Capacity Building for Organizational Resilience: Integrating Standards on Risk, Disruption and Business Continuity in the Curriculum

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Abstract: Disruption is an inevitable factor in business and society, while inability to mitigate and manage risk can cause irreparable damage to business, the economy, and our ways of life. The COVID-19 pandemic has heightened interest in standards-based strategies for risk management and crisis preparedness to enhance organizational and societal resilience. University curricula that integrate national and international standards offer students a rich skill-set for effective performance in their careers. Moving forward, we must cultivate capable professionals who understand the challenges and risks facing society, and grasp standards and systems for strategic planning, response, and recovery to promote organizational resilience and sustainable development. Our research focuses on integrating risk management and continuity standards into university curricula, based on implementation at a large private university and regional community college in the Northeastern United States. We propose and evaluate a modular approach to introduce students to specific national and international standards and teach them to identify and apply relevant standards based on the locally-driven, whole community nature of disaster, response, and recovery. Standards-based curriculum and the skills that result will be key to readiness for tomorrow's graduates.

Keywords: Standards Literacy, University Curriculum, Emergency Preparedness, Business Continuity, Organizational Resilience

Introduction

Business and society are increasingly vulnerable to stresses that can disrupt operations, supply chains, and our ways of life. Disruption risk can be associated with a range of factors, such as information security (Yao and Jong, 2010), terrorism (Coaffee, 2016), natural hazards (Kleindorfer & Saad, 2005), climate change and related extreme weather events (Scott et al., 2020), aging infrastructure (Osei-Kyei, et al., 2021), and global health threats (McInnes & Roemer-Mahler, 2017; OECD, 2003). The inability to mitigate and manage such risks can cause significant, potentially irreparable damage. While businesses have increasingly incorporated elements of continuity planning to minimize the impact of disruption, many were unprepared to meet the challenges for continued operations resulting from the COVID-19 pandemic. This crisis has heightened private and public interest in standards-based, systematic strategies for risk management, crisis preparedness, and business continuity to enhance organizational and societal resilience and competitiveness.

National and international standards for risk and continuity management offer structured frameworks and technical guidelines that represent emerging consensus on best practice as firms seek to enhance organizational resilience (Tiernan et al., 2019). Such standards have an increasing presence in risk management, crisis preparedness and response, and organizational continuity, and these domains are interwoven in a range of disciplines, including health, safety, environmental, policy, business, and information technology, to name a few. These operational standards provide an opportunity for the implementation of systems and strategies that reduce organizational vulnerability, provide for efficient crisis response and recovery, and promote resilience. Such standards and strategies will shape how our society deals with vulnerability and disruption and will in turn shape the standards of how the professional will create value for society. Those entering the workforce must understand the role of standards in general, as well as the role that particular standards and their application can have upon professional practice. As we move forward, it is clear that we need to cultivate capable professionals who understand the challenges and risks facing organizations and society, and who grasp standards and systems for strategic planning, preparedness, response, and recovery to promote organizational continuity, resilience, and sustainable development. Curriculum that incorporates and applies key standards used in the public and private sectors offers students a rich skill-set in preparation for effective performance in their careers.

Our research supports the integration of standards-based content into university curricula, as a means to strengthen student education, learning and literacy in standards and standardization. This paper describes and evaluates a modular approach for standards-based curricula on risk, disruption, and continuity for degree programs in engineering technology, smart systems technologies, construction and environmental, health and safety management, and its impact on students entering the workforce in engineering and management disciplines. Our research involved integrating risk, disaster and continuity standards content into existing courses and programs at two institutions of higher education in the Northeastern United States. Curriculum was implemented in a range of courses at these institutions and validated by participating higher education partners at two additional institutions, providing feedback across the arc of early college constituencies and later college and graduate education. Our approach was designed to prepare students in their future roles to identify and

apply a range of relevant national and international standards based on the locally-driven, whole community nature of disaster response and recovery, and to integrate systems across several relevant standards for risk, disruption, and continuity. While the curriculum was piloted in environmental health and safety, civil engineering, and smart systems technologies courses, it is relevant and applicable to a range of disciplines that incorporate risk, disaster science, business continuity, and critical systems resilience.

Risk is a polysemantic term that lacks a consensus definition (Aven, 2012; Xu, 2008). For this work, we focus primarily on disruption risk, reflecting uncertainty and the potential for adverse outcomes such as harm or loss resulting from disruption. We conceptualize resilience as a characteristic of a system or an organization when considered as a whole. A system is understood to be stable, when it is able to remain more or less the same within a range of conditions, is flexible and able to adjust to stress (Holling, 2001; Thompson et al., 2009).

Methods

Our research involved implementation and assessment of curricular and instructional design to enhance standards literacy in the context of risk, disruption, and business continuity. Our approach integrated a selection of related standards in graduate and undergraduate curricula through design, testing and evaluation of portable learning modules, based on a proven education structure consistent with Liu et al. (2013a; 2013b) and Greenwood et al. (2018a; 2018b). Key standards included a selection of relevant frameworks and guidelines from the International Organization for Standardization, known as ISO, as well as U.S. standards from NIST, FEMA, and NFPA.

Compatible modules were developed to introduce students to standardization and standards development while incorporating and integrating specific content used in industry and society in the following three domains:

1. Risk: risk and vulnerability assessment, mitigation, and response;
2. Disruption: disaster and emergency mitigation, preparedness, prevention, and response;
3. Continuity: proactive strategies for recovery, continuity, and organizational resilience.

While traditional educational research has focused on enhancing a student's ability to acquire knowledge, more recent work has addressed how students learn and "encode knowledge" through study tasks. Karpicke and Blunt (2011) maintained the importance of considering the retrieval processes developed during learning, and Taylor and Kaza's (2011) work reinforced this notion by demonstrating how self-contained modules about computer security can successfully be embedded in introductory programming courses to increase students' security awareness. Loepp (1999) emphasized the importance of designing a relevant, standard-based curriculum while ensuring students are challenged to address real-world problems. With this in mind, the research team developed a set of self-contained, yet transposable learning modules, organized in thematic elements that can be implemented in combinations appropriate to various course learning outcomes. Each module included educational content and supporting resources with active learning components tethered to real-world situations to enhance student retrieval and retention of knowledge. Our curricular module design template is shown in

Table 1.

Table 1. Module Design Template

Component	Description
Module Overview & Description	- Executive summary with introduction and overview of the module - Module learning outcomes, description, and rationale - Summary of key standards included in the module
Educational Content	- Slides and notes for lectures with guided activities and exercises - Supplementary resources, e.g., readings, links to materials and tools - Example discussion questions and exercises
Module Assessment	- Example assignments - Assessment tools and methods to measure module effectiveness

Module assessment was designed to occur at multiple levels, including internal and external content review as well as evaluation of student learning. Internal faculty evaluators reviewed content for evidence that the materials reflected different cognitive learning levels, provided connection to real world contexts and situations, and connected back to the learning objectives. External content review was provided from faculty at two secondary partnering institutions as a means of content validation. Constructive feedback from these reviews was applied to refine and improve module content. Following completion of module implementation in courses, faculty evaluated student learning based on results achieved on assignments, exercises, projects, and exams.

Results and Discussion

To date, we have engaged approximately 100 students and seven instructors with our educational content across seven courses at four universities. In all courses in which modules have been completed with graded assignments, we have met our goal for student success. Ninety-one percent of students achieved a B or better on related assignments overall, based on the sum of the number of students achieving above an 80% on each assignment, divided by the sum of the number of students completing each assignment.

Feedback from instructors has been generally positive and constructive. At the graduate level, one instructor observed that students appeared to "grasp concepts well and were able to successfully apply them to the project and answer the related assignment questions," and noted that the use of a group project allowed participant-participant collaboration to reinforce the concepts and advance students' learning. At the undergraduate level,

two instructors noted that students really engaged with the content and case study/scenario-based assignment, and that this helped to "make content more relatable."

Challenges observed during module implementation were related to preparation of instructors and selection and adaptation of applicable content for integration in a specific course. A new instructor in the environmental sustainability, health and safety discipline who was just introduced to the content noted that a few students "were confused by exposure to frameworks from disciplines outside of the EHS realm" and that it was a challenge for him to present some of the content that fell outside of his disciplinary expertise. Going forward, he intends to dig deeper into the module resources and adapt and integrate our content further to target the specific focus of the course, which is consistent with the aim of our module structure and approach. We plan to implement our modules in three additional courses in the current semester, taking our instructor feedback into account.

Conclusion

This research addressed methods, practices and results for integration of risk management, disruption, and continuity standards into university curricula. Our experience and assessment indicate that a modular, active learning approach to standards-based curriculum development is successful. The modules were effective for a wide range of audiences from undergraduate to the graduate level. The assessments of student learning indicated that the approach was effective in enabling students to engage in learning about standards in risk, disruption, and continuity that support organizational resilience, and to internalize, give meaning to, demonstrate, and apply this knowledge. By creating modular sets that organize standards content in smaller, thematic elements, the content can be used in and adapted to a variety of educational settings, with selection and customization of appropriate classroom activities and assessment tools. In addition, our faculty reviewers affirm our view on the usefulness and applicability of the modules to a wide range of professional programs; however, introductory materials will likely merit scaling and adaptation by the individual instructor to provide the appropriate context for their students and enhance engagement.

Finally, the facets of what it means to be a professional continue to evolve. Standards-based, systematic strategies for risk management, crisis preparedness, and business continuity can enhance organizational and societal resilience and competitiveness in what may be referred to as the age of disruption. We maintain that such standards and strategies will shape how our society addresses vulnerability and prepares for and responds to disruption and will in turn shape the standards of how the professional will create value for society. Standards-based curriculum and the skills that result will be key to prepare tomorrow's graduates for societal challenges that lie ahead.

Recommendations

Faculty and young professionals who are not typically introduced to standards within their discipline in their

academic career can benefit from structured and formalized instruction on standards and standardization. Discipline-specific faculty education and workforce development through professional societies or credentialing organizations would extend the impact of this effort.

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