, K. (2011). A more perfect union: Campus collaborations for curriculum mapping information literacy outcomes. Retrieved from http://www.ala.org/acrl/sites/ala.org.acrl/files/content/conferences/confsandpreconfs/national/2011/papers/more_perfect_union.pdf

Nash, M. (2004). Information literacy and the learning community. *Nebraska Library Association Quarterly*, *35*(4), 18–24.

National Business Education Association. (2013). *National standards for business education: What America's students should know and be able to do in business.* Reston, VA: National Business Education Association. Retrieved from https://neapolitanlabs.education/assets/north_linn/files/business_education.pdf

NIST. (2018). NIST standards services curricula development cooperative agreement program. Retrieved January 16, 2019, from https://www.nist.gov/curricula-grants

Okun-Kozlowicki, J. (2016). Standards and regulations: Measuring the link to goods trade. Retrieved from https://www.trade.gov/td/osip/documents/osip_standards_trade_full_paper_2016.pdf

Phillips, M. (2019). Standards Collections: Considerations for the Future. *Collection Management*, *44*(2–4), 334–347. https://doi.org/10.1080/01462679.2018.1562396

Phillips, M., & McPherson, P. (2016). *Using everyday objects to engage students in standards education*. Paper presented at the 2016 IEEE Frontiers in Education Conference (FIE), Erie, PA. https://doi.org/10.1109/FIE.2016.7757698

Phillips, M., & Huber, S. (2017). Standards resources for engineering and technology. *Issues in Science & Technology Librarianship*, *87*. https://doi.org/10.5062/f4b27sj7

Purdue University Krannert School of Management. (n.d.). Rankings Summary. Retrieved from https://krannert.purdue.edu/news/rankings.php

Strauss, J. (2013). Northwestern BCIC CTIM standards in context module. Retrieved from https://www.northwestern.edu/standards-management/documents/NOV%202014%20REV%20CTIM%20Standards%20in%20Context%20Course%20Module.ppt

Strauss, J. (2015, November/December). Putting Standards in Context. *Standards Engineering 67*(6), 12–13. Retrieved from https://www.ses-standards.org/page/306

Texas A&M Mays Business School. (n.d.). Rankings. Retrieved from https://mays.tamu.edu/rankings/

Thompson D. C. (2011). *A guide to standards*. Portsmouth, NH: Standards Engineering Society.

Triche, S., & McKnight, D. (2004). The quest for method: the legacy of Peter Ramus. *History of Education*, *33*(1), 39–54. https://doi.org/10.1080/0046760041000164875 1

UNLV University Libraries. (2011). *Libraries instructional framework working group report 2011*. Retrieved from https://www.library.unlv.edu/about/instruction_framework

USB-IF. (n.d.). Retrieved from https://www.usb.org/

Table 1. Courses in the Purdue University Undergraduate Management Program that Include Standards in their Syllabi

Course Numbers	Course Titles	Syllabus Language That Includes Standards
MGMT 44710	Competitive Strategy	"competition for standards and multi-sided platforms;" "the art of standards wars"
MGMT 44810	Technology Strategy	"standard battles & design dominance"
MGMT 452	Manufacturing Strategy	A case questions is: "what is the process employed at Nypro to identify and standardize important innovations?"
MGMT 459	International Management	"global standardization"

Table 2: Potential Opportunities for Industry Standards Integration at Purdue University and Texas A&M University

Business Curriculum Area	Purdue Course(s)	Texas A&M Course(s)	Course Content Relevant to Industry Standards (*Listed in at least one course syllabi*)
Business and Management Strategy	MGMT 352 MGMT 44710 MGMT 44810 MGMT 44690	MGMT 466	competitive advantage, environmental management, market research / competition, negotiation, quality management, risk analysis/management
Business Law	MGMT 254	MGMT 211	consumer protection, product liability, product safety, regulations
Ethics and Social Responsibility	MGMT 254 MGMT 44690	MGMT 211 MGMT 372 MGMT 373 MGMT 422 MGMT 439 MGMT 452	ethical negotiations, ethics in management consulting; social responsibility
Human Resources	MGMT 44310 MGMT 44428 OBHR 330	MGMT 373	managing people, organizational behavior, workplace safety & health
Information Systems	MGMT 382	ISTM 210 ISTM 250	computer hardware, software, and operating systems; decision support systems
International / Global	MGMT 352 MGMT 44310 MGMT 452 MGMT 459	ACCT 229 MGMT 439 MGMT 452	global standardization, global strategy, global supply chain, globalization
Marketing	MGMT 324 MGMT 484	MKTG 321 MKTG 438	digital analytics, market research / competition, packaging, product design, product positioning, quality, social responsibility
Process / Product Development	MGMT 352 MGMT 361 MGMT 452 MGMT 484	MGMT 440 MGMT 477 SCMT 345 SCMT 364	design, entrepreneurship, market research / competition, operations management, quality, process analysis, product life cycle, product/process
Project Management	MGMT 452	MGMT 460 SCMT 364	project management