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Recognizing and Addressing Conflict That Emerges from Sociotechnical Change in Higher Education

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Recognizing and Addressing Conflict That Emerges from Sociotechnical Change in Higher Education

by

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Dedication

I wish to dedicate this dissertation to two influential men in my life: Oliver T. Watkins and Donald Richardson who provided the love, inspiration, motivation, and the means for me to fulfill my dream of a PhD. Though they passed before seeing it come to fruition, they still guided me. My children and family are here, and I am forever blessed to have incorporated many of their invaluable thoughts and suggestions. So, this writing is also dedicated to the pseudonyms.

Acknowledgments

I had the great fortune of discovering Nova Southeastern University's graduate program in Conflict Analysis and Resolution. It opened my eyes to issues and concepts—yes, theories—I had never considered or understood before. The multidisciplinary ingredients found in this degree program fulfilled every aspect of my own journey in life, and I am changed.

That journey involved new relationships with three astounding women who formed my committee: Dr. Urszula Strawinska-Zanko, Dr. Cheryl Duckworth, and Dr. Robin Cooper. I overtly selected this authentic and committed chair and team, knowing that I would not get off easy. Thank you for your subject-matter knowledge, patience, leadership, and special friendship.

I also wish to thank my generous research participants for the openness shown to me during a very stressful pandemic. It is a time we shall all remember.

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Abstract

Today's unprecedented technology growth impacts at many levels—from individuals to groups to society. This study aims to characterize how exponential digital technology growth and organizational change is explained and experienced in a university setting deploying new instructional technologies—and how or where conflict emerges. Organizational conflict is a phenomenon that takes many forms and may not be fully recognized. This dissertation highlights theories of technology invention and disruption, the dynamics of sociotechnical change (defined as the interdependencies between people, technology, and the environment) and response in organizations, complex adaptive systems, and practice theory of change. It considers current technological forces at work; digital use and literacy in higher education; mechanisms by which digital technology affects stakeholders; how institutional technical capacity is assessed; how technology is adopted; and ultimately, how a lack of contextual understanding or awareness of conflict may contribute to acute disruption for incumbent academic institutions. Quantitative research and Theoretical Thematic Analysis (qualitative research) were employed concurrently. Thematic insights from interviews and surveys converged to identify patterns of sociotechnical change, and the conflict that emerged, during COVID-driven requirements to implement all courses fully online. The intent was to substantiate theoretical underpinnings for organizational strategy in today's times. This approach illumined the decisions that were made and how they were deciphered, how change was experienced, as well as how conflict was managed. Modeled was the multidisciplinary approach prescribed through a conflict lens—making a viable contribution to the study of sociotechnical change in organizations and institutions.

Keywords: digital technology, digital learning, sociotechnical change, organizational conflict, complex adaptive systems, disruption, and higher education.

Chapter 1: Introduction to the Study

As with any journey, one starts with a nucleus of an idea for where to head. My dissertation thesis journey began in 2019 with concerns I harbored about my own digital literacy in light of having four adult children who were either creating digital/electronic content, selling digital/cloud capabilities, edging into the science and/or art of digital transformation, or applying digital/sensor innovations to industries, such as healthcare. Basically, I had hoped that venturing into this highly technical field would enable me to "keep up" with them and others, while building my own expertise for how technology is related to conflict studies. As I progressed, the review of literature steered toward the components of strategic planning and organizational development. Feasting on books about technology innovation, the digital age, forces influencing the future, the new machine age, machine learning, analytics—to name a few—it became clear that strategies for handling change in organizations are facing an entirely new and unanticipated set of conflicts, with the ultimate foe being corporate or institutional failure. It has been termed "exponential change," whereby "timelines for technology have moved from linear to exponential, so that what happens in the next ten years will eclipse what has occurred over the last century in terms of change" (Diamandis & Kotler, 2015; Evans, 2017, p. 208). Though the exponential progression of digital technology has been under scrutiny by many, no one anticipated the COVID pandemic in 2020, and the disruption it was to mount, including that upon this dissertation topic.

Background, Problem, and Significance

Organizations typically benchmark resources, processes, values, culture, and risk against a standard set of indicators. This dissertation concept signals the need for immediate analysis of challenges and opportunities that can prove disruptive—exposing wholly different value propositions, metrics, and relationships—that are being, or will be, faced in every sector and organization. Many, including higher education, have resisted the portending changes.

My dissertation topic in broad terms focuses upon how the impact of digital technology trends on individuals, organizational units, and the broader society is realized in a specific case study within the domain of U.S. higher education. It is my contention the concept of technical disruption in organizations requires a multidisciplinary approach, to include research from these fields: economics, business, history, psychology, sociology, anthropology, technology, policy, and systems—with an overlay of conflict analysis and resolution. These multidisciplinary studies provide mechanisms through which organizations may assess, address, and adapt to potential disruptive technological change—and specifically the conflict that may emerge, both from within and without their brick-and-mortar walls. Further, the literature review has informed (a) historical patterns of technological invention or progress—and society's reaction; (b) heightened concerns for trends in higher education that impact its sectoral response to technological disruption; and (c) the relevance of conflict studies in organizational settings experiencing "sociotechnical change"—defined as the interdependencies between people, technology, and the environment.

I am interested in the application of theories and praxis—highlighting a dominant theory and several supporting theories. The main theory of study is "Sociotechnical Change" (Dolata, 2014; Juma, 2016; Trist, 1981). Secondary theories include "Technological Disruption" (Christensen, 1997, 2000, 2016)**; "**Organizational Theory"

(Lewin, Trist, 1981); “Diffusion of Innovations” (Rogers, 2003, 2004; Downes & Nunes, 2014); “Complex Adaptive Systems” (Olson & Eoyang, 2001); “power and control” (Foucault, 1982, 1984, 1988, 2013a, 2013b); and “Practice Theory of Change**”** (Mitchell, 2006; Shapiro, 2005, 2006; Jabri, 2006; Ross, 2000; & Watkins-Richardson & Walsh, 2016).

Further, I believe new observations and resolutions will be gained through this proposed contextual synthesis of trends in exponential technology and the social response to innovation, organizational capacity, and change, focus on academic processes and structures, and conflict studies—inspiring a combination of quantitative and qualitative research and analysis that can be replicated in multiple sectors or industries in the future.

Purpose Statement

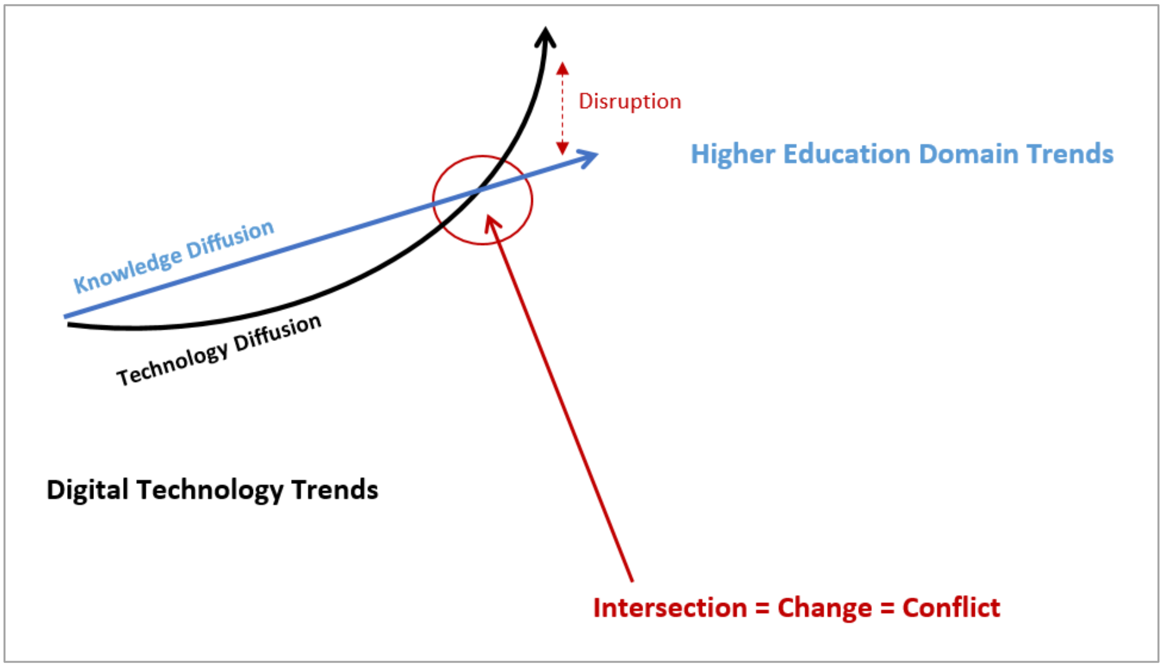
An early review of the literature illustrated that (1) the topic of technology disruption is addressed predominantly by economists and technologists, (2) organizational change issues are provided from the perspectives of business managers and psychologists, (3) higher education trends are stated through academics and administrators, but no indication of a (4) conflict lens (sociological, political, and/or systems) has been applied to address the fallout from acute organizational problems at the intersection of the first three. An investigation into how an organization, say an institute of higher learning, may discern technological change trends impacting its mission, and then its capacity and adaptability to confront the challenges (with meaningful attention to the conflict issues that could arise) would help to understand the context in which conflict may be thoroughly analyzed in an organizational setting when technological change seems absolute.

Thus, the intent of this study addresses how the combination of exponential digital technology growth and organizational change is explained and experienced for decision-makers and faculty in higher education, and how or where conflict emerges. The paper highlights theories of technology invention and the dynamics of sociotechnical systems; current technological forces at work on the individual and society as a whole, and the potential for change; the tradition of higher education and the domain's approach to change; the level of digital awareness and literacy in higher education; the spectrum of attitudes among stakeholders; mechanisms by which digital technology impacts them; recognizing and addressing change and conflict; how institutional technical capacity is assessed; how technology is adopted; and ultimately, how a lack of full contextual understanding or awareness of conflict (i.e., the combined impacts of technical trends, organizational capacity for change, academic culture—and now—an unforeseen pandemic) may contribute to potential disruption (severe state of conflict) in higher education.

In the initial design of the research, I created a notional visual depiction (Figure 1) of two independent trajectories: (1) digital technology invention and diffusion (from a historic vantage point to current day), and (2) U.S. higher education's progressive approach of knowledge diffusion. The notional point where these two trajectories intersect represented the locus of my research, as technical diffusion and knowledge diffusion cross and ignite an impetus for change in the way universities operate and deliver on their academic mission.

Figure 1

Conceptual Understanding of the Conflict Case



Note. Trajectory drawing adapted from Ismail, et al., 2014, p. 20.

Aspiring study goals included:

- Gain insight to how technology development has historically manifested community and economic power to shape societies.
- Identify current digital technology advances, new blended organizational and/or transformational structures under development, and the magnitude of potential change these will create.
- Delve into the academic/university sector through an analysis among differing stakeholders (e.g., business-minded, compliance-minded, and /or instruction-minded educators and administrators) to understand the technology context and level of awareness, attitudes, and perceived strategies for addressing

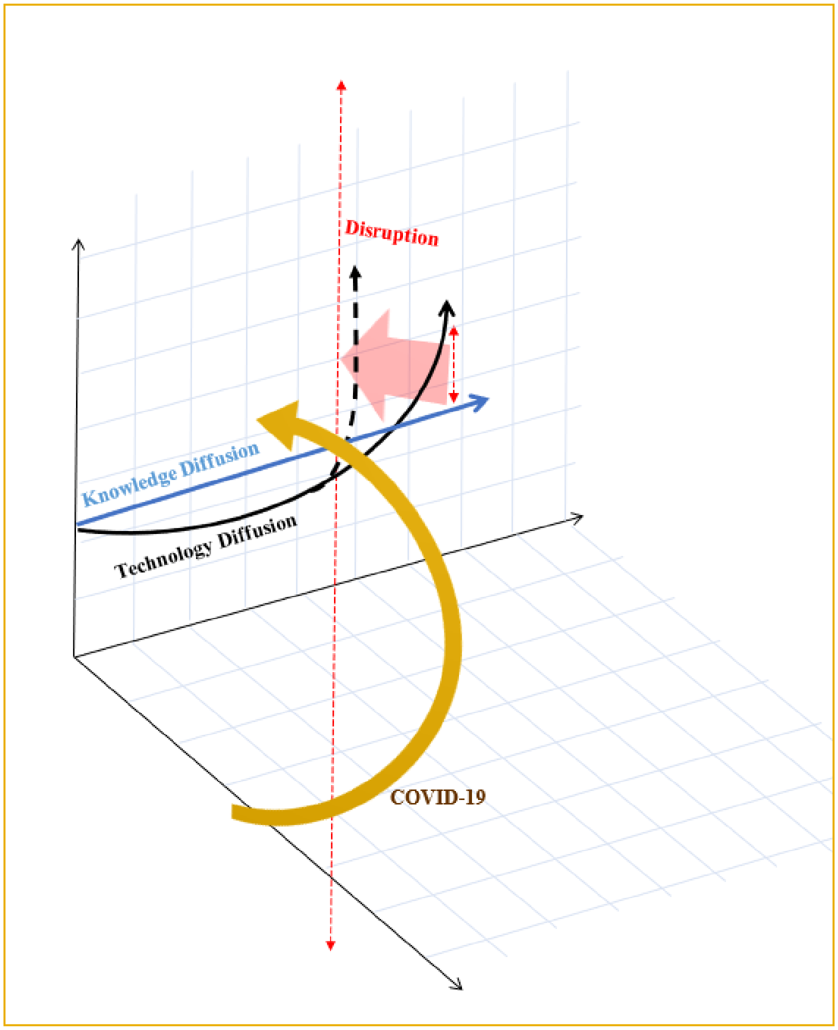
relevant digital technologies—narrowing the scope toward the academic sub-field of instructional design and methodology.

- Gain an understanding of how conflict resolution need not be an afterthought but anticipated and strategically addressed by employing precepts of "Practice Theory of Change."

As stated, this topic was inspired—and the literature researched—before the advent of COVID-19. A new visual, Figure 2, attempts to explain the now preempted (anticipated) intersection of digital technology and higher education, and it heralds an immediate conflictual thrust. In other words, the disruption I thought might come later, arrived now. Ready or not or like it or not, digital instruction—versus physical classroom instruction—had to go into immediate gear in pandemic times.

Figure 2

Conceptual Understanding of the Impact of COVID-19 on the Conflict Case



This notional graphic basically illustrates that the potential for disruption in Higher Ed by the onslaught of digital technology (impacting instructional design) was brought forward on my own timeline—that forcing, as I said, by COVID-19. I was sure there was great conflict and much to hear from educators, but I had wondered how much time I could possibly borrow from them to get answers to my research questions, as they were in the midst of this sweeping change. After discernment, I determined not to see this dissertation as pre-empted, but oh so timely—even fortuitous—and so I continued to pursue the topic, with a disruptive factor already at work.

A key facet of the study was to identify—through accessible documentation and perceptions—a “technical profile” of a participant institution of higher learning, based upon Ulrich Dolata’s (2014) *Transformative Capacity of New Technologies—A Theory of Sociotechnical Change*. This theorist heuristically determined areas of import to include in an assessment of an organization’s capacity for successfully employing sociotechnical change, as well as the ability to adopt the changes and head toward transformation. As no actual survey instrument exists, value was added by blending other leading scholars’ approaches to sociotechnical change in the actual mixed methods research—such as Clayton Christensen and Henry Eyring’s (2011) work on technology disruption in higher education, which illumined the aspect of institutional culture on capacity-building and adoption, and Everett Rogers’ (2003) “Theory of Diffusion of Innovations,” in which a natural curve in the adoption process was described. Additionally, academic survey instruments currently in existence, and approved for my use, were modified and extended. A specific focus was on the experience of new methods for teaching, i.e., instructional technologies and design. Therefore, research objectives included:

- To inform the identifiable requirements of sociotechnical organizational change and transformation (mechanisms through which institutions may assess, address, and adapt) due to “a diverse range of actors with a diverse range of guiding principles, routines, and patterns of organization that are embedded in a diverse range of structures and institutional milieus” (Dolata, 2014, p. 91);

- To illumine heightened concerns for trends in academia that impact its sector response to technological disruption;
- To narrow the study to instructional design technologies (though these are influenced by a broader range of digital technologies), and
- To illustrate the relevance of conflict studies in today's technical (and pandemic) climate.

Data was required that drew from the equal strengths of quantitative research and qualitative research to fully investigate the measurable impacts of change—and multiple constructed realities—at the intersection of technology and knowledge diffusion. Through this concurrent mixed methods approach, the independent strand results were blended to achieve an analysis and desired contextual synthesis that answered the following research questions.

Research Questions

1. How is exponential digital technology growth and organizational change perceived and experienced for decision-makers, faculty, and instructional designers in higher education, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes? What are the differences in responses between the three participant groups: faculty, administrators, and instructional designers?
2. What are the ideas or opinions regarding how much change has been or will be required? How are pressures for change being handled?
3. What are the consequential conflicts that may impede success, how or where do they emerge, and how are they managed?

Qualitative Sub-Questions

- Can current, or recent, implementation or adoption scenarios be described?
- How do stakeholders understand, cope with, mitigate, or exploit the impacts of digital technology?
- What drives behavior and illumines motivations or priorities?
- How do tensions or conflicts emerge; how are they managed?

Quantitative Sub-Questions

- What is the level of awareness and spectrum of attitudes of faculty, decision-makers, and designers in higher education toward potential trends in digital technology and the changes that may occur to their operations and/or mission—short- and long-term?
- What are the mechanisms (means, methods, processes, structures, etc.) by which digital technology impacts individual stakeholders in higher education institutions?
- What characteristics or factors contribute to perceived changes due to implementation of digital technology?
- Does the theory of sociotechnical change provide a good starting point for the assessment of digital technology capacity, adaptability, and impacts on higher education?

The rationale for this study was the development of an organizational assessment process, protocol, and tool designed to help identify discernable disruptive changes and conflicts that arise from the current digital technology climate. Such insight would provide valuable new approaches for any one in authority and/or responsible for the success of their organization. This study is compelling, as the potential for technology to disrupt the complex, change-resistant, and long-established mission of academia is growing more real—and did in fact surface, due to COVID-19.

Definition of Terms

- “Complex Adaptive Systems” are about relationships among members of a system. Utility-maximization rules may make for movement from lower to higher levels of group cohesiveness and order. Enabled is emergent self-organization, in relation to complex-network synchronization that is enhanced by heterogeneity. When the resulting system can create emergent behavior capable of response to the environment, it is “adaptive.” (Rogers, et al., 2005, p. 3)
- “COVID-19” is the short term for an infectious disease caused by a newly discovered coronavirus in late 2019. The pandemic has since spread throughout the world and caused widespread death (6.34M, as of this writing), overtaxing of medical systems, and created severe economic and educational impacts. (World Health Organization, 2020)
- “Creative Construction” is a phrase coined by economist Joseph Schumpeter in 1911 (1934, 2012). It is the result of innovative change creating “new combinations and a shift in the locus of product development, such as new production techniques, new processes, new markets, new materials sources, or the reorganization of an industrial sector” (p. 66).
- “Creative Destruction” is a phrase suggested by economist Joseph Schumpeter (1942, 2008, p. 81). Change requires the destruction of something old, replaced

by something new. The gun replaced archery; the mobile phone replaced landlines.

- “Diffusion” (in social sciences) is the “process by which innovations are adopted by a population….Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread..... Diffusion is the process by which an innovation is communicated over time among the participants in a social system” (Rogers, 2003, p. 35). Diffusion “phenomena bear a resemblance to complex adaptive systems” (Rogers et al., 2005, p. 2)
- “Digital literacy, or readiness” – people’s preparedness for use of digital technology that enhances communication and learning, as well as safety and an organization’s competitiveness.
- “Disruptive Innovation or Disruptive Technology Theory” (technological discontinuity, Juma, 2016, pp. 17-18) – a legitimate phenomenon; a triggered event; “what a firm faces when the choices that once drove its success now become those that destroy its future” (Gans, 2016, p. 13). Christensen created the term, and he distinguishes “disruptive innovation” from “‘sustaining technologies’ that improve the performance of established products, along the dimensions that mainstream customers in major markets have traditionally valued” (as cited in Juma, 2016, pp. 17-18).
- “Inclusive Innovation” – Juma (2016) believed that “new controversial technologies are likely to enjoy more local support where the business models include provisions for inclusive innovation” (pp. 292-293). This may entail

training, joint ventures, management of intellectual property, and new policies that are supported locally and by the public.

- “Internet of Things (IoT)” – the already existing network of machines that are “able to communicate with each other, making decisions to power a seemingly invisible layer of everyday living. Basically, everything is, or will be, connected. (Webb, 2016).
- “Path Dependence” – a phenomenon where past events define the trajectory of future developments. The need to adapt to change through innovation and the pressure to maintain continuity are sources of tension. Innovation seeks to reorder society. It quickly comes in conflict with the need to maintain continuity (Juma, 2016).
- “Power and Control” – discussed often in tandem with Derrida, Foucault addressed modern culture or modernity and the loss of the “old cultural order” of oneness, due to issues of power and control. Topics included “decentering, discourse, and differences” (Lemert, 2013, p. 284).
- “Practice Theory of Change” – a program evaluation technique that synthesizes elements of a problem or program, then considers strategies and action toward evolving a “theory of change” with positive “intended effects” (Shapiro, 2005)
- “Social Learning” – the process of adoption of new technologies (Juma, 2016)
- “Sociotechnical Theory” is “a system approach that focuses on the interdependencies between and among people, technology, and the environment (i.e., market)” (Applebaum, 1997, p. 454).

    - “Sociotechnical Change Theory” – Juma (2016) described the phenomenon as “articulated ensembles of social and technical elements that interact with each other in distinct ways, are distinguishable from their environment, have developed specific forms of knowledge production, knowledge utilization and innovation, and which are oriented toward specific purposes in society and economy” (Juma, 2016, pp. 18-19, & p. 321).

- “Work Systems and Change” – Trist’s (1981) socio-technical approach to organizations and management of change. Implementation is prescribed on three interconnected levels: “the primary work system, the whole organization system, and the macrosocial system” (p. 11).

Assumptions

Participants in this study were asked to provide authentic input from their own perspectives, which is where the value of the study lies.

Limitations

Portions of the results of this study are limited to individuals with the capacity to know the organization’s strategic goals and metrics, i.e., administrators. Another portion of the results are limited to faculty and instructional designers, or learning specialists, who are involved, or who have been involved, in the implementation of digital instructional technologies. The ability to generalize these results to other populations is unknown.

Delimitations

The participants in this study were intended to be those who have access, authority, or knowledge regarding their institution mission, strategic goals, or execution of new technology initiatives. A snowball sampling methodology for acquiring participants filtered these individuals through an initial series of questions.

Chapter 1 Summary—Setting the Stage for Research

My research has emerged from several circumstances. Initially, I held my own inquisition about today's speed of technological change and my [in]ability to keep up. As I began reading both business and scholarly literature, however, concern grew about the impact of current technical innovations on individuals, organizations, and ultimately, society. I learned a term for this: sociotechnical change. For as many career years as I have spent among retailers, corporations, non-profit associations, and academia, I experienced an epiphany when I realized that strategies for organizational change are rarely coupled with theories, philosophies, and practices of conflict and its resolution. Organizations tend to implement change from the top down, through the proverbial strategic plan, rather than as an interactive acknowledgement of conflict's ability to establish a barrier against progress. In fact, conflict is not seen as a root cause. This view was reinforced by Calestous Juma, a professor from Harvard. Juma (2016), wrote *Innovation and its Enemies: Why People Resist New Technologies* and felt that the issues of resistance and tensions about technology have been ignored. Conflict has many forms. Conflict develops not solely between individuals, but about polarized interests, inadequate understanding or skills, mismatches of solutions to problems, or unintended consequences and systemic flows (to name only a few). I gained insight about a frightening event called “disruption”—what I call a manifestation of conflict—which may be mitigated when considering conflict study and thoughtful intervention in the mix of innovation. I garnered references to the disruption of higher education as we know it, and it gave me great pause.

The literature review that follows expands upon this general quandary about whether higher education has lost its center—and will find it again—as the engine for knowledge creation, diffusion, and change (Abeles, 2017, p. 212; Fischer, 2006). Digital technology threatens to alter it. Abeles illumined a dark situation for the university when he stated, “Unfortunately, in its expanding efforts, it now finds itself like a runner on a mountain trail who has just realized that a sharp turn has been missed and now finds itself suspended in mid-air over the canyon” (p. 212). What a telling vision. This is the disruptive possibility to which I alluded at the start of this paper. Raised is the question of how the sector of higher education will respond to profound changes and uncertainties inherent in exponential technological diffusion. Raised also is the question of how higher education can maintain its position of tradition amid the urgent forcing to “go digital” as incurred by the COVID pandemic.

My original research started dauntingly and large, but as my focus crystalized, the need for further research in the higher education setting has only deepened my commitment to the relevance of conflict studies in today’s technical climate. The literature review that follows in Chapter 2 pursues the topical flow established in the dissertation purpose statement and primary question:

> How is exponential digital technology growth and organizational change explained and experienced for decision-makers and faculty in higher education, and how or where does conflict emerge?

The literature review follows a notional development trajectory from the past to current day for each area of interest: (1) technological innovation and (2) higher education—providing context for the problem. It then explores the point of intersection of these two trajectories, where appropriate theories are implicated for how the phenomenon of conflict operates in the higher education domain.

Chapter 2: Literature Review

The purpose of this research was to conduct a mixed methods study to identify how the impact of digital technology trends on individuals, organizational units, and the broader social system is realized in a specific case study within the domain of U.S. higher education. The topic of study required a multidisciplinary approach to discern mechanisms through which an organization may assess, address, and adapt to potential disruptive technological change—and specifically the conflict that may emerge.

To examine the literature related to this topic, this chapter first defines the overall conceptual framework for the literature research. Next it explains the strategy used to aggregate relevant literature to form a contextual synthesis that illumines an understanding or awareness of organizational conflict. Finally, it provides a full discovery from three overarching perspectives: (a) historical patterns of technological invention or progress—and society's response; (b) heightened concerns for trends in higher education that impact its sectoral response to technological disruption; and (c) the relevance of conflict studies in organizational settings experiencing sociotechnical change. In doing so, the chapter examines gaps as well as trends in how the strands of literature come together.

Conceptual Framework and Literature Overview

Multidisciplinary theories combine to support a conceptual framework for this study. These include a dominant or main theory: "Sociotechnical Change" (Dolata, 2014; Juma, 2016; Trist, 1981), and several supporting theories: "Disruptive Innovation/Technology" (Christensen, 1997, 2000, 2016); "Diffusion of Innovations" (Rogers, 2003, 2004; Downes & Nunes, 2014); "Organizational (Group) Dynamics and

Change" (Lewin, 1930s, Trist, 1981); "Complex Adaptive Systems" (Olson & Eoyang, 2001); and "Practice Theory of Change" (Mitchell, 2006; Shapiro, 2005, 2006; Jabri, 2006; Ross, 2000; & Watkins-Richardson & Walsh, 2016). A final theory of relevance to this study is "power and control" (as delineated by Foucault, 1982, 1984, 1988, 2013a, 2013b), as it seems to permeate the others. The dominant and supporting theories are defined as follows.

Sociotechnical Theory is a system approach that focuses on the interdependencies between and among people, technology, and the environment or market (Applebaum, 1997, p. 454). The component "Sociotechnical Change Theory" is described as a phenomenon with "specific forms of knowledge production, knowledge utilization and innovation, and which are oriented toward specific purposes in society and [the] economy" (Juma, 2016, pp. 18-19). This study will utilize a heuristic framework developed by Dolata (2014), in which sociotechnical change theory is described as "the mutual influence of technology, socioeconomic structures, and institutions that inform a sector's capacity to adapt to a new technology" (Dolata, 2014, p. 1). Dolata's work informs an organization's transformative capacity, sociotechnical adoptability, and gradual transformation (p. 2).

Disruptive Innovation/Technology is "a process by which a product or service that takes root in simple applications at the bottom of a market—typically by being less expensive and more accessible—and then relentlessly moves upmarket, eventually displacing established competitors" (Christensen Institute, 2021). The term is associated with business models, which makes it difficult to understand the wider societal implications. Christensen (1997, 2000, 2016) coined the term "innovator's dilemma," which describes a paradox that “the logical, competent decisions of management that are critical to the success of their companies are also the reasons why they lose their positions of leadership” (p. xvii).

Diffusion of Innovations is a theory that “seeks to explain how, why, and at what rate new ideas and technology spread.” Diffusion is the “process by which an innovation is communicated over time among the participants in a social system” (Rogers, 2003, p. 35). Diffusion “phenomena bear a resemblance to complex adaptive systems” (Rogers et al., 2005, p. 2) and occurs with assistance from opinion leaders, change agents, and aides.

Organizational Dynamics and Change refers to Trist’s (1981) sociotechnical approach to organizations and management of change. Implementation is prescribed on three interconnected levels: “the primary work system, the whole organization system, and the macrosocial system” (p. 11).

Complex Adaptive Systems are about relationships among members of a system. Utility-maximization rules may make for movement from lower to higher levels of group cohesiveness and order. Enabled is emergent self-organization. When the resulting system can create emergent behavior capable of response to the environment, it is “adaptive.” (Rogers, et al., 2005; Olson & Eoyang, 2001)

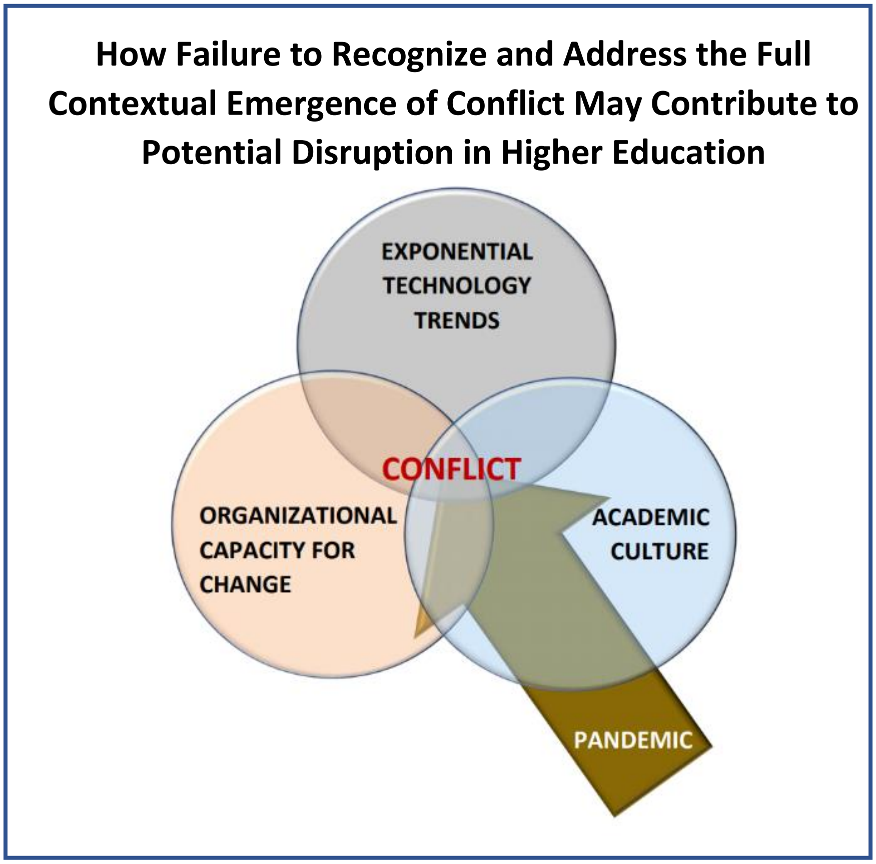
Practice Theory of Change: a program evaluation technique that offers tools for synthesizing elements of a problem or program, then considers strategies and action toward evolving a “theory of change” with positive “intended effects” (Shapiro, 2005).

Power and Control: discussed often in tandem with Derrida, Foucault addressed modern culture or modernity and the loss of the “old cultural order” of oneness, due to issues of power and control. Topics include “decentering, discourse, and differences” (Lemert, 2013, p. 284).

The visual in Figure 3 is intended to show the overlapping relationship between three areas of concern that form the conceptual framework for this literature review, and when combined, create a story that illustrates the need to recognize and address sociotechnical context, impacts of change, challenges—especially in pandemic times—and the conflicts that may emerge. This conceptual framework will be employed in the evaluation of the case study of an institution of higher education as it implements instructional technology programs. An overview of these components follows.

Figure 3

Visual of Conceptual Framework for Study

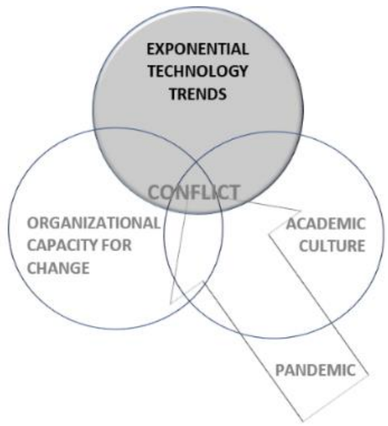


Exponential Technology Trends and the Social Response to Innovation

Inventions are mechanisms that connect the needs, values, and desires of a society. Rightly so, technology invention has evolved alongside the rise of human civilizations. For context about today's digital climate, I felt it important to review innovation through history, and the concurrent social response. Inventions are mechanisms that connect the needs, values, and desires of a society. Rightly so, technology invention has evolved alongside the rise of human civilizations. For context about today's digital climate, I felt it important to review innovation through history, and the concurrent social response (Figure 4).

Figure 4

Highlighting Exponential Technology Trends in the Conceptual Framework



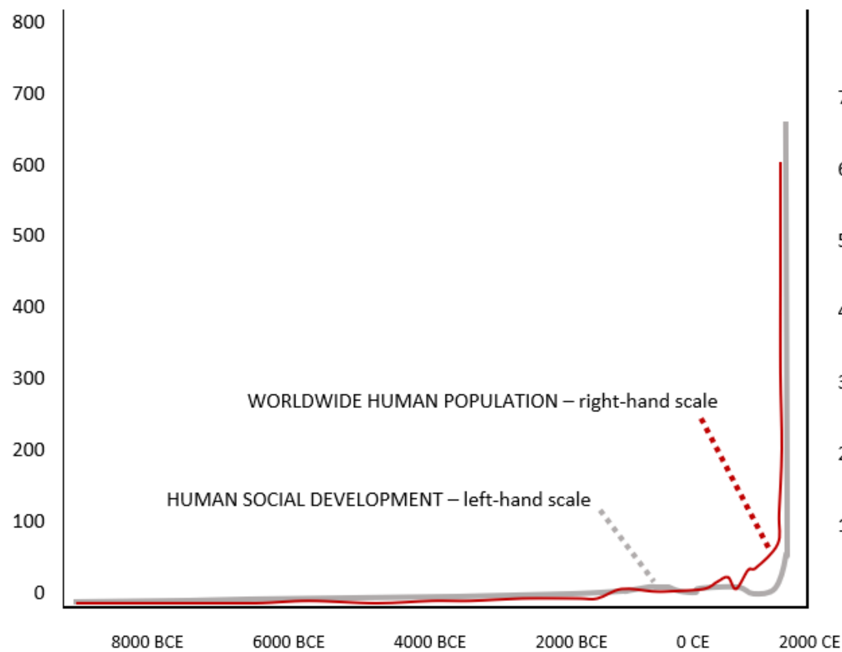
Inventions have been shaped by scientific and social factors. When introduced to the stories and principles attributed to many key inventions, one comes to appreciate the undergirding of historical trade, wars, and empires; the problems and challenges confronting society; the transformations of daily life through changing social structures; and even the meaning of life (see Carlson, 2013). Inventions can possess economic and noneconomic functions that facilitate social and political order, and eventually (a higher order of) cultural distinctions once basic survival needs have been met. The process is cyclical, as human needs trigger a search for new solutions, and new technologies generate new needs. Seen another way, both coevolve with the creation of new standards, rules, social norms, and associated organizations. Capitalism has helped to fuel invention and innovation as it is "an engine whose motion comes from 'new consumer' goods, the new methods of production or transportation, the new markets, [and] the new forms of industrial organization that capitalist enterprise creates" (Schumpeter, 1942, 2008, p. 83).

Civilization has experienced three industrial revolutions—with a fourth currently in the making—whose resulting innovations have significantly changed the world. There are both positive and negative responses that result from innovation, and these follow a continuum of behaviors from initial perception, to acceptance, to adoption or non-adoption, to discontent, to disruption, and to catastrophic failure or meltdown. Rational and non-rational decisions play out through many human sensitivities to change, uncertainty, and threats to status quo. Humans exist in social systems that are further elevated by globalization and that have far-reaching implications for structure, flow, and change. That structure has historically been obtained through setting goals, prescribing roles and authority, identifying rules and regulations, and understanding informal patterns (Rogers, 2003, p. 411).

Trends emerging in the third revolution (Information Age or Digital Revolution) and now the fourth revolution (Cyber-physical Systems) have begun to exacerbate inequities. "Change involves loss," as stated by Trist (1981), and it brings out "primitive emotional cultures" (pp. 47-48). Compounding the newest response to technical revolutions is their exponential-ness. A bit of light humor can be found in this quote: "The greatest shortcoming of the human race is our inability to understand the exponential function" (Bartlett, as cited in Juma, 2016, p. 316). I mention this because of a 1965 prediction by Gordon Moore, a former CEO of Intel, that has evolved into a well-established phenomenon in digital technology today. Known as Moore's Law, it states the "steady doubling in integrated circuit capability every eighteen to twenty-four months" (Brynjolfsson & McAfee, 2016, p. 41)—causing exponential growth, as that very technology becomes the foundation to other innovation. Three graphic examples, Figures 5, 6, and 7, are appropriate at this juncture. These will be further explained in the literature review, but the visuals speak for themselves about exponential growth and important triggers in time.

Figure 5

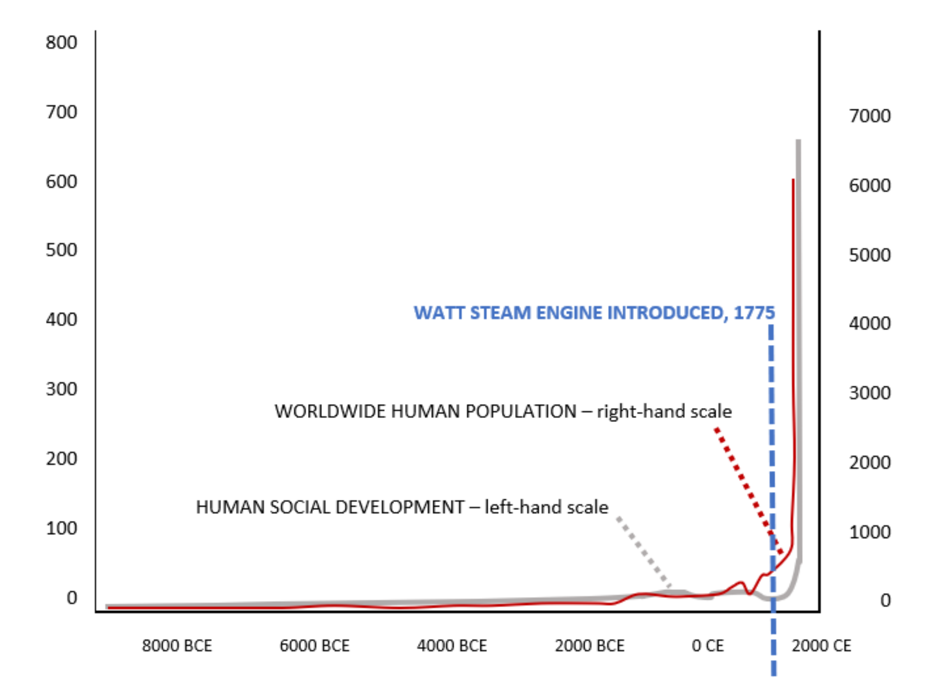
Human History in Terms of Social Development and Population Growth



(Brynjolfsson & McAfee, 2016, p. 5)

Figure 6

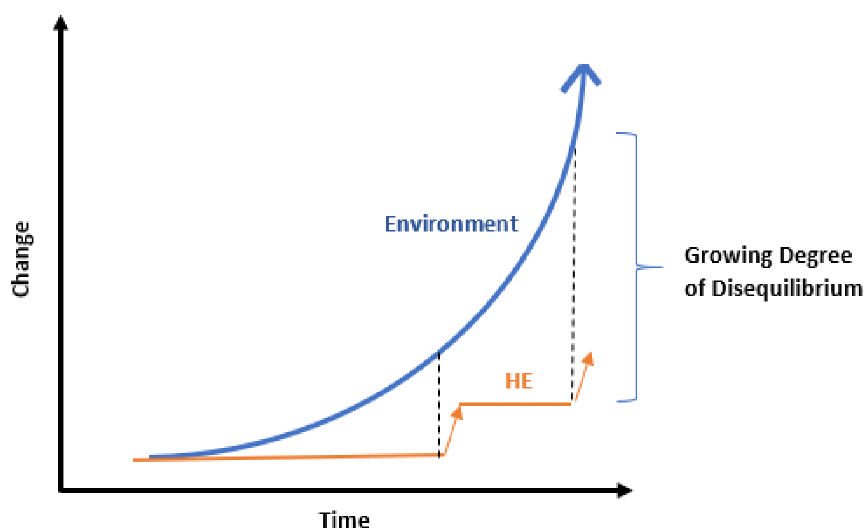
Overlay of the Invention of the Steam Engine



(Brynjolfsson & McAfee, 2016, p. 7)

Figure 7

The Relationship Between Environmental and Higher Educational Change



(Taylor & de Lourdes Machado, 2006, p. 153)

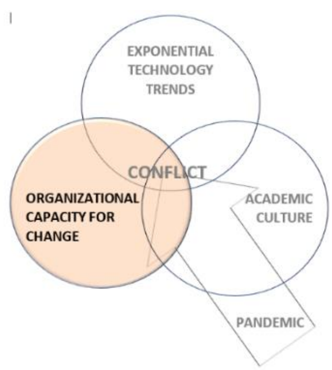
As a final mention to this overview, I will add that the literature review reinforces the interdependent nature of individual adaptation to technology, an organization's capacity for change, and the external social environment. Given such pervasive tentacles, the very real understanding that history conveys is that social response to technological innovation is by nature, conflictual.

Organizational Capacity for Change

New technologies are disruptive in nature. When faced with the pressure of retro-fitting new technologies into an existing organizational structure—technologies that no longer match the organization's profile—substantial change is required to remain legitimate (Dolata, 2014). See this second area of study in Figure 8.

Figure 8

Highlighting Organizational Capacity for Change in the Conceptual Framework



Often, capacity to take on something new is estimated in terms of space and capital, i.e., is there enough room, is there enough money, do we need to hire different people? The broader investigation of "sociotechnical capacity" requires a determination of whether exploitation of a new technology is possible and how much change will be required. Going deeper, estimating an organization's capacity for change requires a look at multiple dynamics that include the type of technology in question; how it will be used, who will use it internally and externally; industrial and corporate (or institutional) structures; research, production, distribution, as well as market demand; embeddedness within a sector and a value network; and finally, rules and regulations, norms, values, strategies for change, and all the actors involved—because sociotechnical change is much more than an incremental improvement.

Assessment of capacity is only a first step. For an organization to adapt a new technology, it must understand how pressures for change are handled and then how the organization and its actors may perceive, adopt, and continuously innovate. A final stage in this process of examining the value, capacity, and change required of new technologies, is gradual transformation, which takes a few decades for an organization or sector to achieve because of the erratic process changes, struggles, and discontinuity cycles that occur. The understanding this topic conveys is that assessment of capacity for sociotechnical change is involved, and if not addressed well, creates conflict.

Academic Culture, Processes, and Structures

These incremental changes occurred in a study of Harvard’s structure over time: small classes for high faculty-student intimacy evolved to lecture halls; moral curriculum gave way to secularization, specialization and departmentalization; summer recess provided time for research; professional schools, fundraising and development activities; electives in the curriculum; faculty tenure; college entrance standards; residential housing; curricular distribution (liberal, general education; undergraduate and graduate) and concentration (majors); grading curves; faculty salary and workload distinctions; standardized admissions testing; externally funded research, and the Carnegie

Classification System. These changes took place over 400 years. Hence, a study of academic culture plays an important role. See this third area of study in Figure 9.

Figure 9

Highlighting Academic Culture in the Conceptual Framework

Polarized views about university mission are expanding—questioning a character-building liberal education mission versus career preparation aimed toward employment opportunities. Changing demographics in student populations are promoting the concept of lifelong learning, as opposed to a discreet set of hours and credits between the ages of 18 and 21. Traditional educators stand firm on the value of in-person (live classroom) learning and make a compelling pedagogical argument.

Computer and internet use in higher education came under examination. As stated in a U.S. Department of Education Spellings Commission Report (2006), "It [higher education] is an enterprise that has yet to address the fundamental issues of how academic programs and institutions must be transformed to serve the changing educational needs of a knowledge economy" (cited in Christensen & Eyring, 2011, p. 3)

As time has progressed, mutually reinforcing formal and informal systems have urged a "bigger and better—quality and quantity" mantra within many of the larger "resource-rich" institutions, which can make them not only cost-prohibitive for many potential students, but also blind to disruptive technologies (Christensen & Eyring, 2011, p. 23). Higher Education is now a mature institution (Thelin, 2011).

Christensen and Eyring (2011) portended disruption in higher education before having access to the study by the U.S. Department of Education (Snyder et al., 2019). They cited "serious indictments: that fewer U.S. adults are completing post-high school degrees; that the costs of attending college are rising faster than inflation; that employers report hiring college graduates unprepared for the workplace" (p. 4)—just samples of the problems facing higher education before exponential digital technology growth has made an impact on the educational mission—and prior to COVID-19.

Christensen's original thoughts in *The Innovator's Dilemma* (2016) played out precisely. He showed that the continuous effort to enhance performance at some point exceeds customer performance needs. When this occurs, "the producer is incurring greater costs and thus must raise prices" (p. 14). Universities believe they are managing well with their rising costs, traditional curriculums, and exclusive selection processes, and may assume immunity from potential disruption.

Coming in from the fringe (as Webb, 2017, would say) is the disruptive technology of online learning as first employed by for-profit organizations, which is causing a rethinking of the traditional higher education model. Notably, the technology has now been used for a decade, but still does not get adequate attention. It offers value to price-sensitive students and is said to lower operating costs for state legislatures that face fiscal challenges to support state institutions (Christensen & Eyring, 2011). Online instruction technology has improved as the speed of the Internet and related communications has increased. Economic downturns have forced cost-cutting at conventional universities, giving a new financial edge to the for-profit educators. Moreover, digital natives have reached college age. They were raised with computers, texting, gaming, Google, and Facebook. Online enrollments are outgrowing traditional campus enrollments. A turn toward a more student-centric educational environment, brought about through "technological and social change threatens to undermine the established university's dominance" (Christensen & Eyring, 2011, p. 325).

Given a culture resistant to change, are universities on the path to a marginal role in a different world? As one educator, DeMillo (2011) has attested, it is time to create a new value system that represents "universal access, open content, and reliance on new technologies" (p. 25), as he proclaimed the irony of a system in trouble, stating**,** "Paradoxically, mainstream universities—where much of the technology originated—have been slow to embrace these technologies, even as they became ubiquitous in other sectors of the economy" (p. 34).

Certainly not intending to take sides, I do want to understand the entire context for both sides on the issue of pedagogical, or instructional technology in higher education. The literature review taps into multiple, real barriers to change and spectrums of attitudes that reveal where and how conflict may emerge.

At the Intersection: Recognizing and Addressing Conflict in Context

The literature review will attempt to provide a full picture (albeit a wide net) surrounding the topic of unprecedented exponential digital technology growth, with an emphasis on how higher education institutions are approaching the technical challenges. The undergirding of the literature review has to do with societal structures and responses to technological innovation and how these are manifested in attitudes and actions. The intersection (focus point for the research questions), so to speak, represents the point at which the two trajectories of technology diffusion (exponential technology diffusion) and knowledge diffusion (higher education foundations) have met, i.e., current day. See Figure 10.

Figure 10

Highlighting Conflict at the Intersection of the Conceptual Framework

The topic of disruption was introduced as a possible scenario, should higher education lose its center on mission. Though disruption represents an extreme example of conflict that could emerge, the literature review has illumined many causes for tensions, competing goals, polarization, and conflict—not only in the macro-sociotechnical sense, but in absolute contrasts between stakeholder perspectives. The goal of this completed study has been to gain new observations and resolutions through this proposed contextual synthesis of trends in exponential technology, organizational capacity and change, focus on academic processes and structures, and to show the relevance of conflict studies in organizational settings experiencing sociotechnical change.

The rationale for this study has been the development of an organizational assessment process, protocol, and tool designed to help identify discernable disruptive changes and conflicts that arise from the current digital technology climate. Such insight would provide valuable new approaches for any one in authority and/or responsible for the success of their organization. This study is all the more compelling as the potential for technology to disrupt the complex, change-resistant, and long-established mission of academia is growing more real—and did in fact surface, due to COVID-19.

Literature Search Strategy

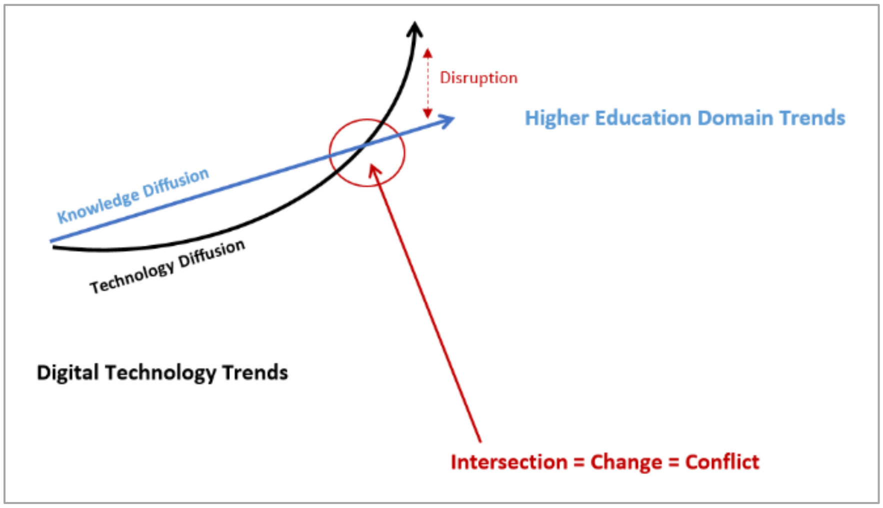
An investigation into how an organization, say an institute of higher learning, may discern technological change trends impacting its mission, and then its capacity and adaptability to confront the challenges (with meaningful attention to the conflict issues that could arise) would help to understand the context in which conflict may be thoroughly analyzed in an organizational setting when technological change seems absolute. This is the thought that has driven my search for literature to provide some theoretical underpinnings to organizational strategy in today's times. Business managers often rely on popular books and articles to inspire and help them solve problems they are experiencing in their companies. I know because I was one of those. As I mentioned in Chapter 1, through my graduate study, I have realized that strategies for organizational change are rarely coupled with theories and practices of conflict and its resolution. Problems do not seem to be addressed within a full context. Though the common mindset considers conflict as an issue between individuals, the broader view I wish to extend for organizational settings is that conflict is a phenomenon that takes many forms brought about by polarized interests, inadequate understanding or skills, mismatches of solutions to problems, misinformation, change, unanticipated consequences, systemic flows downstream of an event, or disruption of norms and ultimately the entire entity. Hence, the literature I pursued for this study involved scholarly works that addressed economics, business operations, history, psychology, sociology, technology and innovation, policy, higher education, and systems, paired with current news, blogs, and popular literature, for balance.

Full Literature Review

This study addresses how the combination of exponential digital technology growth and organizational change is explained and experienced for decision-makers and faculty in higher education, how or where conflict emerges, and how conflict is managed. The first path of discussion will follow a notional exponential trajectory of technological innovation that highlights early inventions, innovation’s implications and consequences, various societal responses, requirements of sociotechnical change, current digital forces, and ultimately, potential for disruption. See Figure 11. The second path of discussion follows the development of the U.S. institution of higher education on its somewhat linear course—its historical patterns, or DNA, to forces of pedagogical change, to potential for disruption. The final portion of the literature review will tie in the theories of conflict that address systems and change—ultimately implying how a lack of full contextual understanding or awareness of conflict (i.e., the combined impacts of technical trends, organizational capacity for change, academic culture—and now—an unforeseen pandemic) may contribute to potential disruption (severe state of conflict) in higher education. It is at this juncture that a gap in the literature will be revealed.

Figure 11

Two Trajectories of Literature Review: Technology Innovation and Higher Education



Note: Trajectory drawing adapted from Ismail, et al., 2014, p. 20.

Thus, the literature review will highlight six sub-topics:

Technology Diffusion

1. Technology invention and the dynamics of sociotechnical systems
2. Current technological forces at work on the individual, organizations, and the whole of society, and the potential for change

Knowledge Diffusion

3. The tradition of higher education and the domain's approach to change
4. Forces of instructional change and risks of disruption
5. Level of digital use in higher education and discourse among stakeholders

At the Point of Intersection

6. Implications for study: context, change, capacity, challenges, and conflict — to understand how the phenomenon of conflict operates in the higher education domain

Technology Diffusion

Technology Invention and the Dynamics of Sociotechnical Systems

The term "technology" can be traced to Greek language roots. "Techne" means the transition of "the true into the beautiful," which can imply a method, tool, skill, or craft, and to "the improvement in skills of craftsmen and artists via the use of such tools" (Leonhard, 2016, p. 22). The component Greek word, "logia," purports "knowledge, from the gods" (p. 119). Humans, thus, have created technology to improve their well-being and increase their knowledge. Current historians believe we are going beyond that premise toward creating technology to improve humans themselves—that is, to change our destiny, which has become a hallmark of the modern world (Leonhard, 2016; Carlson, 2013). This beginning of the literature review will lay the foundation for technological development (and related synonyms: invention and innovation) and the role of society (or sociotechnology, when combined).

From Invention, to Diffusion, to Adoption

Inventions are devices that connect the needs, values, and desires of a society. Rightly so, technology invention has evolved alongside the rise of human civilizations. We tend to believe that our inventions today are more sophisticated than those of the past. However, the use of a tool to achieve a required task is relative to the task, so sophistication is not always a primary consideration. The earliest invention known, the chopper carved of stone, is believed to have appeared 2.5 million years ago, having been devised by Australopithecines, or hominids close to the human family tree. Historians named the earliest artifacts Oldowan tools, as they were discovered in the Olduvai Gorge in Africa. The simple stone tool remained a survival mechanism for one million years.

Technology development also possesses the characteristic of going beyond a single invention or object, to becoming a metabolism, or set of components that form a system (like the jet engine in operation). Once it has managed that, it becomes a full collection of devices or processes organized around a culture (Arthur, 2009). Human needs trigger a search for new solutions, and new technologies generate new needs. Seen another way, both coevolve with the creation of new standards, rules, social norms, and associated organizations. The aviation industry is an example of what evolved from the Wright Brothers' first flight. Juma (2016) highlighted the beginnings of the aviation industry thus:

> The introduction of flight has coevolved with the aviation industry, which has transformed economies around the world. Innovation is essentially the transformation of the economy through the introduction of new forms of economic organization. The economy is thus the unfolding expression of the underlying technologies. Thus, the adoption of new technologies is a process of social learning. (pp. 22-23)

Technology application has not always guaranteed human progress. While the Romans were establishing intricate weapons, buildings, bridges, and roadways as exhibits of prowess, their population suffered invasion, famines, and epidemics (see Duncan, 2017; Aoun, 2017). Coal-fired steam engines, a breakthrough invention in a later era, brought about air pollution and lung disease. Increased use of chemicals launched the environmental protection movement (Juma, 2016). What also evolved through time is *inequality*—a circular societal consequence of invention. Inequality began to manifest itself through the symbols of power and entitlement that invention helped create (Carlson, 2005)—thus employing technology to create "social and political order" (Carlson, 2013, p. 7). Such concepts raise the implications of, and attitudes toward, technological development today and how we "make and shape" our world (Carlson, 2013, p. 9). The consequences of innovations have received inadequate attention. As this literature review develops, the reader will begin to see multiple sources and consequences of innovation surface, which give impetus to the study. One set of sources reside in the economic, political, and social sectors—with systems implications.

Economic, Social, Political, and Systems Implications

Capitalism is a system designed to evolve, and with evolution comes change. Economist Joseph Schumpeter (1942, 2008) referenced "the capitalist engine, whose motion comes from 'new consumers' goods, the new methods of production or transportation, the new markets, [and] the new forms of industrial organization that capitalist enterprise creates" (p. 83). He coined the term "creative construction," which signified innovative change that results in new combinations—and not just implicating product development, but an expansion to "new production techniques, new processes, new markets, new material sources, or even the reorganization of an industrial sector" (Schumpeter, 1934, 2012, p. 66; Juma, 2016). Further, Schumpeter described "creative destruction" as change requiring the destruction of something old, replacing it with something entirely new, rendering the former obsolete or no longer economically viable (Schumpeter, 1942, 2008). These forces of economic transformation resulted from successful technological innovation that either expanded or completely altered the composition of the economy. Schumpeter thought of the economy as an ecosystem. He described capitalism as possessing an evolutionary process, and the process of creative destruction as essential to capitalism.

Another important concept in any discussion of innovation or invention and its competitiveness is “single dominant design,” resulting from technological discontinuities, or disruption. A technical breakthrough begins with intense technical creation, variation on preceding versions, and then selection. What culminates is a single dominant design that triumphs over all others (Juma, 2016). Today’s iPhone is an example of this concept.

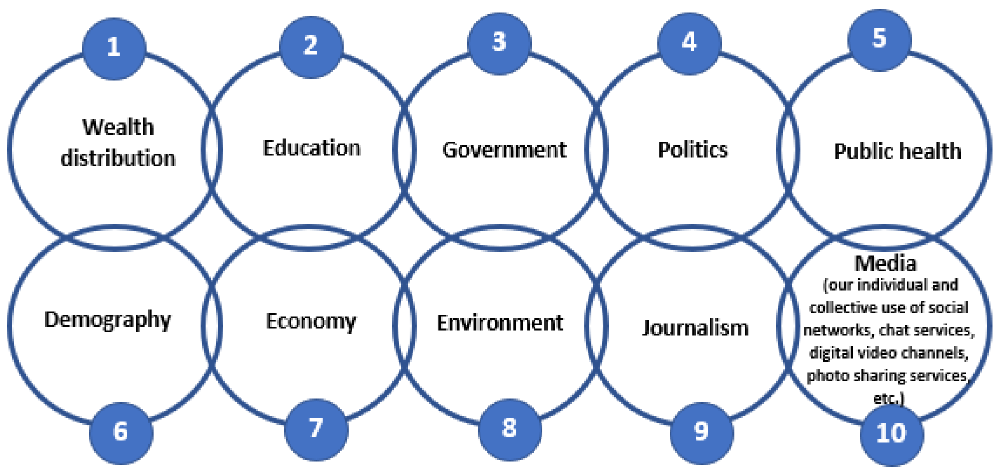
An important theory that can be attributed to the combined philosophies of capitalism and democracy is “Sociotechnical Change Theory.” It is the combination of “social and technical elements that interact with each other in distinct ways, are distinguishable from their environment, have developed specific forms of knowledge production, knowledge utilization, and innovation, and which are oriented toward specific purposes in society and economy” (Juma, 2016, pp. 18-19).

Innovation Invites Change Through Trends and Patterns

Change comes in different ways: methodically incremental, sweepingly transformational, unexpectedly from the fringes, and at the extreme—sudden meltdown. Trends trigger change. Webb (2016) described trends as “catalyzed by new technology…timely and persistent…evolving as they emerge” (p. 47). They begin on the fringe, as indistinguishable, unconnected dots, then move to the mainstream. When the dots finally connect, a trend is visible. By that time, it is very real and hard to extinguish. Rarely can anyone see a trend coming far in advance (pp. 47-49). Not only do we not see a trend coming, but we are also ignorant of the combination of sources that participate in its creation—and may even contribute to a major societal shift. Webb listed these as ten sources (forces), or "intersecting vectors of change," which highlight the existence of a complex system through which technological change emerges (p. 63). Figure 12 illustrates technology as a prime connector.

Figure 12

Technology as a Primary Connector of Ten Modern Sources of Change



Source: Future Institute Today, 2017, p. 33

Webb suggested the direction and magnitude of each vector must be plotted as it relates to new developments in emerging technology. Another way to understand change is to look for patterns (O'Reilly, 2017, p. 5). We have a history of patterns to review.

Technology Inventions That Significantly Changed the World

Civilization has come to describe moments of dramatic change in time—even though they may take decades to evolve—as revolutions. Most historians today describe multiple industrial revolutions. These involved different countries and drivers, as described by Davis (2016):

- First industrial revolution (1750-1850) – the age of mechanical production:
  - Involved coal, steam, iron, machine tools, and factories;
  - Was driven by craft or hands-on knowledge;

    - Started in England and spread to Europe and America;
- Second industrial revolution (1875-1925) – the age of science and mass production:
    - Involved oil, electricity, steel, mass production, and big business;
    - Was driven by a mix of practical knowledge and science;
    - Started in America and spread to England, Europe, and Japan;
- Third industrial revolution (1950s-1990s) – the information age, or the digital revolution:
    - Involved semiconductors, mainframe computers, personal computers, and the Internet;
    - Analog technologies moved to digital technologies;
    - Dramatic disruption, especially in global communications and energy, as electronics and information technology began to automate production and take supply chains global;
- Fourth industrial revolution (2000s-present) – cyber-physical systems:
    - Genetic sequencing and editing;
    - Artificial intelligence, machine intelligence;
    - Miniaturized sensors;
    - 3D printing;
    - The Cloud, blockchain (cryptographic methods);
    - Globalization 4.0;
    - Technology imbedded within societies and even human bodies. (Davis, 2016, para. 3)

A detailed chart of inventions and their implications resides in Appendix E. I compiled the list using two Carlson (2005, 2013) sources. A few examples are highlighted here. Around 8,000 BCE, the potters' wheel was invented. It stored energy via momentum of a turning wheel and was one of the first machines. Ships or Galleys also emerged at that time. Made from dug out trees with a keel later added for steadiness, this invention allowed trade and ideas to spread. Through the manipulation of chemical and biological processes in 5,000 BCE, beer, wine, and distilled spirits illustrated how invention could shape social order and convey cultural meanings. Architectural advances, such as the roman arch and aqueduct in 300 BCE to 476 CE, advanced design elements that could withstand weight and transport water—inventions that were shaped by political change, leadership, and power, but created the idea of commonwealth, public works, and spectacle. 900 CE saw the development of gunpowder, cannons, and guns. The foundational product of combustion illustrates how differently this invention altered history between the East and the West. China used gunpowder and rockets to maintain homogeneity in their culture (to keep out invaders), while Europeans used it to separate into different nations. The caravel and use of celestial navigation, 15th century, integrated three innovations: better ships, systematic information about prevailing winds and currents, and new navigation techniques. This systematic, applied knowledge appears to be the first creation and use of technology to deliberately shape the destiny of a nation, which was Portugal. It marked the beginning of the modern world. It also fueled the acquisition of wealth and the furtherance of technology. The evolution of coal, iron, and steam in the 18th-19th centuries inspired the first industrial revolution and is attributed to rising incomes, productivity (output), and new consumer demands. Fast-forwarding, we saw how in the 19th-20th centuries, innovations in food preservation (by killing bacteria) sped the migration from rural areas to factories and to the production of larger quantities of food in one area for consumption in another, which in turn, fueled development of transportation systems. Household appliances, such as the vacuum cleaner and washing and drying machines, welcomed the emergence of the consumer society, mass-production, retail stores, an improved quality of life for middle-class Americans. Interestingly, it fostered a switch from men using machines, to women having the experience. The 20th century ushered in electronics, computing, digital devices, and the Internet—all of which created an aggregate of information available to just about anyone. The list is quite long, and so I must curtail this discussion, but the study of invention has indeed illustrated the coevolution of humanity and technology. Of more interest is the historical and inherent social response to innovation.

Social Responses to Innovation

Economic and technological history is comprised of biases that impacted adoption of change, both negatively and positively. Some of these are reflected in literature and theory by illuminating social response to technology in terms of human understanding, drivers of discontent, and elements of innovation adoption.

Human understanding of technological innovation is confounded, then cast in many ways. Juma (2016) put forth the following three reasons that influence our responses to technology:

1. The social implications of the speed of innovation generates faster than the design of new complementary institutions;

2. Innovation cycles are currently shortened—at times leapfrogging, or bypassing, existing technologies—which enables new products to reach market at a faster rate; and
3. Globalization has created new opportunities for rapid diffusion of new technology and engineering practices. (Juma, 2016, p. 12)

Human understanding is hindered by tensions between what is new (innovation) and what has been a staple (incumbency) lead to public controversies and policy challenges (Juma, 2016, p. 19). Individuals, given uncertainties concerning risks and benefits or an inability to seek relevant reference points or trusted authorities, tend to respond with irrationality. This, according to Juma, reflects a deeper set of prior beliefs that are subconsciously entrenched, and individuals then apply cognitive, rather than evidence-based decisions (p. 25). He described “path dependence” as a phenomenon in which the trajectory of the future is defined by past events, and therefore tension is incurred by the need to adapt to change through innovation in the face of pressure to maintain continuity. Juma felt that innovation, by definition, reorders society and thus will create conflict (p. 21).

Cultural “identities” also generate tension (a sociocultural intersection with technology), and societies exhibiting political or economic “inequities” may experience “heightened technology controversies” (Juma, 2016, p. 7). Perhaps along these lines, “vested interests,” may be another major factor of human understanding of technology. Oft mentioned in the literature on innovation is the story of the Luddites of Northern England around the year 1811. Skilled artisans had for many years been the sole makers of stockings until a factory owner in the city of Nottingham purchased a steam-powered mechanical frame that replaced the workers. Determining their highly developed skill sets were no longer needed, and their livelihoods at extreme risk, the artisans formed a secret society. They invented a fictitious leader named Ned Ludd, called themselves the Luddites, and launched an attack on the hosiery factory, smashing all the machines. The uprising spread to other communities, requiring the government to bring in the military to contain them (Aoun, 2017, p. 5). For over two hundred years, the Luddites have stood as a symbol of resistance to technological dislodgment. Aoun explained other instances of dislodgment, such as how the tractor sent many manual laborers into factories; or how the development of automation in factories took people off manufacturing lines and into office jobs. He said, “Karl Marx warned of the effects of automation on the proletariat, and John Maynard Keynes believed that machines would cause ‘technological unemployment’” (p. 6). Again, cultural identity is significant in the study of our response to technical innovation, as it highlights human worldviews, values, and doctrines.

Moreover, Juma (2016) related that the story of the Luddites “captures the systemic nature of technological transformation, that is, “fear of system-wide impacts” and the associated “uncertainties” in complex economic systems” (pp. 25-26, italics added). The example of the Luddites links economics with technology, illustrating difficulty in discussing one field without the other.

Other examples of human understandings might be manifested in “intellectual responses” to innovation, which Juma (2016) named as “risk aversion, negative externalities, correlation between technology and political and social uses, and philosophical objection to the manipulation of nature for human benefit” (p. 31). Risk aversion follows from the impact of higher costs versus benefits (be they real or opportunity costs). Negative externalities represent the assumption that natural resources may be used in the extreme or there may be a cost now to something that was previously free. The correlation between technology and political and social uses causes uncertainty and anxiety. An example is drone technology, which creates debate in the military arena, but promise in a humanitarian application. Lastly, the philosophical perspective aims at rejecting technology that causes ecological degradation or harm to future generations (pp. 31-32).

Human response to innovation can also arise from beliefs that appear to not follow a rational process. Our human mind often invokes shortcuts in times of uncertainty, that is, decisions based upon prior, unrelated losses or experiences that are projected onto the current innovation. These are described as sociopsychological factors (Juma, 2016, p. 34). Habits are difficult to break, but losses, too, are not easily forgotten. So, when reminded of either of these, individuals will evaluate risk cognitively, but operate emotionally (p. 35).

A common thread appears to run through human understandings (tensions, uncertainties, threats to identity and vested interests, intellectual responses), nonrational decisions (sociopsychological factors), and now, real economic factors: the importance of cost to benefit when responding to innovation. Fear of loss motivates individuals' attempts to slow down change, even at the sacrifice of gain (Juma, 2016, p. 11). Further, per this discussion, how a society views its economy is rather precious. When new technologies bring new forms of socioeconomic organization—which they are wont to do in a capitalist economy—dynamic change and self-organization occurs, and the process of adapting, or social learning, begins (p. 23). Given the thrust of this dissertation, it is important to realize that with self-organization and social learning resulting from technological innovation, an economy will experience workforce changes and/or job loss (creative construction or creative destruction, per Schumpeter, 2008, 2012). This may hurt workers who have accumulated status. Emotional discontent exposed by the economic consequences of innovation are indeed real.

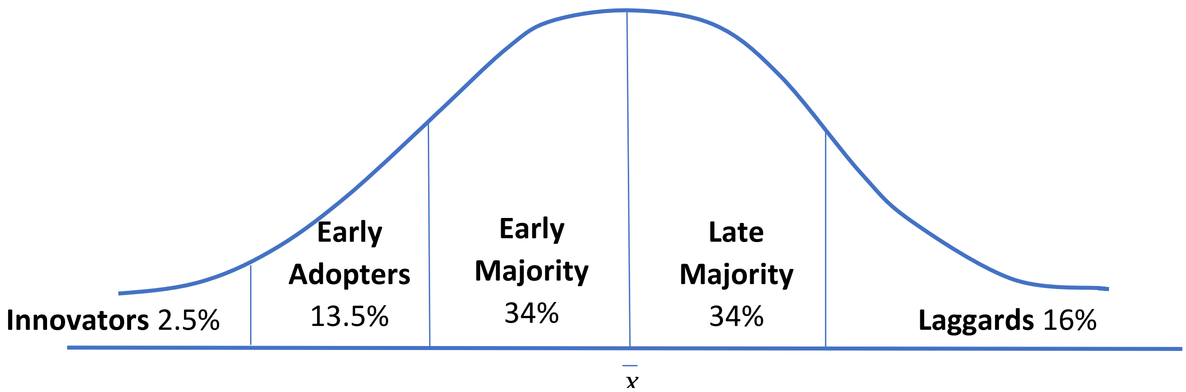
Drivers of Discontent. The exploration of human understandings about innovation mentioned common threads, such as uncertainty, fear of loss, fear of system-wide impacts. But what drives toward a sense of "discontent" the likes of which drove the acute actions of the Luddites? Is it a stronger fear that evolves from losing one's known center of strength (versus the unknown)—one's moorings? The title of a chapter in a book by McAfee et al. (2017) reads: "The Dream of Decentralizing All the Things" (p. 278). This resonated with me, as I have always been fascinated by conflict theories regarding losing the center. Jacques Derrida and Michel Foucault are often mentioned in the context of poststructuralism because of the nature of their writings and alignment of thought. The writers both believed modern culture had its limits. Lemert (2013) recounted how Derrida and Foucault predicated the end of modernity, or the "old cultural order" of oneness, on such topics as "decentering, discourse, and differences" (p. 284).

Innovation Adoption. Counter to theories of uncertainty or discontent is theory about innovation "adoption." Diffusion (in social sciences) is the "process by which innovations are adopted by a population….Diffusion of Innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread" (Rogers, 2003, p. 35). Rural sociologists in the 1940s first studied diffusion by investigating how Iowa farmers adopted hybrid seed corn. In the following decades, the study of diffusion has spread to other disciplines, resulting in some 5,200 diffusion studies published (Rogers et al., 2005, p. 4).

The literature about the concept of diffusion is immense and fragmented, as it draws from interdisciplinary fields such as anthropology, economics, sociology, and marketing, and examines innovations from multiple perspectives (Aizstrauta, et al., 2014). Rogers' (2003) diffusion of innovation theory has formed the basis for many models that seek to explain the factors that impact "whether an innovation will be introduced, shared, and adopted by individuals within an organization" (Aizstrauta et al., 2014, p. 73). Through Rogers' "innovation-decision process," "an individual (or other decision- making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to decision to adopt or reject, to implementation of the idea, and to confirmation of this decision" (p. 73). Attributes of innovations also have a hand in the innovation adoption process. Many researchers use Rogers' now-familiar terms for the stages of diffusion: "Innovators, Early Adopters, Early Majority, Late Majority, and Laggards" (p. 281). A depiction of the process is illustrated in Figure 13 below.

Figure 13

Adopter categorization based upon innovativeness–Diffusion of Innovations Model (DIM)



Note. The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption (*x*).
Source: Rogers, 2003, p. 281

Specifically, Rogers (2003) suggested four elements of the diffusion of innovations, as stated in a single phrase: “(1) An innovation (2) that is communicated through certain channels (3) over time (4) among the members of a social system” (p. 36).

Implications for Technology Diffusion and Disruption for Social Systems

The diffusion of innovations theory informs behavior toward technological innovation by mention of the “social system” in which we operate. For Rogers (2003), a social system “is a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal.” Think: team, department, or work group with “patterned arrangements of units that enable structure, stability, and regularity to individual behavior in the system” (p. 37). Several elements reside within a social system to include communication structures; behavioral patterns or norms; individuals who influence adoption; change agents and aides who assist with influence; and consequences, or changes, that occur when an innovation is adopted or rejected (pp. 37-38).

Considering again the discussion on finding the center, a social system finds comfort in organizational structure. That structure is obtained through setting goals, prescribing roles and authority, identifying rules and regulations, and understanding informal patterns (Rogers, 2003, p. 411). Rogers identified centralization, formalization, and interconnectedness as having a negative effect on an organization's ability to innovate; whereas, good attitudes toward change, complexity, system slack, and size have a positive impact. System openness, external to the inner workings of the organization, was also viewed as a positive influence on the organization's innovativeness. The illumination of an ability inherent in complex systems to impact innovativeness may have led to a later development by Rogers and colleagues, which follows.

Complex Adaptive Systems and the Diffusion of Innovations

Rogers et al. (2005) developed a new approach to Rogers' original theory of innovation diffusion. Creating a co-theoretical model, they combined complex adaptive systems theory (CAS) and the diffusion of innovations model (DIM) to construct a "predictive or applied hybrid model of induced change in population behavior" (p. 2). They exploited what is referred to as the "strength of weak ties" among social network members and to approach the management of innovation in an organization (pp. 2-3). "In linear systems the relationship between cause and effect is smooth and proportionate. Linear systems respond to big changes in a big and proportionate manner and linear systems respond to small changes in equally small and proportionate way" (Kiel, 1995, as cited in Rogers et al., 2005, p. 3). A complex adaptive system, alternatively, "comprises multiple agents dynamically interacting in fluctuating and combinatory ways, following local rules to maximize their own utility while also maximizing individual consistency with influences from network neighbors" (Klein, Sayama, Faratin, & Bar-Yam, 2002, as cited in Rogers et al., 2005, p. 3).

Complex systems reference relationships among associates of a system. Order may be marked by "emergent self-organization, in relation to complex-network synchronization that is enhanced by heterogeneity" (Motter, Zhou, & Kurths, 2004, as cited in Rogers et al., 2005, p. 3), and when "the resulting system can create emergent behavior capable of response to the environment, it is adaptive" (Johnson, 2001, as cited in Rogers et al., 2005, p. 3). Rogers called members who connect members of overlapping systems "weak ties" to the outside (p. 4). The prior discussion on adoption now leads to the consequences of disruption, which follows a different set of rules.

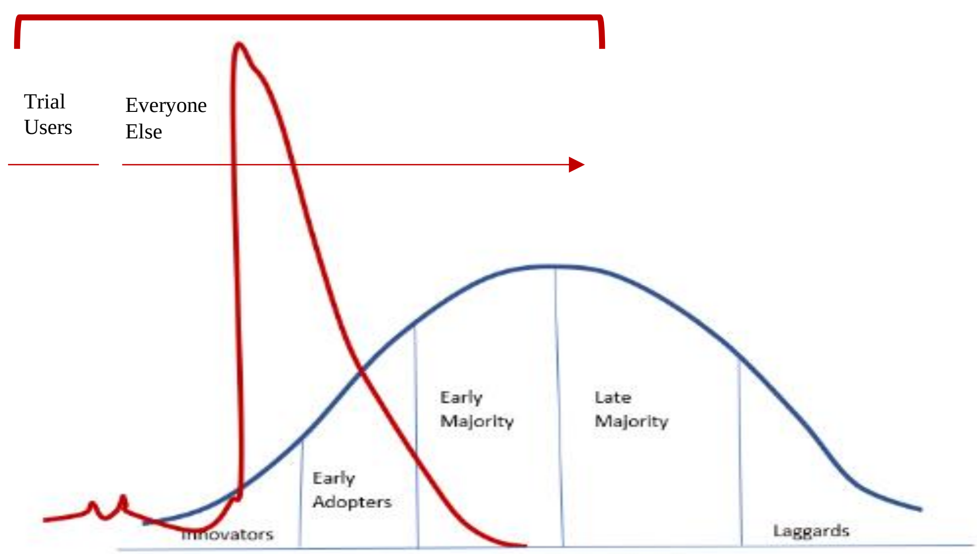
Disruption: A Counter to Rogers' Diffusion Model

Downes and Nunes (2014) contend that a "fourth stage of innovation—the era of 'Big Bang Disruption' (BBD)"—is upon us. In their view, "the new disrupters attack existing markets not just from the top, bottom, and sides, but from all three at once initiating exponential growth and falling costs of new technologies, devastating innovation." The suddenness with which BBD can occur "presents an insurmountable obstacle for traditional academic approaches to strategy." In effect, "your new competition operates without any of your constraints and doesn't play by the old rules" (p. 7). The authors define "exponential technologies" as the most important drivers of global economic growth (pp. 22-23). Today, every business is a digital business (p. 25).

Downes and Nunes (2014) presented three characteristics that define a BBD: undisciplined strategy, unconstrained growth, and unencumbered development (pp. 30-31), which when I overlaid theirs upon Rogers' (2003) classic bell curve—the five segments—"innovators, early adopters, early majority, late majority, and laggards" (Rogers, 2003, p. 281)—two groups emerge: "trial users, who often participate in product development, and everyone else" (Downes & Nunes, 2014, p. 35). Note how the notional new curve eclipses the Rogers curve in Figure 14—with heightened adoption over a very narrow span of time.

Figure 14

Big Bang Market Adoption

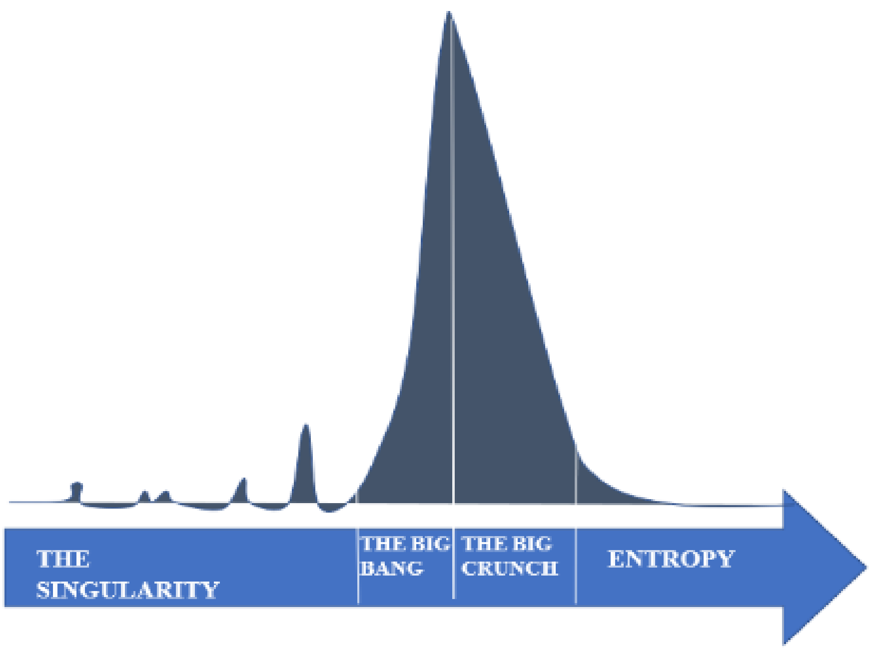


Source: Downes & Nunes, 2014, p. 35

The "shark fin" that Downes and Nunes (2014, p. 83) drew seized upon the shift from "strategic business change driven by incremental technology improvements to Big Bang Disruptors powered by exponential technologies" (p. 83). The contour reflects the economic drivers: "the declining cost of innovation, the declining cost of information, and the declining cost of experimentation. Together, they have shortened and skewed the life cycle of industry change, often to devastating effect" (p. 83). Figure 15 names the phases of big bang disruption, which attempt to align with the physical scientific event that formed our universe called "The Big Bang."

Figure 15

The Shark Fin



Source: Downes & Nunes, 2014, p. 79

The four stages in this figure are briefly identified as:

- The "Singularity" – a state that encompasses mature industries that witness threats to their supply chains "against the pressure of new entrants wielding disruptive technologies" (Downes & Nunes, 2014, p. 83)
- The "Big Bang" – occurs when pressure mounts to such an extreme that things explode. Users abandon older products, services and brands, causing massive disruption to existing industries" (p. 84).

- The “Big Crunch” – exemplifies the dissapation of matter as it expands—illustrating that mature industries have a life cycle that matures and experiences death (p. 84).
- “Entropy” – reflects the physical state when matter and energy eventually collapse and then regroup, taking on new form. “In BBD, entropy reflects the last phase of dying industries, where remaining assets, largely intangible, are smashed together to create new Singularities” (p. 84).

Downes and Nunes (2014) considered the education domain. Since institutions are typically not market-driven in how they consider reducing transaction costs, they may not be inclined to adopt technologies in the same manner as for-profit organizaitons. Dysfunctional fragmentation results from (a) students with “little bargaining leverage,” (b) administrators with “limited authority to expand the institution virtually using the Internet and mobile technologies—even those, including video streaming and digital content, that are both mature and firmly established in other ecosystems,” and (c) faculty members caught in the middle, “torn between their loyalty to the schools at which they hold tenure and the opportunity to reach a wider audience with their expertise” (p. 154). Thus, the choice for my focus on higher education begins to bear meaning. Pressure has been building for years—especially for public universities experiencing political and economic issues. Technology may now be forcing change. According to the authors at the time of their book publication, by 2011 more than “30 percent of students enrolled in degree programs had taken at least one online course” (p. 155). (Updated numbers will be detailed later in this dissertation.) The disruptors that have surfaced are in the form of private-sector outsiders, such as the nonprofit Kahn Academy and Udemy (p. 155). Downes and Nunes stated that still,

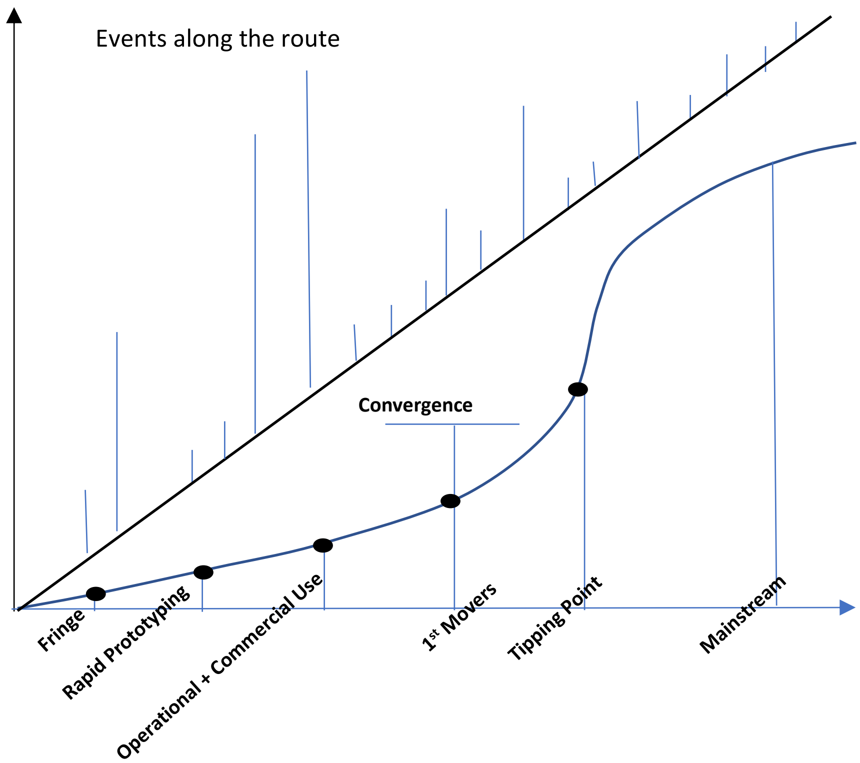
> …universities remain tentative as providers or suppliers—worried that widespread adoption could diminish their brand and the value of limited enrollments in residential programs. Kahn Academy, for example, rejects the classroom paradigm altogeher, promoting instead an interactive problem-driven learning model. By 2013, Kahn Academy was reaching six million unique users each month. (p. 155)

Considerations of Technology Transience and Disruption

The adoption curve previously mentioned as Big Bang Disruption raises the discussion of technology transience, or the duration of time for technology usefulness as it passes from rise and rapid adoption, to falling or slowed adoption, and eventual satiation and replacement. Given the scenario, it is difficult for organizations to know what to anticipate, how to react, and how much to invest. Another visual is provided by Web (2016), who displayed an S-curve explanation for adoption in Figure 16.

Figure 16

The Timing of a Trend



(Webb, 2017, p. 207)

Christensen (1997, 2000, & 2016) has been cited often for his study of the phenomenon that incumbent organizations face when they may be doing all things right, only then to be doing the wrong thing and hence experiencing disruption or failure. Examples of corporate disruption are many. The mega-retailer Sears ignored the rise of discount retailers in the 1960s, as well as letting new credit card vendors, Visa and MasterCard, overtake its established lead in the use of credit cards in retailing—not to mention the popular catalog business it invented and was forced to cease in the online commerce era. Sadly, Sears announced the selling of its trademark building tool and appliance line. Another giant, Digital Equipment Corporation, was lauded for its astute management as the information age began. However, it ignored the arrival of desktop computers, and went out of existence. Yamaha, Honda, and Kawasaki introduced small, off-road motorcycles in Europe, which disrupted Harley-Davidson and BMW in North America. Christensen has a long list of similar examples. Known corporate examples of disruption blind sidedness include Blockbuster and the advent of Netflix; Blackberry and the iPhone; Kodak and the iPhone, newspapers and Craigslist or Google; IBM and the Personal Computer; and universities versus MOOCs (Massively Open Online Courses) (Gans, 2016). Gans maintained that the firms most vulnerable are the ones who are content with their success. He highlighted theories of dominant design, demand-side and supply-side considerations, poor systems feedback mechanisms, paralysis in decision-making, reactive versus proactive management, and architectural (or wholesale) innovation versus component (or parts) innovation. Further, Gans stated that mere uncertainty over whether an event is in fact disruptive gives rise to the problem. In organizations experiencing uncertainty, the workforce experiences a sense of threat that generates conflict.

Incumbent, or leading firms, have difficulty with technological change and usually confront change with managerial, organizational, or cultural responses. Christensen (2016) opened eyes by considering the value network of an organization, which is a nested network of producers and markets "through which the components of each level are made and sold to integrators at the next higher level in the system" (p. 32). He stated, "a disruptive technology gets its commercial start in emerging value networks before invading established networks" (p. 41). This discussion illustrates a dynamic set of operational decisions that must be made no matter the organizational or sectoral structure.

The Dynamics of Sociotechnical Systems and Organizations

The historical theorists list is long of on how organizations work. In responding to technological and market change, Burns and Stalker (1961) (as cited in Appelbaum, 1997, p. 454) developed concepts of organic (or fast) and mechanistic (or stable) organization structures. The terms “unity of command” and “span of control” are attributed to the work of Joan Woodward (1965), as are the concepts of unit production, mass production, and process production (Appelbaum, 1997, p. 454). Charles Perrow (1967) compared approaches to decision-making (and how to introduce technology) with the degree of variability existent in the structure of the work (Appelbaum, 1997, p. 455). The focus of these studies had roots in the behavioral sciences.

Beginning in the early 1960s, the Tavistock Institute of Social Research in London (from which Burns, Stalker, and other notables hailed) began extensive research on “work design and redesign for self-regulated groups, and additionally, various interactions among elements of the system” (Applebaum, 1997, p. 452). The Institute’s efforts fostered organizational development as a new discipline—one that grew to require “expertise and judgement in social, technological, and systems theory and practice” (p. 452). This author also stated, “Changes that support organizational development goals must consider how relationships among the various systems will be affected as they all are interdependent” (p. 452).

The Emergence of Sociotechnical Systems Theories

Trist (1981) was a pioneer in action research and socio-technical analysis of organizations. For twenty years Trist was a founding member and researcher at the Tavistock Institute. Attributed to Trist are the theoretical underpinnings and practical development in the field of sociotechnical systems. His work spanned five decades until his death at age 83 in 1993. Work at Tavistock began after the conclusion of World War II, in 1949. One of the undertaken projects has significance to this sociotechnical systems study: the "diffusion of innovative work practices and organizational structures" (Trist, 1981, p. 7). Trist (1981) advocated that socio-technical analysis be approached on three altitudes:

- The primary work system (line department or service unit consisting of workers unified in purpose and activity);
- The whole organization (plant or self-standing workplace, entire corporation or agency); and
- Macrosocial phenomena (systems in communities, industrial sectors and/or institutions operating at the overall societal level). (Trist, 1981, p. 7)

He examined the relations between these levels in the historical context of the management – labor interface. Trist viewed the organization to be "equal parts a technical, as well as, a social system, that all factors should be considered" (p. 7), and as a result, created a new field of study. He and his associates examined the post-war coal mining industry in England, as an initial step toward understanding the interactions between organizational functions, workforce, and newly introduced technologies in mining.

Trist (1981) illuminated an oft-accepted process: that engineers will design a technology the organization may seem to require, with no regard for the "people cost" of proceeding. His work changed the way work organizations were seen, and both "economic performance and job satisfaction were deemed equal outcomes—the level of which depended on the goodness of fit between the substantive factors" (p. 10).

Many writings and research about organizational development came as a result of the post-industrial order that followed World War II. Even as late as Trist's in 1981, the transition was a channel between pre-and post-war (and a question of whether we had "lost the stable state," (p. 44)) but anticipated nothing of the exponential growth of digital technology experienced today.

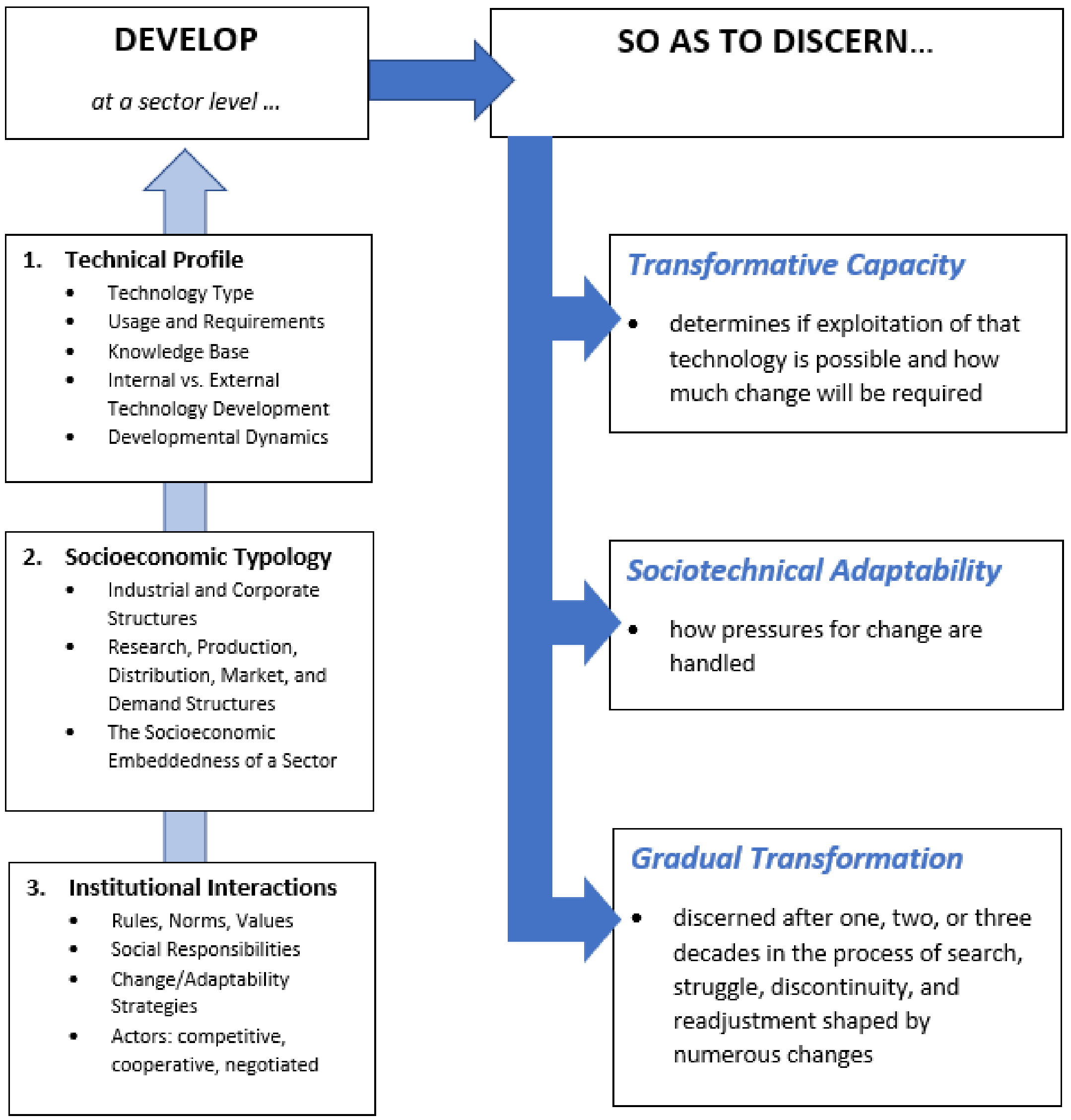
The Social Consequences of Radically New Technologies

Through my literature research, I was introduced to Ulrich Dolata's book: *The Transformative Capacity of New Technologies—A Theory of Sociotechnical Change,* which was published in 2014. Dolata teaches organizational sociology and innovation studies at the Institute for Social Sciences at Stuttgart University, and he is also the institute's director. His interests (as listed on the university web page, https://www.sowi.uni-stuttgart.de/abteilungen/oi/team/) include technical, organizational and economic sociology, innovation research, technology policy, sociology of genetic engineering, and the Internet. As can be seen by the literature review up to this point, scholarly studies on organizational change linked to technology ascended from the post-war years of the 1960s. Finally, I had my hands on more recent thought—even though the likes of Emery and Trist are as relevant, if not more so, today. Dolata advanced a view of sociotechnical change from the sector level, which in many ways picked up from where Trist (1981) left off at the macrosocial level. Dolata described sociotechnical change theory as "the mutual influence of technology, socioeconomic structures, and institutions that inform a sector's capacity to adapt to a new technology" (Dolata, 2014, p. 1). By this, he believed technology to be a powerful phenomenon with the ability to penetrate society, restructure it, regulate it, and transform it. In doing so, technology exerted pressure for change on societies' "actors, structures, and institutions"—impacting relationships and realigning "patterns of social organization" (pp. 2-3). Dolata's emphasis on sociotechnical change theory created what he referred to as "a heuristic framework…that helps to conduct qualitative case studies" (personal communication, April 9, 2018). To that end, he described in detail specific stages of data collection at the sector (or domain) level to inform "transformative capacity, sociotechnical adoptability, and gradual transformation" (Dolata, 2014, p. 2). I inquired about the existence of a quantitative instrument, to which he replied, "no, but it would be really interesting (and doable) to use the building blocks of my concept…so let's stay in touch" (personal communication, April 9, 2018).

Dolata (2014) spoke of the co-creation that occurs when radical technologies emerge whose social consequences are uncertain. In the process of learning that it is not always possible (or clear) how to adapt to the new technologies, the technologies themselves also undergo further development—becoming modified or overhauled. This entire process of "sociotechnical search and selection" may take several decades. Touching upon the disruptive nature of new technologies, Dolata identified how dysfunctional—even potentially entering a state of crisis—organizations can become if experiencing pressure from "new technologies that no longer match their profiles…requiring them to undergo substantial change to remain legitimate and to avoid obsolescence" (p. 4). He further stated the importance of analyzing how a sociotechnical field or system "undergoes significant change and how this change then proceeds; how to understand and explain sociotechnical dynamics that disrupt the normal course of things" (p. 4). The characteristics of Dolata's (2014) framework are described in Figure 17.

Figure 17

Visual Stages of Dolata's Theory of Sociotechnical Change Analysis



Note. The "transformative capacity of new technologies" is an assessment of how much organizational, structural, and institutional change may be required, as new technologies (with new properties) seek to be integrated into existing "socioeconomic constellations."

"Sociotechnical adaptability" is an indicator for how pressures for change are handled. Technology-induced change depends upon the "capability of the institutions and actors involved to perceive, adopt, and further develop new technologies that are path-deviant [from the status quo]."

"Gradual transformation" might, after one, two, or even three decades appear as a radical sociotechnical shift, but it is the "outcome of a longer, non-linear, and often erratic process…that focuses on the peculiarities, dynamics, and variants of such enduring periods of transformation. Substantial changes to their underlying technologies inevitably have consequences for their organizational, structural, and institutional constitution."

(Dolata, 2014, pp. 3-5)

Adaptability as a Research Approach. Viewed through Dolata's (2014) sociotechnical/organizational development lens, new technologies that portend high transformative capacity may pose quite different challenges to the various actors within a sector. Recognizing and measuring adaptability is made difficult through, in Dolata's words, "a diverse range of actors with a diverse range of guiding principles, routines, and patterns of organization that are embedded in a diverse range of structures and institutional milieus" (p. 91). The key to understanding a sector's adaptability to technology-induced change is to also look at the external social conditions. Then, study how established actors react to new technological opportunities that seem to go against their "guiding principles, organizational patterns, and routines" (p. 91).

As I leave this topic, I am compelled to add to what has just been described in Dolata's (2014) theory with thoughts from Appelbaum (1997). To Appelbaum, "Socio-Technical System (STS) design is based on the premise that an organization or a work unit is a combination of social and technical parts, and that it is open to its environment…[and]…work systems produce both physical products and social/psychological outcomes" (p. 453). Like Trist (1981), he prescribed "joint optimization of the social and the technical aspects—resulting in a work structure that relates people to the organization's technology" (Appelbaum, 1997, p. 453). He deemed the organization and the external environment to be interdependent.

Current Technological Forces at Work and the Potential for Change

"The greatest shortcoming of the human race
is our inability to understand the exponential function."
–Bartlett (as cited in Juma, 2016, p. 316)

Post industrialization led our society to what has been termed the "information revolution" or the "digital age." According to the U.S. Defense Advanced Research Projects Agency (DARPA), research they conducted in the 1960s served a pivotal "role in launching the 'information revolution.'" (DARPA, *n.d.*). Their ARPAnet, as it was called, created "a pioneering network for sharing digital resources among geographically separated computers…and in 1969, after an initial demonstration, led to the Internet" (DARPA, *n.d.*). Though it was not instantly noticed, who could have imagined the capabilities at our fingertips today? To establish a context for the discussion about the Internet and information and communication technologies (ICTs), the latest available statistics garnered from the *Internet Live Stats* (*n.d.*) web page reveal this about the U.S.:

Table 1

U.S. Internet Penetration 2020

Internet Users (2020 Q1)	Penetration (% of Population)	Population (2020)	Non-users (Internet-less)
288.1 million	87%	331,002,651	42,902,651

Source: Data Reportal, 2020

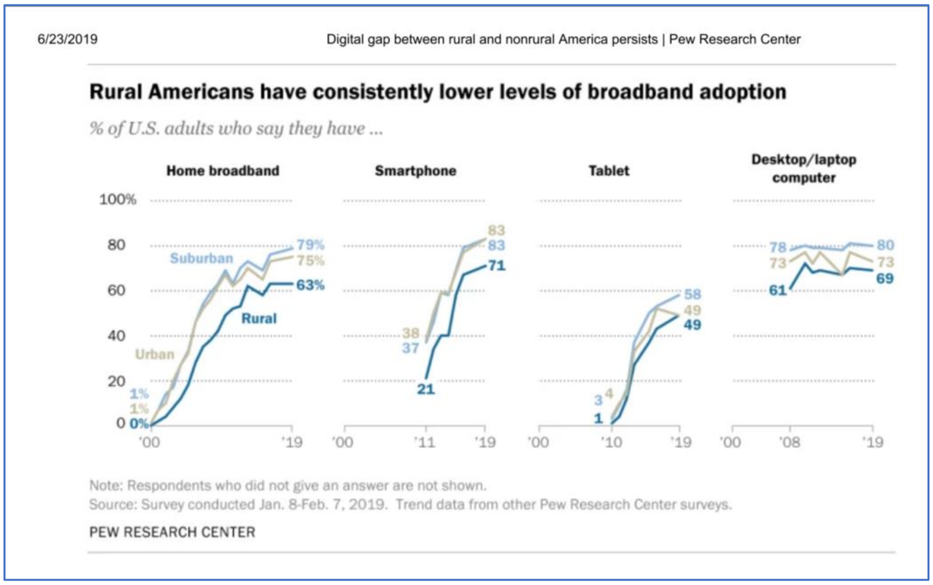
As illustrated by the “internet-less” numbers, a “digital divide” has arisen, whereby a major segment of the U.S. population is incapable of engaging in the digital realm because it cannot physically connect to it. Much research was done on this topic in the late 90s. Since that time, technologies have improved, giving better Internet access across the U.S., but the quality of connection and related services remain a concern. More striking today is the differential of access to the bourgeoning Internet of Things (IoTs) and to broad offerings tied to the Internet. These are identified as complementary technologies that foster and thrive in the online environment, enabling knowledge production, sharing, assistance, and consumption.

The U.S. Census Bureau tracks computer and internet use, informing that in 1984, a reported 8 percent of households owned a computer. By 2000, the number had increased to 51 percent, by 2015, 79 percent, and by 2016 it had reached 89 percent. In 1997, data collection about Internet usage began. That year, 18 percent of households used the Internet; a decade later, in 2007, 62 percent; and in 2015, the number had reached 73 percent of U.S. households (Ryan, 2017).

A Pew study (Perrin, 2017, 2019) found disparity between rural Americans and urban or suburban Americans regarding technology adoption. See Figures 18 and 19.

Figure 18

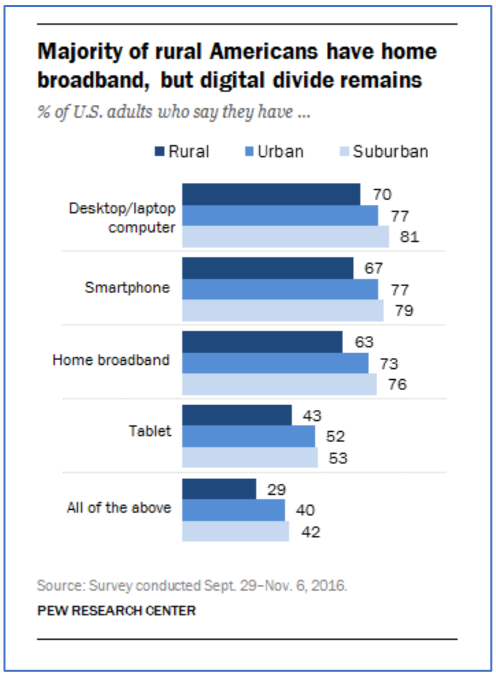
Rural American Broadband Adoption



(Perrin, 2019)

Figure 19

Geographic Digital Divide



(Perrin, 2017)

Given the amount of news coverage for the top global technical firms, the investor interest in the technical industry, newly released top-selling, non-fiction books about “disruptive technologies,” scholarly reliance on digital databases, the common vision of people glued to their iPhones or iPads, and a scary reliance on all things Cloud (and the surfacing of artificial intelligence into the vernacular), there still exist circumstances of inequality of access in America.

Building on the Past

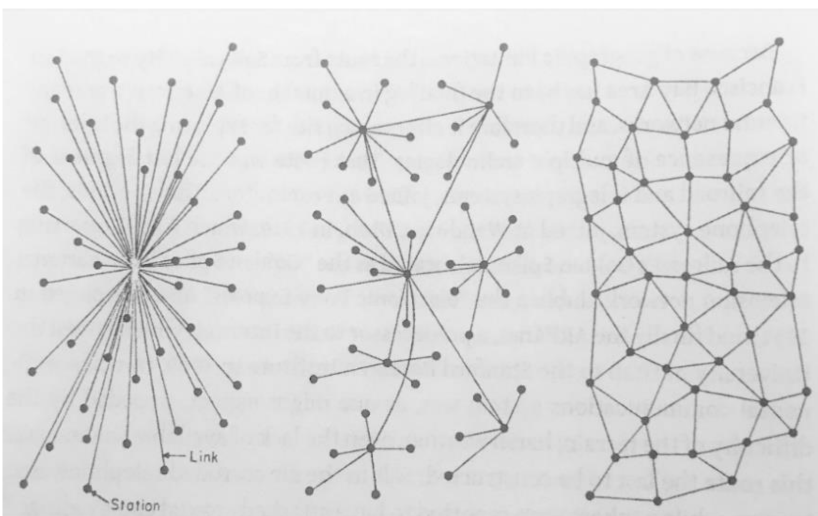
Access to today’s digital technology, it appears, grew out of older networks, such as railroads. Having peaked in 1916 at 250,000 miles of laid track, railroads began to fade as a central mode of transportation. Many former railroad beds have been ripped up. One such case is a Southern Pacific track. Hu (2016) stated, “the relationship between old and new is a complicated one, because beneath the abandoned railroad bed from the nineteenth century lies fiber-optic cable, technology of the twenty-first century” (p. 1). What occurred with Southern Pacific was that the area beneath the former tracks had electric circuitry used for train signaling. This was useful to those attempting to develop better telecommunications systems. Southern Pacific, taking advantage of an opportunity, spun off a new telecommunications division in 1978 called the Southern Pacific Railroad Internal Network, or SPRINT.

More compelling is the thought that our current digital systems parallel the network laid so long ago. Old maps reveal great expanses of land between railroad connections—enabled through the transcontinental rights of way granted in the 1860s by the Pacific Railway Acts (Hu, 2016, p. 3). Hu further stated that “in examining the physical geography of digital networks, we can see the spaces where the old has been displaced, and where new media, such as that of the Internet, are layered, adjacent, or even intertwined with far older mediums" (pp. 2-3). Noting this historical event, it is made clear how the digital structure came into being, and why parts of the U.S. are weak on, and even bereft of, connectivity.

At the base of the current exponential growth of digital technology is the famed Internet. Figure 20 provides three different network typologies that illustrate the arc of diverse organizational designs through which the Internet evolved—perceived as a star (centralized), to a tree (decentralized), and to a mesh or cloud (distributed).

Figure 20

Centralized, Decentralized, and Distributed Networks



CENTRALIZED **DECENTRALIZED** **DISTRIBUTED**

Source: Hu, 2016, p. 6

The distributed design reflects the Internet today, which has moved away from a centralized structure. When the Internet's predecessor, ARPAnet, in 1969 expanded to a handful of universities across the U.S. continent, it initiated the distributed shape and "the dispersion of power through the formal qualities of the computer networks that supposedly enable it" (Hu, 2016, pp. 5-6). Hu described a network thus: "everything is connected, and, as such, is a product of a system of belief.…The network exists primarily as a state of desire" (p. 10). Moreover,

> …the system reroutes itself depending on the need. It is a logical overlay, rather than a physical thing; it is a process, not a static moment.…The network is an idea that is resistant to knowing…very nebulous, echoing the word's Latin origins in "nebule," cloud. (p. 15)

The Discourse of Exponential Change

What is different today (the past 20 years) in the way we invent or innovate? For one, our vocabulary has changed. Moore's Law, Big Data, algorithms, machine learning, network effects, the Cloud, and platforms are a few of the most repeated words in the discourse on exponential digital technology and the change it incurs. Each of these is interrelated.

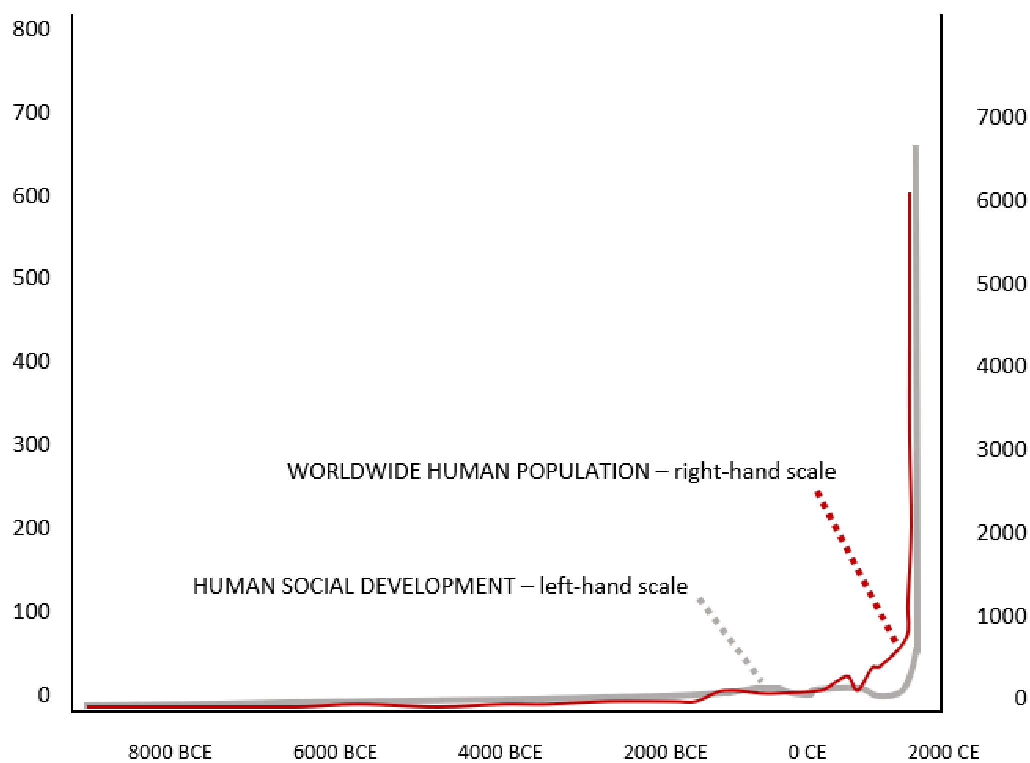
Moore's Law became 57 years old in 2022. A 1965 prediction made by Gordon Moore, former CEO of Intel, represents the phenomenon of the "steady doubling in integrated circuit capability every eighteen to twenty-four months" (Brynjolfsson & McAfee, 2016, p. 41)—hence producing the exponential growth of digital technology. The Law is a central phenomenon of our information age, and it has proven true. Brynjolfsson and McAfee called it "a steady drumbeat in the background of the economy" (p. 43).

In a comparison case of the first microprocessor to that of today, "performance is now 3,500 times higher, energy is 90,000 times more efficient, and the price per transistor has fallen 60,000 times" (Intel, n.d., .53). Comparing this growth data to, or overlaying it on, say the automotive industry, the following would result: "cars would go over 300,000 miles per hour, get over 2,000,000 miles per gallon, and cost only $0.04" (Intel, n.d., .53-1.14).

The following two figures (Figure 21 and Figure 22) provide a provocative look at the impact the first industrial revolution had on social development and population. The illustrations also provide a graphic look at exponential change.

Figure 21

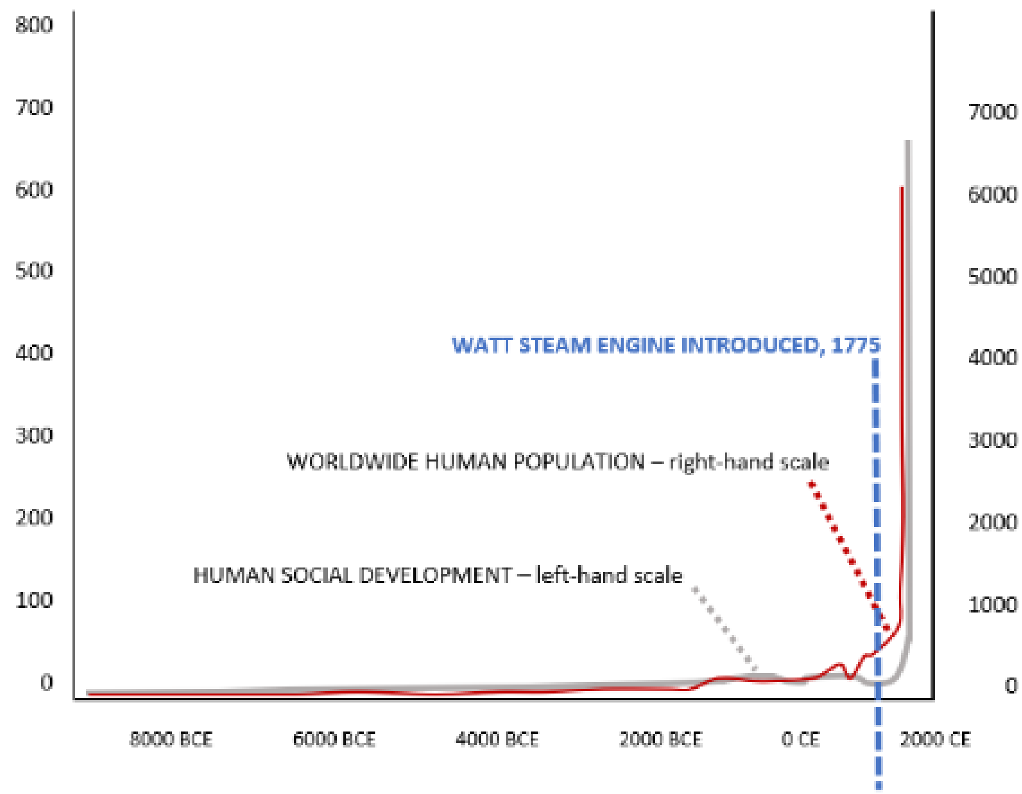
Human History in Terms of Social Development and Population Growth



(Brynjolfsson & McAfee, 2016, p. 5)

Figure 22

Overlay of the Invention of the Steam Engine



(Brynjolfsson & McAfee, 2016, p. 7)

Technological advances in how we gather, use, and store data has recently become a focal point. McAfee and Brynjolfsson (2017) proffered that IBM estimates “90 percent of all the digital data in the world was created within the last twenty-four months” (p. 95). They stated, “Signals from sensors in smartphones and industrial equipment, digital photos and videos, a nonstop global torrent of social media, and many other sources combine to put us in an era of ‘big data’ that is without precedent” (p. 95). Cloud computing is less than a decade old, but it aids in the acceleration of technology in three ways, according to McAfee and Brynjolfsson: (1) it lowers barriers to entry because the broader access to computing power is available to almost anyone; (2) it allows exploration of the computation trade-off between local and central; (3) it aids in the flow of communication (p. 96). “Algorithms,” when complemented by data, support and further accelerate the developments in “machine learning,” which is the art and science of building software systems that can detect patterns and formulate successful strategies after being shown many examples (p. 85). A “platform” is a “digital environment characterized by near-zero marginal cost of access, reproduction, and distribution. (Marginal cost is the [economic] cost of producing or distributing one more item)” (p. 137). “Network effects” are created, and made more valuable, by the number of users. The concept is sometimes referred to as “demand-side economies of scale” (p. 141), which implies that the benefits to users (the source of demand) grow as the scale increases. The average cost to the supplier (or platform) also decreases as the scale increases. The common feature of digital platforms is that they can unbundle resources that used to be tightly clustered together, and therefore difficult to consume one by one (p. 145).

If ever there was a sense that innovation and technology are all around us, that thought has never been truer than now. It is, however, difficult to define (for the regular individual) what has caused this and what the consequences may be. New forces shaping the future may, on the surface, seem trivial, but our daily lexicon now includes such words as virtualization, screening, digitization, cognifying, tracking, sharing, and liking (Kelly, 2016; Leonhard, 2016), without comprehending that human linearity when converged with exponential technology enables new combinatorial advances of technology and a recursive ability of technology to self-amplify improvements through artificial intelligence (Leonhard, 2016). This author proclaims we are developing “digital obesity…a mental and technological condition in which data, information, media, and general digital connectedness are being accumulated to such an extent that they are certain to have a negative effect on health, well-being, happiness, and life in general" (p. 97). Leonhard harbors fears that we will face the question of how to detox a whole culture, stating, "As techne [tool] becomes the who as well as the how, are we even strong enough and self-aware enough to wake ourselves?" (p. 96).

To focus this discourse on societal response and exponential change, consider what drives the spectrum from discontent to disruption to meltdown. To be balanced, also consider technological success stories.

Current Drivers of Discontent

A confluence of multiple factors leads to difficulty in predicting the economic and/or long-term impacts of new technologies. These multiple factors surface because of how innovations are defined at the outset; what may be potential future improvements; compatibility with other technologies, emergence of new technological systems; and the development of new, potentially universal, applications (Juma, 2016).

Impacts on workers, should new technologies render their skills obsolete, cause immense discontent, eroding human capital and creating fear and anxiety. Juma (2016) related, "Fear that using computers as educational tools in schools would displace teachers is still in public consciousness, despite the rapid adoption of this technology for teaching purposes" (pp. 40-41). Globalization maintains a controversial position as it has inspired challenges to innovation by those displaced by technology. Besides loss of income, workers experience loss of identity, challenged worldview, and invaded privacy (p. 42). Eventually, worker fears fuel collective public attitudes. Juma suggested a broadening of strategies, implying that exclusive strategies lead to intense debates, and inclusive innovation should be employed. It is through coevolution, over time, of technologies and social institutions—thus forming "a complex cultural fabric"—that is advocated (p. 297).

Disruption – Good and Bad, Depending

Literature and discourse reveal disruptive events happening now due to the speed of innovation, the breadth and depth of simultaneous change, and the complete transformation of entire systems (Schwab, 2016)—and at each level: society, sectors, organizations, and individuals.

The societal response to what is occurring in this Fourth Industrial Revolution is predicted by Schwab (2016) to be driven by several factors occurring simultaneously. These include: over-indebtedness, an aging population, conflicts between traditional and modern value systems, social unrest due to rising inequality, a "me-centered" society, disempowered citizens due to structural violence and surveillance, and very importantly, the "danger and dynamics of sharing that typifies social media use, [as it] can skew decision making and pose risks to civil society…[and, due to the volume of information available through digital channels] an individual's news sources become narrowed and polarized" (p. 95). Not only does the technology hold the greatest promise, but it ignites potential peril. We must think highly strategically to harness the potential and mitigate the risks. Again, to put things in perspective, note how the spindle (originating in the first industrial revolution) took 120 years to extend beyond Europe. The Apple iPhone took a decade to nearly cover the globe, as a significant contribution to the Third Industrial Revolution. What is occurring today, with few noticing, is the Fourth Industrial

Revolution, which includes the items mentioned earlier: AI, robotics, the Cloud, and advanced manufacturing. Importantly, Schwab brought home the value of progress when it is aimed in the right direction, and he highlighted the systemic structure of digital technology and its many uses today. Shades of Marxist theory arise in the disproportionate substitution of capital for labor (as tech companies create a great deal of wealth with fewer workers involved). Schwab endorsed a navigational path that builds "'contextual intelligence,' i.e., the ability and willingness to anticipate emerging trends and connect the dots…discerns the changing boundaries between sectors and professions…changes conceptual and mental frameworks and organizing principles…and fosters 'emotional intelligence'" (pp. 106-109). Today's workforce is needing to learn how "to work with increasingly capable, connected, and intelligent machines" (p. 45). The human dimension is at the heart of the process (p. 57).

Regarding business, economic, and government sectors there exists a productivity paradox. Schwab (2016) defined this as "the perceived failure of technical innovation to result in higher levels of productivity" (p. 32). Other economists have flagged a slowed growth of productivity after 1970. To understand the problem, Schwab described two rival effects that technology exerts on employment. First, the "'destruction effect' occurs as technology-fueled disruption and automation substitute capital for labor, forcing workers to become under-skilled and unemployed." Second, the "destruction effect" is joined by a "capitalization effect," whereby the increased "demand for goods and services leads to the creation of new occupations, businesses, and industries." To gain perspective, consider that 90 percent of the U.S. workforce was in agriculture in the 19th century, and today it is 2 percent—a change that occurred over a long period of time, causing minimal disruption.

Systemic, too, is the growth in platforms and on-demand economies, which aids in decreasing marginal costs (of labor, for instance) while increasing capital. On-demand jobs become part of a new reality, which impacts work/life balances. Further impacted is the leadership quality in businesses, which touches on organizational stability and resources. Schwab (2016) warned, “the velocity of disruption and the acceleration of innovation are hard to comprehend and anticipate,” and that new business models are needed, for new technologies are likely to impact “both the demand and supply side of business” (p. 53). He placed the “human dimension at the heart of the process” and advocated for compatibility between the online and offline business, economic, and governmental worlds (p. 57).

An organizational response in today’s climate might be to turn exponential itself, to disrupt. Ismail et al. (2014) described an exponential organization as one “whose impact (or output) is disproportionally large—at least 10 [times] larger—compared to its peers because of the use of new organizational techniques that leverage accelerating technologies” (p. 18). As a case in point, thirty years ago some of us earned MBA degrees to learn how to orchestrate new processes such as new product development (NDP) in corporations. I was one of those. In reviewing these steps toward achieving NDP today, note their linearity: “idea generation, idea screening, concept development and testing, business analysis, beta and market testing, technical implementation, commercialization, and finally new product pricing” (p. 39). Ismail et al. asserted that many organizations today employ linear-thinking structures, which cannot scale themselves in a period of exponential technology growth.

Another popular author—and I include some of these in this literature review because they make an impression on managers and individuals, even if not particularly scholarly, and this drives change, discontent, and disruption at the macrosocial level—is O'Reilly (2017), who asked a couple of provocative questions: "Are we looking at the map or the road?" (p. 19) and "Are we trying to overlay prior maps on that which is new?" (p. 21). O'Reilly highlighted the Internet and how it has taken networked firms to a new level (such as Facebook, Amazon, and Google), stating:

> These large companies have gone beyond being just hubs in a network. They have become platforms providing services on which other companies build, central to the operation and control of the network. When marketplaces become digital, they become living systems, neither human nor machine, independent of their creators and less and less under anyone's control. (pp. 90-91)

At the individual level, Schwab (2016) identified challenges to identity, privacy (trading privacy for convenience; loss of personal data), issues of ownership, patterns of consumption, balance of work and recreation, career development, skill cultivation, relationships, hierarchical dependencies, and health (p. 97). Humans, when faced with these challenges and our potential augmentation with machines, make us "question the very nature of human existence" (p. 97). Schwab has foreseen increased polarization. An admitted engineer with an enthusiasm for technology, Schwab very soberly worried about "how the integration of technology in our lives will impact our view of identity and whether it could diminish some of our quintessential human capacities as self-reflection, empathy, and compassion" (p. 98). Brynjolfsson and McAfee (2016) returned to a theme that permeates this literature review: some people will be left behind because their capacities do not match the new environment.

Meltdown

Charles Perrow studied catastrophic failure, such as the Three Mile Island nuclear plant meltdown in Pennsylvania in 1979. His findings concluded that the crisis was the result of an organizational problem—a combination of several small failures in the system. Thus, his eventual book, *Normal Accidents* (1999), detailed decision-making mistakes in high technology environments. Perrow determined characteristics that contributed to the functionality, or connection between different parts, of a system, from loose to tight *coupling* and linear to complex *interactions*. His theory and framework help in the understanding of failures or accidents. A nuclear plant, for example, is both complex and tightly coupled, which he implied:

> Our understanding of how it works and what's happening in it is less likely to be correct, and our mistakes are more likely to become combined with other errors in perplexing ways. And tight coupling makes the resulting failures harder to contain…Reducing complexity and adding slack helps to escape the danger zone. (Clearfield & Tilcsik, 2018, pp. 27-28)

A more relevant example to discuss in this dissertation is today's use of a smartphone because of its linkage to many things that were not always connected, such as videos. Once a video is posted or sent to someone, it is amplified by the power of social media, and is instantly a component in a tightly coupled system, "shared at lightning speed; impossible to take down," as added by Clearfield and Tilcsik (2018, p. 37). As systems get more complex, the probability of failure—or meltdown—increases. Consider also, the vulnerability of the Internet of Things (IoT).

Elements of Success

One Pew Research study touched upon the topic of learning. The Pew researchers used a method for understanding literacy by asking questions related to “desire to learn” and “how people learn.” Of interest, there are online programs available of which many in the study were unaware. The rise of the Internet could be a real blessing for the education sector—both for formal, as well as informal learning. The Great Recession of 2008 created a reckoning for many Americans in a changing economy. As jobs became “at-risk,” a “skill recession” (Horrigan, 2016, p. 9) presented itself, and people had to react to new realities. An opportunity for a new education ecosystem arose online that had the “equalizing potential of a new technology on educational outcomes” (p. 10). That said, and hoped, the Pew research revealed that “technology’s role in learning plays out very differently depending on a person’s socio-economic standing” (p. 10). Historically, people have turned to increasing their education in response to technological and social changes. According to Arthur (2009), as human beings “we need challenge, we need meaning, we need purpose, we need alignment with nature. Where technology separates us from these it brings a type of death. But when it enhances these, it affirms life. It affirms our humanness” (p. 216).

A closing remark on the technology trajectory discussion reiterates the coevolution of technology with society. Albert A. Bartlett, a professor of physics at the University of Colorado at Boulder, said: “The greatest shortcoming of the human race is our inability to understand the exponential function” (as cited by Juma, 2016, p. 316).

With that, Juma held hope that in the future policymakers will "pay greater attention to the disjuncture between rapid technological innovation and the slow pace of institutional adjustment.

The literature review shall now pursue the knowledge diffusion trajectory, or Higher Education's modifications through time.

Knowledge Diffusion

The Tradition of Higher Education and the Domain's Approach to Change

The reason why universities may look and feel similar is easy to understand. Colonial America tried to replicate the established European institutions, as best they could. Among the earliest were Harvard, Yale, Johns Hopkins, Cornell, and Massachusetts Institute of Technology (MIT). A century and a half later, our higher education institutions still share common traits—a sort of university DNA (Christensen & Eyring, 2011). The DNA took hold as the pioneering institutions, such as Yale and Harvard, began granting doctorate degrees in the mid-nineteenth century. As these graduates joined other university faculties, they took their experiences with them. From this rose a common academic culture. The common DNA emitted a sense of stability that added great value. Ironically, this same value is what makes higher education less "responsive to modern economic and social realities," according to these authors (p. 21). As the higher education domain has evolved, mutually reinforcing formal and informal systems have urged a "bigger and better—quality and quantity" mantra within many of the larger "resource-rich" institutions, which can make them not only cost-prohibitive for many potential students, but also blind to disruptive technologies (p. 23). Michael Crow, president of Arizona State, pointed out "a lack of institutional differentiation as a liability in American higher education" (as cited by Christensen & Eyring, 2011, p. 25).

Tracing the academic pathway of Harvard from its inception in 1636 to now illustrates the historical patterns of our university culture today. With Puritan beginnings, Harvard was founded on a sacred purpose. There was a president and two or three tutors. It lacked scholarship, or the discovery of new knowledge. Moves away from the "Puritan orthodoxy and dogma" and a focus on clergy education through "rote recitation" led the college toward a new secular and specialized pedagogy whereby program chairs became "endowed" and students were given greater "depth and practicality in their studies" (Christensen & Eyring, 201, p. 37).

A two-hundred year puritan domination of the curriculum ended at Harvard as the nineteenth century appeared. Students were given more choices, such as another language or subject in place of Greek or Latin. Changes in course offerings caused cost increases and complexity to the undergraduate education. Christensen and Eyring (2011) stated:

> Harvard's commitment to it traditional model of higher education was also a reaction to developments in the world beyond the academy. The more things changed around them, the more academic scholars found a sense of stability and safety in the classical tradition. The supposed virtue of the ancients was seen as an antidote to the venality of the new commerce. (p. 42)

"Democracy's Colleges"

Some historians have determined that public education received its start from the 1862 Morrill Land Grant Act, which was legislation that fostered "affordable, practical higher education by state-supported colleges and universities—democracy's colleges" because it created a model of cooperation between federal and state and support for higher education (Thelin, 2011, p. 75). Of note, some say the state university was already in operation by 1862, and that the Act created problems because it was more focused on land use than higher education (pp. 77-78).

Between 1860 and 1890, American institutions were challenged to respond to an attractive commercial and industrial economy yet maintain their “historical missions and traditional audiences”—thus opening to a growing importance of intellect and away from a denominational affiliation (Thelin, 2011, p. 108). As the economy was becoming industrialized, universities found they had to convince families that an undergraduate education was worthwhile and affordable, while holding fast to the institutional desire to educate for character. Americans believed a college education was a passport to middle class. Universities were making choices between mission and market (pp. 108-109).

DNA’s Incremental Changes

A detailed chart that illustrates the timing of Harvard curriculum traits and their implications appears in Appendix F. Some specific traits highlight the development of the DNA within all higher education. In the mid-to-late 1600s, small, face-to-face classes provided intimacy, but also low instructional efficiency, so the lecture was designed. Classical, religious instruction drove moral content, but narrowed the curriculum. Nonspecialized faculty enabled dogmatic instruction with low faculty expertise. One hundred and fifty years later, secularization took hold, as did subject matter specialization, departmentalization, and the creation of summer recess for the purpose of allowing faculty to conduct research, which simultaneously lowered the utilization of physical facilities. Private fundraising began at this time, which diminished dependence on student tuition and state support. The elective curriculum surfaced in the late 1800s to early 1900s. This began a fragmentation of the curriculum by creating a loss of subject matter breadth and depth. During this period graduate programs developed, faculty became more self-governing and began building tenure. College entrance standards were created. Prior to World War II, the residential housing system started. New curriculum divided between a liberal, general education and concentration on majors—and effort to bring back the balance between subject matter breadth and depth. This, however, also created the concept of delegating instruction, so that professors could focus again on their research endeavors. Post war, the cost of running universities was on a major increase, admissions tests arrived, research found external funders, and the Redbook was devised to prescribe requirements of high school students to earn a liberal education. Finally, the Ivy Agreement, made between seven sister institutions, established the Ivy League and an emphasis on athletics (Christensen & Eyring, 2011; Thelin, 2011).

The years between the two world wars saw an expansion of sports, leisure, and fashion on campus life. As Thelin (2011) wrote, college represented "success and excess" (p. 205). But the "golden age" arrived post-World War II. A new term surfaced, "postsecondary education," as politicians and the media highlighted the importance of learning. Thelin placed the postwar growth in perspective, thus:

> In 1939-40, total student enrollment at all colleges and universities was just under 1.5 million. Enrollment dipped during the war. By 1949-50, total student enrollments had ballooned to almost 2.7 million—an increase of about 80 percent in one decade. The figure increased to about 3.6 million in 1960 and then doubled

again over the next decade, reaching over 7.9 million in 1970. (American Council on Education, as cited in Thelin, 2011, p. 261)

Universities – Post WWII

As idealism in the country at-large emerged, so did the spirit spread to universities. Women were admitted to Harvard, and it experienced a rise in government-funded research. Though patterns of thought and behavior were changing, a reemergence of specialization and skepticism occurred as social turmoil entered in the 1950s and 1960s. Other changes occurred after World War II that impacted higher education. Views of a new global economy brought competition worldwide, yet the U.S. experienced a cadre of unskilled factory workers who needed to be educated. The GI bill (resulting from the Servicemen's Readjustment Act) and other federal aid programs also brought many returning soldiers to college. To avert discontent by returning military veterans after the war, Franklin D. Roosevelt and Vice President Harry Truman created the idea of the GI Bill in 1944. It "guaranteed a year of education for every 90 days of service, a month for each month of active duty, for a maximum of 48 months. It also covered tuition, fees, books, and supplies up to $500 a year—paid directly to the institution" (Thelin, 2011, p. 262). There was also a "subsistence allowance" paid to the veteran (pp. 262-263). What surprised even the creators of the bill was the turnout. By the fall of 1945, eighty-eight thousand veterans had applied and been accepted for participation. By 1946, GI Bill college enrollments surpassed one million. Total benefits paid out exceeded $5.5 billion ($48 billion in 2000 dollars)" (p. 263). This, in turn, created the first accreditation process for universities, as they were required to assess their continued institutional eligibility for the federal program. Standardized testing for admissions and placement decisions was initiated (p. 265). With larger enrollments, great building efforts resulted. Importantly, "Students on the GI Bill tended to reinforce the conservative nature of the American campus" (p. 267).

Harvard, according to Christensen and Eyring (2011), "lost sight of a large portion of the potential higher education market, the one below them, in which ordinary high school graduates (and nongraduates) need remedial liberal education and practical career preparation" (p. 128). To remain on their own trusted footing with restrictive enrollments, Harvard found itself raising tuition, seeking alumni philanthropy, and looking for all sorts of ways to increase revenues as it faced unprofitability in its current state (p. 134). Thus, the university model was established that made it more difficult for students to access a path toward graduate school and not the workplace, and a preferred pedagogy of face-to-face instructor/student interaction.

Other changes occurred during the postwar period. President Truman, in 1946, established a Commission on Higher Education, which was the first time the U.S. federal government had touched upon higher education, typically a state and local concern (Thelin, 2011, p. 268). Within the blueprint was a larger role for government in the development of the sciences. A system of competitive grants was created, which began to create well-funded research universities. So successful was the program, that universities had to compete to remain in leadership positions. It gave the government power over institutions that had maintained their academic freedom. Thus, political conflicts emerged that questioned faculty conduct and loyalty. At the same time, Senator Joseph McCarthy was promoting his "Un-American Activities Committee," and questions regarding research for political compliance added tension to the times (pp. 274-276). Termed "the federal grant universities" by 1960, a small percentage of institutions benefited most from the new funding source (p. 278).

Mass higher education gains met with student discontent also in the 1960s. As Thelin (2011) said, "Research universities versus personal small institutions created an unsatisfactory experience for many students. Active unrest took place at a few major state universities—University of California at Berkeley, for example" (p. 307), as college administrators attempted to impose restrictions on academic freedom. The term "establishment" referenced such administrators. Simultaneously, the computer and punch cards developed—a rather big leap into technology that labeled universities as the "knowledge industry." Again, a vocal Clark Kerr (University of California), according to Thelin, "had spoken unabashedly and positively about the ability of the university to meet the needs for developing talent and placing it in the economy of a technological society" (p. 309). This placed the higher education institutions in a prescribed role in society. However, when the war in Vietnam presented itself, none of this association sat well with the politics of the time, and student radicalism only increased.

The period following the 1960s' unrest saw federal funding move to newly created independent institutes for research and the disappearance of supportive legislators, alumni, and the general public. Universities began to realize they needed to formulate strategic missions beyond "to advance knowledge," if they wanted to persist in the goal of "transforming society toward upward mobility" (Thelin, 2011, p. 315). Moreover, Thelin wrote:

> By 1970, one piece of conventional wisdom was that the prototypical American university was under duress because "its center had failed to hold." A more

> discerning variation on this observation was the reminder by academic critics that the essential source of malaise had been misunderstood, and hence misstated. The problem was not that the center had failed, but rather that the modern American university had no center at all. (p. 316)

The 1970s ushered in a period for Harvard that proved heavy with the weight of the DNA, as economic problems and issues of individualism emerged. The university introduced a new “core curriculum” that drew from senior faculty disciplines and raised the quality of knowledge. Gender and race diversified, social responsibility and public service were advocated locally as well as worldwide, though a plan to admit more foreign students was voted down by the faculty (Christensen & Eyring, 2011, p. 173). The climate encouraged faculty to cluster within their own disciplines or departments, losing sight of the larger university. There were concerns about the quality of undergraduate instruction, given a lack of accepted measures of learning (p. 176).

By the 1990s Harvard’s tuition had grown from $2,800 twenty years earlier to $14,860—and tuition only covered 20 percent of the $1 billion-plus operating budget (Christensen & Eyring, 2011, p. 182). Multiple Harvard presidents found the cost trend impossible to control. New to fundraising were faculty. Buildings were more expensive to construct and maintain. Much of the cost increases were driven by new information technology, yet “that technology did little to increase the instructional productivity of the faculty” (p. 184). The university found itself in an inflationary spiral, and with other universities at the time, was critically hurt by the recession of 2008. Harvard experienced an $11 billion drop in endowments (p. 189). Recovery from that has been hard, but the university domain is recovering as it looks to “resize and reshape” (p. 190).

The latter decades of the 20th century witnessed a steady decline of confidence in the American university. Little systematic information was available with which to analyze the problems. Outside reports detailed “overextended university budgets and declining long-term endowments” (Thelin, 2011, p. 318). Also, institutions had begun to harbor the same “DNA,” so differentiation was hard to achieve. The Carnegie Commission was created to classify institutions—"operational definitions that distinguished a ‘research university’ from a ‘doctoral-granting university,’ a ‘comprehensive university,’ a ‘liberal arts college,’ or a ‘two-year college” (p. 320). The Carnegie Classifications were quickly considered a hierarchal ranking scheme and managed to increase the chaos, as schools tried to meet the expected criteria (p. 320). In addition to these issues, other anomalies started to impact university submissions. These included: declining birth rates; the ending of the U.S. military draft (but “college entry for Americans between the ages of eighteen and twenty-two had ceased its attractiveness”); and population migrations from the Northeast and Midwest into the Sun Belt states, leaving vacancies in one area and fewer institutions in the other. Higher education numbers declined by 175,000 in one year from 1975-76—the first drop since the GI Bill participation waned in 1951 (p. 321). Confidence had declined in what the college experience meant.

Finding a New Equilibrium

U.S. institutions of higher learning are resilient. As the 1970s through 2000s brought discomfort and challenge, community colleges grew more than a “fifteen-fold increase” over those decades, spurring growth in part-time, commuting, and non-traditional students (Thelin, 2011, p. 327). This changing demographic required student aid (such as the Pell Grant and the Guaranteed Student Loan Act), which became a preferred portable source of financial aid over federal funding. A career orientation altered studies to include courses and programs in business administration, management, and accounting—precursors to graduate programs in business, medicine, or law (p. 327). It became apparent that colleges had to partner with high schools to ensure a flow of students. Faculty positions by this time had become saturated, so there were fewer college teaching opportunities. Still, higher education was treated in the press as an "endangered sector" (p. 336). States regained the burden of support for their relevant public institutions. Beginning around 1966, "for-profit" institutions emerged (p. 340).

Attempting to Reconfigure for the 21st Century

Ironically, the previous trip through history reveals much repetition in the kinds of ills experienced and successes achieved by U.S. higher education. News in 2019 was filled with the problem of student debt. Federal support for research had tapered, and competition for other grants was highly competitive. Learning environments were challenged to acknowledge, and incorporate, new instructional designs that included technology. Diversity throughout all institutions was growing. Changes occurred in gender representation among students, faculty, alumni, and administration—namely women. The for-profit sector of higher education made large strides—making a strong connection between a college degree and gainful employment, as well as, grasping distance (online) education before many other institutions. Administrative salaries and costs kept rising. Against most previous tradition, universities began to recruit corporate executives to their Boards of Trustees—redefining the separation long held as sacred. It is noteworthy, however, that the Bill and Melinda Gates Foundation and the Lumina

Foundation have guided their support toward students, rather than directly to colleges (Thelin, 2011).

Forces of Instructional Change and Risks of Disruption

"…It is an enterprise that has yet to address the fundamental issues of how academic programs and institutions must be transformed

to serve the changing educational needs of a knowledge economy."

- U.S. Department of Education Spellings Commission Report, 2006

(Christensen & Eyring, 2011, p. 3)

This section of the literature review begins with an analysis of the numbers, as collected by the *U.S. Department of Education's Digest of Educational Statistics* (Snyder, et al., 2019) for the academic year 2016-17. The Digest is a long report, so the data that follows has been selected for the purposes of this dissertation. My intent was to shape today's relevance of higher education—given its history, DNA, and promises—and the onset of digital technology or the "knowledge economy," as described in the Spellings Commission Report, 2006, (Christensen & Eyring, 2011).

General Education Outcomes

The Promise of Labor

Level of education and percentage of people "employed or actively seeking employment" in 2016 produced a correlation as described in the Digest of Education Statistics (Snyder et al., 2019). That is, "the labor force participation rate was generally higher for adults with higher levels of educational attainment than for those with less education" (p. 655). Further,

> Among 25- to 64-year-old adults, 86 percent of those with a bachelor's or higher degree participated in the labor force in 2016, compared with 72 percent of those who had completed only high school and 60 percent of those who had not completed high school. (Snyder et al., 2019, p. 655)

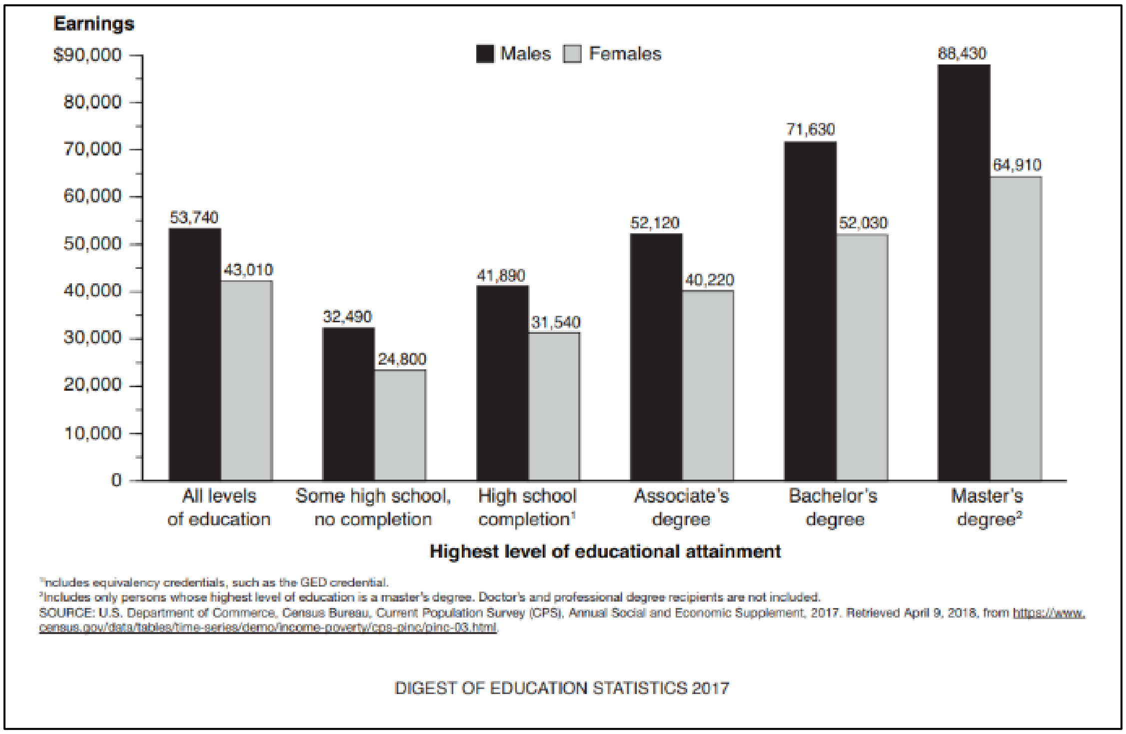
Similar findings were illustrated in the unemployment rate, whereas a higher rate existed with people who had "lower levels of educational attainment"….Within each education level, the unemployment rates for 16- to 19-year-olds and 20- to 24-year-olds tended to be higher than the unemployment rate for 25- to 64-year-olds" (Snyder et al., 2019, p. 655).

The Promise of Earnings

The Digest (Snyder et al., 2019) found "median annual earnings to be higher for adults with higher levels of educational attainment. Both males and females, with more education, generally earned more than their counterparts of the same sex who had less education" (p. 356). Figures 23 and 24 present this picture.

Figure 23

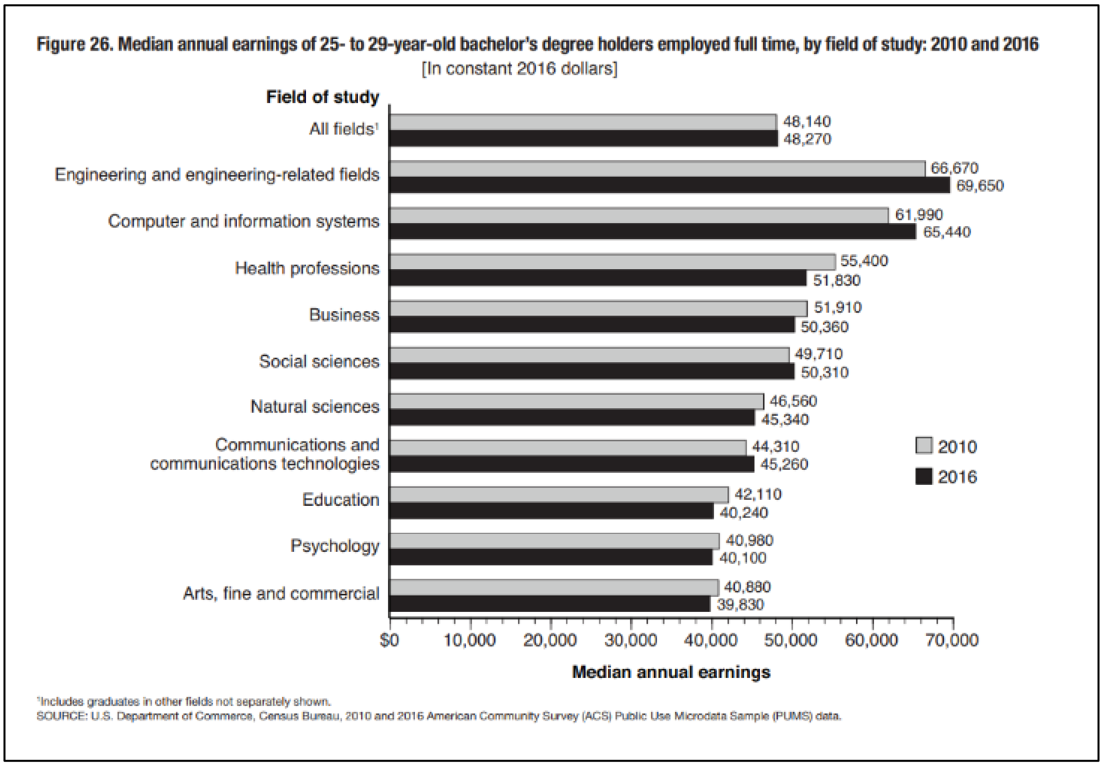
"Median annual earnings of full-time year-round workers 25 years old and over, by highest level of educational attainment and sex: 2016



(Snyder et al., 2019, p. 658)

Figure 24

"Median annual earnings of 25- to 29-year-old bachelor's degree holders employed full time, by field of study: 2010 and 2016 (in constant 2016 dollars)"



(Snyder et al., 2019, p. 659)

Changing Demographics in Higher Education Enrollment

The Digest (Snyder et al., 2019) housed information obtained for Tables 2 – 5, and Figure 25, which detail enrollment overall, and specifically by factors of public/private, race/ethnicity, gender, undergraduate, and graduate.

Table 2

College Enrollment (in thousands

	1990	2000	2010	2016
Total	**13,819**	**15,312**	**21,019**	**19,841**
Males	6,284	6,722	9,046	8,636
Females	7,535	8,591	11,974	11,205
Public	10,845	11,753	15,142	14,583
Private	2,974	3,560	5,877	5,258

Note. "Enrollment in 2-year and 4-year colleges **rose 37 percent** from 15.3 million in fall 2000 to 21.0 million in fall 2010, and then **decreased 6 percent** to 19.8 million in fall 2016. In fall 2016, 8.6 million students were **males** and 11.2 million were **females"** (Institute of Educational Sciences National Center for Education Statistics https://nces.ed.gov/programs/digest/mobile/)

Note an enrollment increase from 2000 to 2010, but a decrease from 2010 to 2016. Also, a higher number of females versus males enrolled across the years.

Table 3

College Enrollment by Race and Ethnicity

	1990	2000	2010	2016
Total	**100.0**	**100.0**	**100.0**	**100.0**
White	79.9	70.8	62.6	56.9
Black	9.3	11.7	15.0	13.7
Hispanic	5.8	9.9	13.5	18.2
Asian/Pacific Islander	4.3	6.6	6.3	6.9
American Indian /Alaska Native	0.8	1.0	1.0	0.8
Two or more races			1.6	3.5

Note. The White population has steadily decreased while Hispanic students have increased. (*Source:* Institute of Educational Sciences National Center for Education Statistics https://nces.ed.gov/programs/digest/mobile/)

Note white and black enrollments are decreasing while Hispanic enrollments are growing. Also, the number of students identifying as two or more races has increased.

Table 4

Undergraduate Enrollment

	1990	2000	2010	2016
Total	**11,959**	**13,155**	**18,082**	**16,869**
Males	5,380	5,778	7,836	7,414
Females	6,579	7,377	10,246	9,455
Full-time	6,976	7,923	11,457	10,431
Part-time	4,983	5,232	6,625	6,439

Note. Total undergraduate enrollment rose from 1990 to 2010 but declined in 2016. (*Source:* Institute of Educational Sciences National Center for Education Statistics https://nces.ed.gov/programs/digest/mobile/)

Table 5

Postbaccalaureate Enrollment

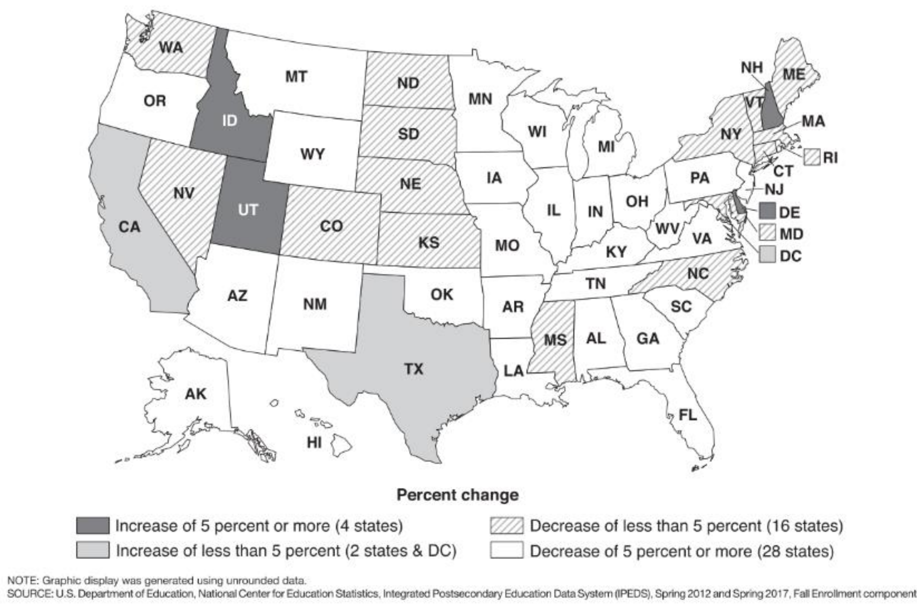
	1990	2000	2010	2016
Total	**1,860**	**2,157**	**2,937**	**2,972**
Males	904	944	1,209	1,221
Females	955	1,213	1,728	1,750
Full-time	845	1,087	1,630	1,696
Part-time	1,015	1,070	1,307	1,276

Note. Postbaccalaureate enrollment increased steadily from 1990 through 2016. (*Source:* Institute of Educational Sciences National Center for Education Statistics https://nces.ed.gov/programs/digest/mobile/)

Note undergraduate rolls have declined while graduate rolls have increased. Also, full-time graduate enrollment has grown larger than part-time since 2000.

Figure 25

"Percentage change in total enrollment in degree-granting postsecondary institutions, by state: Fall 2011 to fall 2016"



(Snyder et al., 2019, p. 386)

In an analysis relevant to instructional design, the Digest of Education Statistics (Snyder et al., 2019) found the following in 2016:

- Of the 19.8 million students enrolled in degree-granting postsecondary institutions, 17 percent took at least one distance education course as part of their program that included a mix of in-person and distance education courses;
- Fifteen percent of students enrolled exclusively in distance education courses;
- Sixty-eight percent of students took no distance education courses;
- In public institutions, about 11 percent of students took their coursework exclusively through distance education courses, compared with 18 percent of

students at private nonprofit institutions and 59 percent of students at private for-profit institutions.

- About 13 percent of undergraduates took their coursework exclusively through distance education courses, compared to 28 percent of postbaccalaureate students (Snyder et al., 2019, p. 381).

Sixty percent of students were enrolled in large (10,000 or more) student campuses, despite the flourishing count of small degree-granting colleges. In fact, the remaining institutions had fewer than 1,000 students each. Again, by the fall of 2016, the institutions with the highest enrollment (at the inclusion of all distance education and on-campus enrollment) were “University of Phoenix, with 131,600 students; Western Governors University, with 84,300 students; Ivy Tech Community College, with 78,900 students; Grand Canyon University, with 75,800 students; and Liberty University, with 75,800 students” (p. 381).

Computer and Internet Use and Higher Education

According to the Digest (Snyder et al., 2019), race and ethnicity factored into the percentage of children with digital devices in their households. For example, 95 percent of Asian children had a desktop, laptop, or smartphone in their household in 2016, other races were less (p. 765). Likewise, according to Snyder et al., “the percentages of children living in households with various types of devices were generally higher for children whose parent(s) had higher levels of educational attainment than for those whose parent(s) had lower levels of educational attainment” (p. 766). Regarding Internet usage among persons aged 25 and over, higher “levels of educational attainment” also correlated with usage (p. 765).

The Risk of Disruption

Failing to Address the Disenfranchised

Returning to the 2006 Spellings Commission Report findings, Christensen and Eyring (2011) portended disruption in higher education before having access to the recent study by the U.S. Department of Education (Snyder et al., 2019). They cited "serious indictments: that fewer U.S. adults are completing post-high school degrees; that the costs of attending college are rising faster than inflation; that employers report hiring college graduates unprepared for the workplace" (p. 4)—just samples of the problems facing higher education before exponential digital technology growth has begun to make an impact on the educational mission.

The for-profit institutions were first to use online learning technology. Their educational model introduced a disruptive one. These schools found success with students who are working adults and who seek content, low cost, and convenience over the institution's prestige (Christensen & Eyring, 2011, p. 10). Further, the "cost to attend a public college has risen by 30 percent, while the earning power of a bachelor's degree remained roughly the same" (p. 13).

Christensen's original thoughts in *The Innovator's Dilemma* (2016) play out precisely. He showed that the continuous effort to enhance performance at some point exceeds customer performance needs. When this occurs, "the producer is incurring greater costs and thus must raise prices" (p. 14). Universities believe they are managing well. Hence, Christensen and Eyring (2011) have arrived at the conclusion that the system risks disruption. As university administrators and faculty strive to improve their product—giving student customers more of what they want and reacting to their competitors—"they overlook what is going on beneath them" (Christensen and Eyring, 2011, p. 16).

Failure to Address Change

Perhaps the absence (until now) of disruptive technology has held the steady state. Instructional design and learning technologies have remained in the realm of textbooks, lectures, and oral and written examinations. Computers may have only been introduced to augment university learning, not unseat it.

Coming in from the fringe (as Webb, 2017, would say) is the disruptive technology of online learning, which is causing a rethinking of the traditional higher education model. Notably, the technology has now been used for a decade, but still does not get adequate attention. Online instruction technology has improved as the speed of the Internet and related communications has increased. Economic downturns have forced cost-cutting at traditional universities, giving a new financial edge to the for-profit educators. Moreover, digital natives have reached college age. They were raised with computers, texting, gaming, Google, and Facebook. Online enrollments are outgrowing traditional campus enrollments.

Implications for Digital Learning and Execution Strategy

The Society for College and University Planning published an article in their house journal in 2015 portending a "sea change in the evolution of the campus into a technology-rich virtual learning environment… a growing library of online educational content and a pedagogical move toward student-centered, project-based, experiential learning" (Park, 2015, p. 12). Competency-based learning is gaining support by accreditation agencies, whereby “students learn at their own pace and not within a predetermined block of time and course of study, i.e., death of the credit hour” (p. 12).

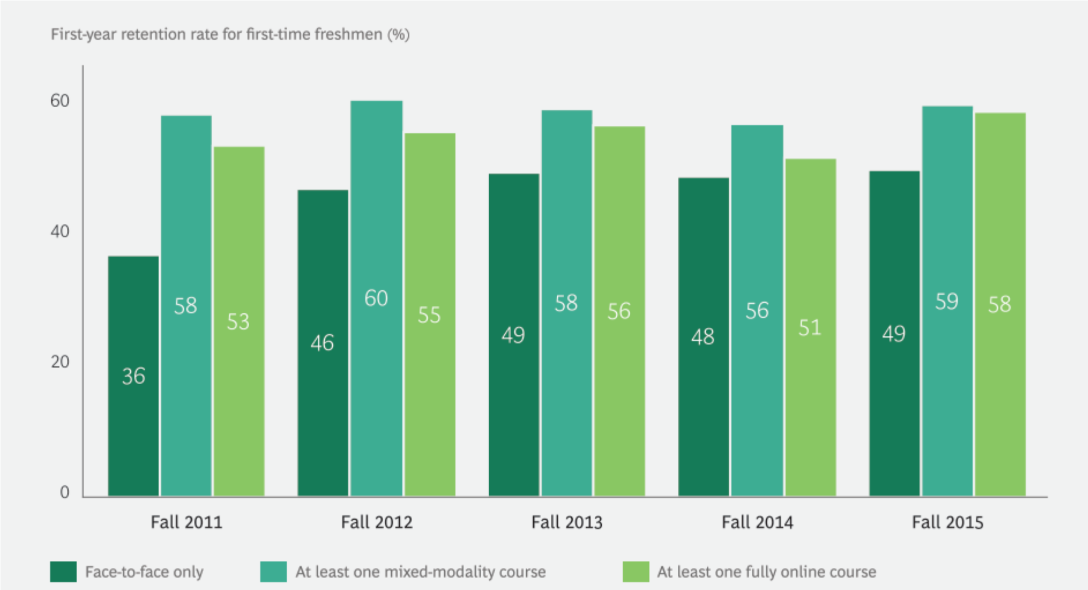
While universities attempt to weather this storm of change, significant research is occurring in the field of instructional design and learning outcomes. Boston Consulting Group (BCG) conducted joint research with Arizona State University (Bailey, et al., 2018) using a case study approach with six U.S. institutions: Kentucky Community and Technical College System, Houston Community College, the University of Central Florida, Rio Salado College, Georgia State University, and Arizona State University. The Bill and Melinda Gates Foundation provided a grant for the study. Their research questions included: “How can the use of digital technologies in postsecondary education impact students’ access to education, student outcomes, and the return on investment for students and institutions? What are the biggest challenges for an institution seeking to implement high-quality digital learning opportunities? What promising practices enable an institution to achieve impact at a larger scale?” (p. 5). The methodology was specifically designed to examine digital learning’s return on investment (ROI). The researchers also investigated four other national surveys that addressed similar issues of access, academic performance, and financial impacts. Interestingly, they did not look at anything dated prior to 2013. Also, there was no outright mention of the incorporation of conflict studies. (Bailey et al., 2018). The findings revealed that greater than one-third of current college students are 25 years or older. “The shrinking shelf life of skills may soon render the one-and-done approach to higher education obsolete” (p. 3). The researchers also cited the maturity of certain instructional digital technologies, while there are advances in “adaptive learning and artificial intelligence, which are able to transform the learner experience in ways never imagined possible" (p. 4). Yet, they claim, "The most promising byproduct of digital learning may be an explosion of data that indexes learner behavior and is opening doors to pedagogical innovations rooted in an unprecedented understanding of the learning science" (p. 3). Most critical about the Bailey et al. study is that it considered individual (university) contexts to discern some "promising practices" for other universities to adopt, whether they are configuring enrollment growth or addressing funding declines (p. 5). The encouragement of a strategic approach to digital learning and investing produced three critical outcomes: "improved access, improved financial picture, and improved academic outcomes" (p. 10).

The value of reading this source material was revealed in the challenges the researchers faced in answering their research questions through a case study approach. Bailey et al. (2018) expressed the challenge of selecting universities, as the team found it difficult to find "scaled implementations of digital learning in the field today" (p. 18). Another challenge was how important it was to secure "rigorous and deep institutional data" and how different the sources of information were within each university studied—for instance none of the universities had a budgetary line item for online learning (thus expense monies were spread across multiple departments) (p. 18). A third was evaluating different scales of operation between the smaller to the larger institutions.

This literature review includes a few key finding graphs from the Bailey et al. (2018) study. Please see Figures 26 – 27. Note that the following sets of findings are from a pre-COVID-19 era.

Figure 26

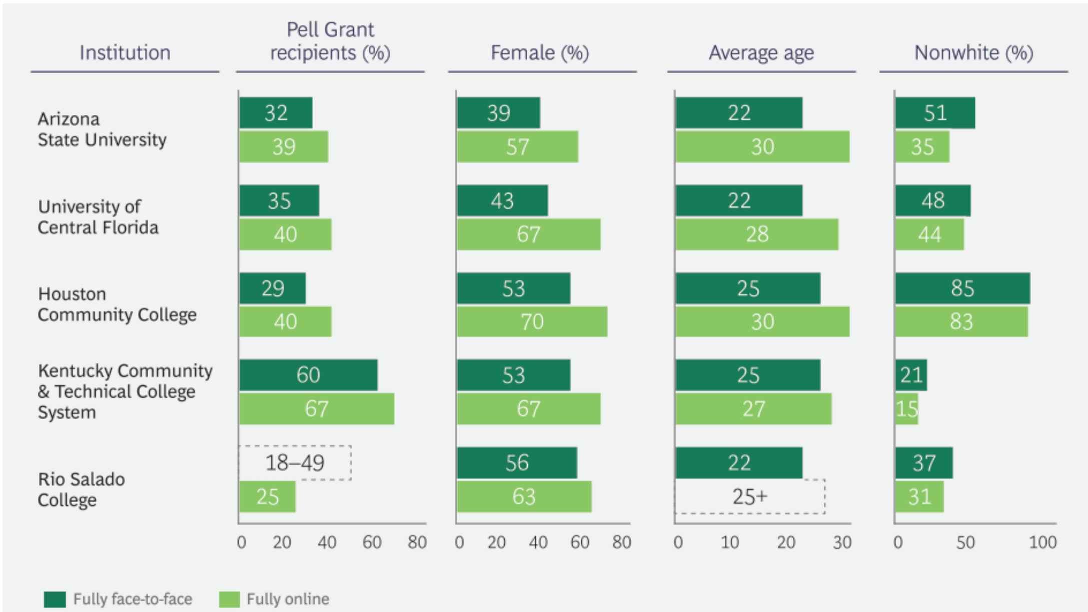
First-Time Houston Community College (HCC) Freshmen Who Took at Least One Digital Course Had Above-average Retention Rates (Bailey et al., 2018, p. 21)



Sources: HCC Office of Institutional Research; BCG analysis.
Note: Number of returning students > 1,000 for each category.

Figure 27

Female Students, Older-than-average Students, and Pell Grant Recipients Are More Likely to Take All Classes Online (Bailey et al., 2018, p. 25)



Sources: Institutional data; BCG analysis; IPEDS.
Note: Rio Salado has no traditional face-to-face offerings, so comparisons are based on the average of the Maricopa County Community College District; Rio Salado is one of ten colleges in the district; and because data on Pell Grant recipients is not available, estimates are derived from the other nine colleges. The relatively low Pell share overall at Rio is likely due to the fact that students must declare their intention to receive a credential to be Pell eligible (and eventually receive Pell funding), and 24% of Rio's students are concurrently enrolled in another institution. Average age is not available for Rio Salado; however, 57% of students at the other nine campuses are older than 25.

Contrary to a look at just equipment, software, and traditional teaching is the thought of who should be involved in decisions on implementation. Masullo (2016) identified the value of opinion leaders and others when technology is being evaluated and integrated. The "change agents," as Masullo described, can come from different corners of the university: the faculty/educator or the technology coordinator. It is vitally important that the change agent is an "opinion leader and able to influence attitudes and behaviors" (p. 34). His views followed those of Rogers (2003).

Traxler (2018) identified attitudes and skills as a likely "barrier to change," naming two concepts: "digital literacy" and "connectivism," because they describe "those skills, attitudes, access, and competences necessary for individuals, and perhaps communities, to flourish in an increasingly digital world" (p. 9). Traxler's concluding words expressed a need for "a more complete understanding of a fluid, partial, and complex environment which education cannot operate in ignorance or isolation" (p. 9).

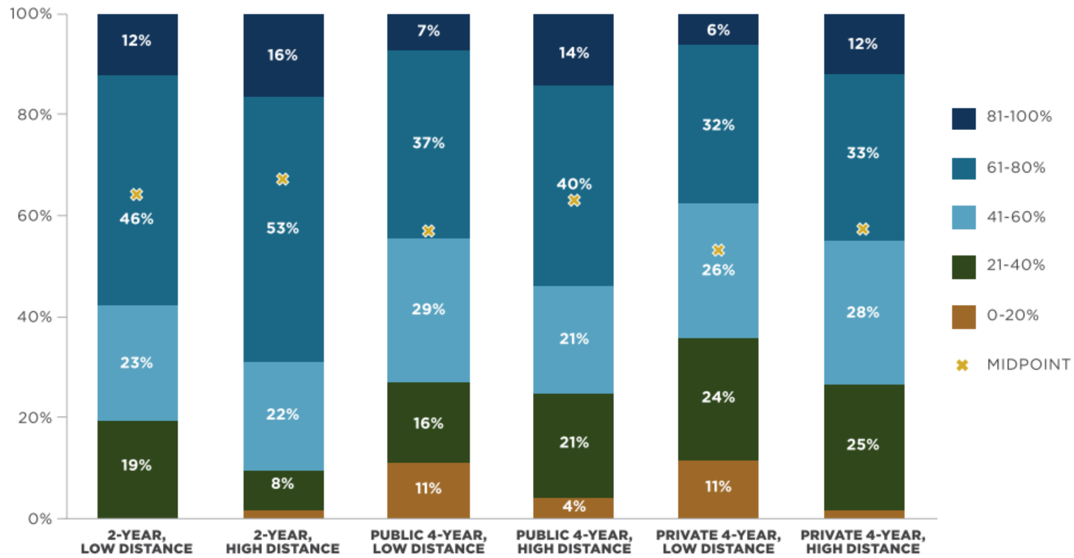
Lammers et al. (2017), or Tyton Partners, furnished a report: *Lessons for the Future of Digital Learning in Higher Education* upon surveying faculty and administrators. Though the report states many benefits, it also expressed impediments that can impact scaled, effective implementation. These are, briefly:

1. The planning and execution of digital learning initiatives is falling short of "strategic" at many institutions.
2. Faculty are a linchpin in digital learning success, yet they are woefully under supported.
3. Digital learning decision-making is decentralized.
4. Low courseware product satisfaction inhibits larger-scale adoption. (Lammers et al., 2017, pp. 6-7)

The research team offered a set of findings, via graph format, worth reproducing here. See Figures 28 – 34.

Figure 28

Progress Toward Digital Learning Implementation Relative to Strategic Plan

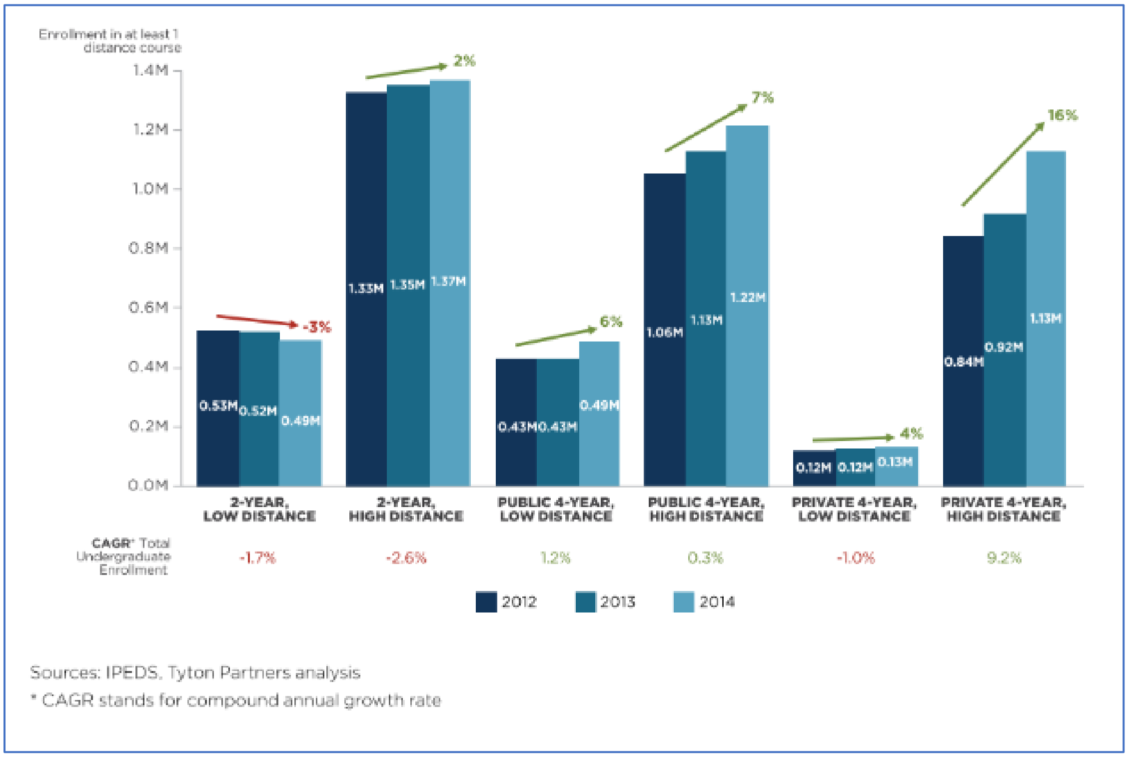


Administrator Survey Question: How far along is your institution toward implementing digital learning in relation to its strategic plan? (On a scale of 0-100%)

(Lammers et al., 2017, p. 8)

Figure 29

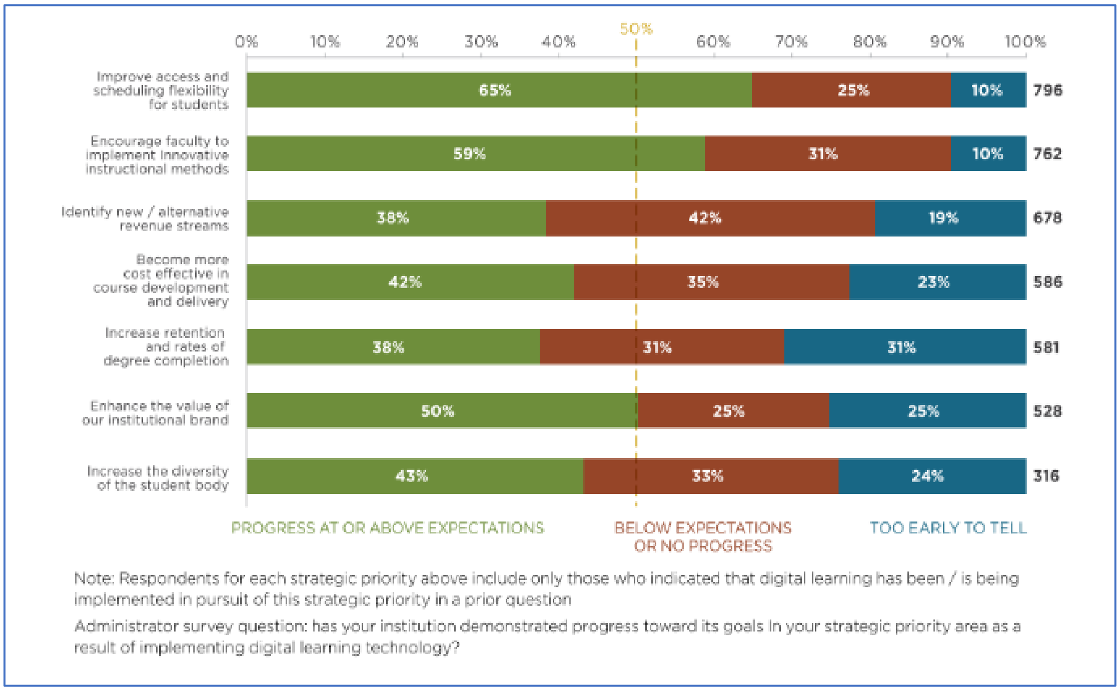
Undergraduate Distance Learning Over Time



(Lammers et al., 2017, p. 11)

Figure 30

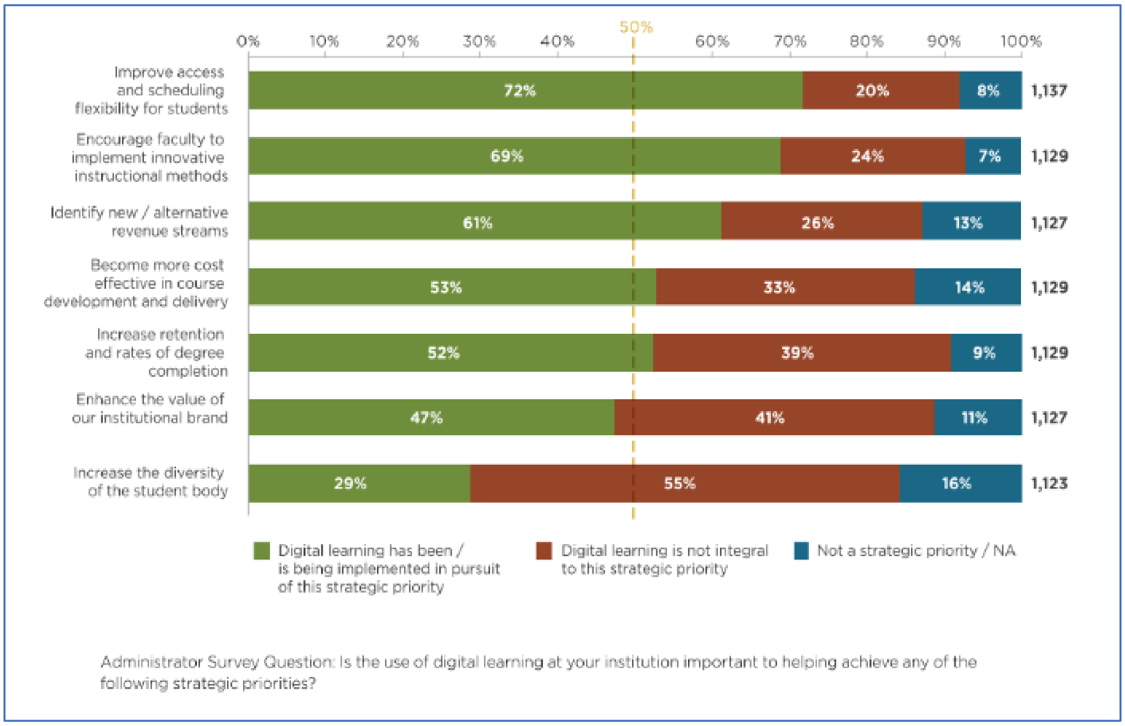
Extent of digital learning implementation in support of institutional strategic priorities



(Lammers et al., 2017, p. 12)

Figure 31

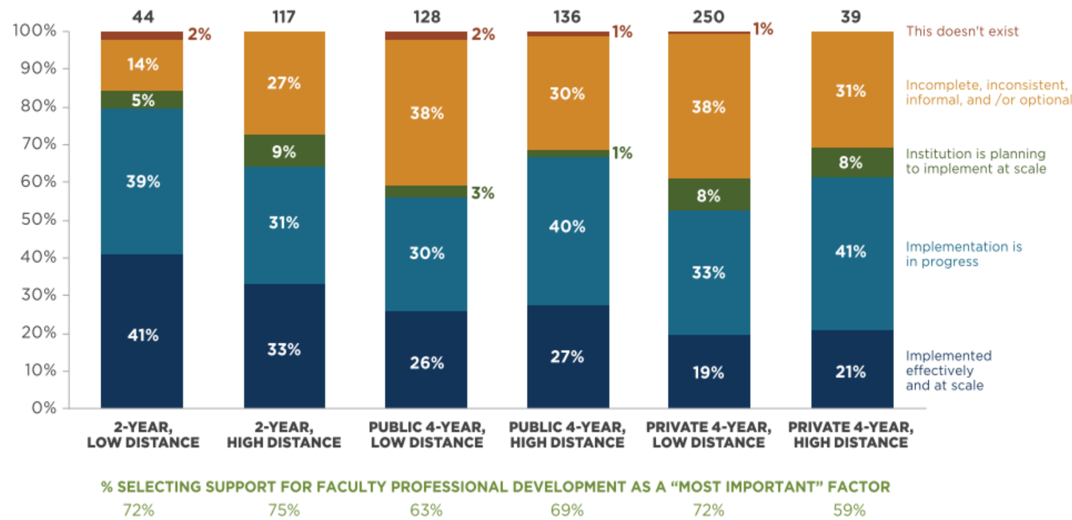
Progress toward goals as a result of digital learning implementation



(Lammers et al., 2017, p. 13)

Figure 32

Scale of professional development support for digital learning implementation



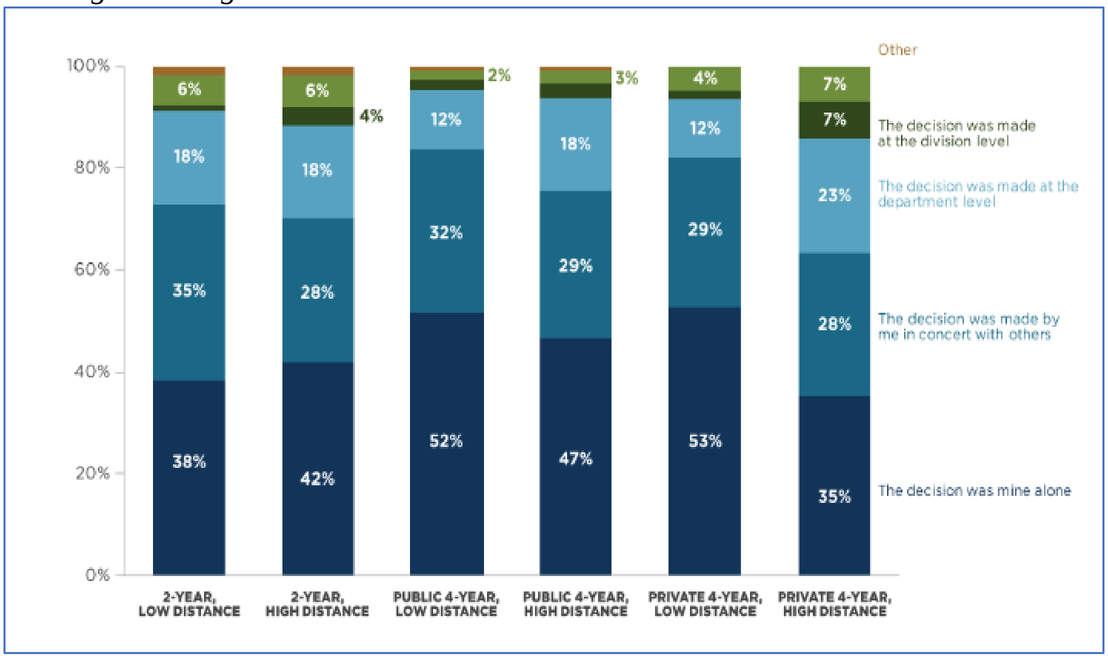
Note: Respondents to this question include only those who indicated that "support for faculty professional development" is among the top three most important factors contributing to a successful implementation of digital learning in a prior question.

Administrator Survey Question: To the best of your knowledge, how broadly does "support for faculty professional development" exist at your institution? Please rank your institution as it relates to digital learning.

(Lammers et al., 2017, p. 15)

Figure 33

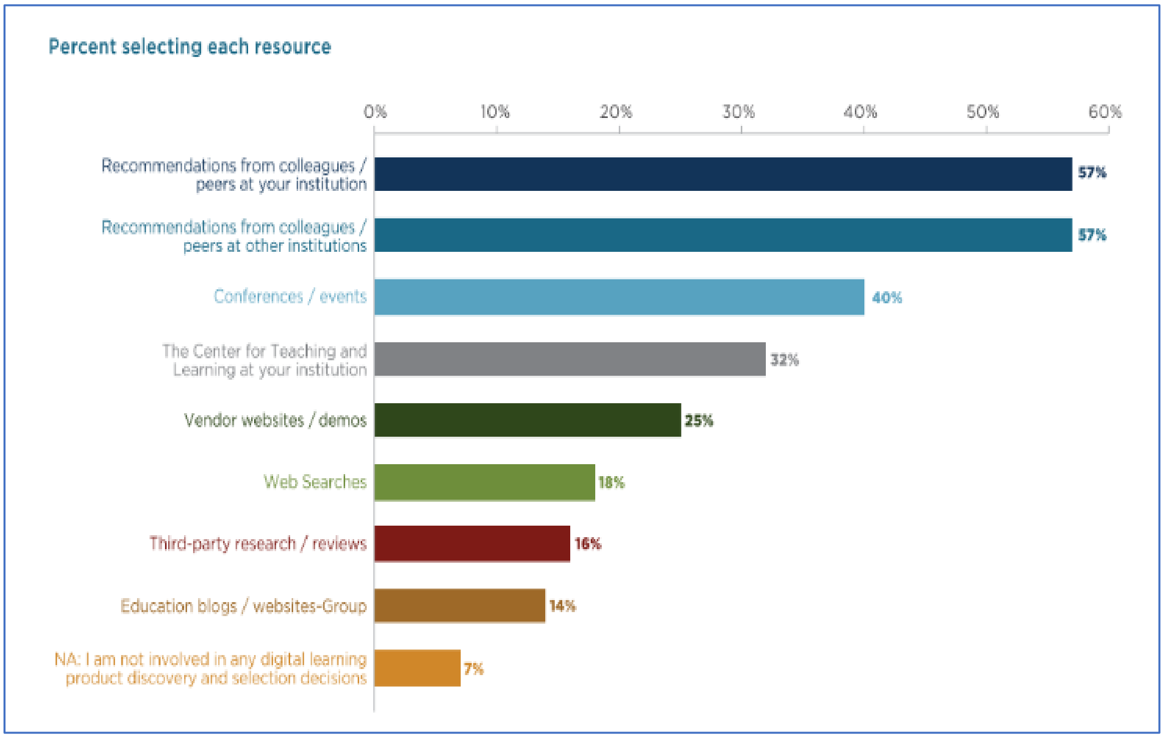
Faculty question: for the course you have selected, whose decision was it to embark on its design/re-design?



(Lammers et al., 2017, p. 32)

Figure 34

Administrator question: which of the following resources are most valuable to inform your digital learning product discovery and selection



(Lammers et al., 2017, p. 33)

A final thought for the discussion about the portent of innovations in instructional design and execution is reserved for a study conducted by Choppin and Borys (2017), in which "trends in design, development, and use of digital curriculum materials" (p. 663) were assessed. Better than any source so far, these researchers succinctly identified four perspectives on this topic: "designer perspective, policy perspective, private sector perspective (publishers and philanthropists), and user perspective (teachers and schools)" (pp. 666-670). Most perceptively, Choppin and Borys identified "the emergence of a dominant perspective [that] speaks to broader concerns about educational priorities being formulated according to a market-based rationality" (p. 663), which was later identified as social mobility. Theirs was a heuristic study of a plethora of materials that included practitioner literature (educational resources), policy documents, reports and evaluations, books, and peer-reviewed articles. They wrote of the “promise of digital programs, as well as the limitations” (p. 663). Like the literature review thus far, the researchers identified transformative features of digital technologies; “multiple forces informing the design, dissemination, and use” (p. 663); and tensions or conflicting perspectives. Citing Labaree (1997), Choppin and Borys relayed three competing goals, or priorities, of education in the U.S.: “democratic equality, social efficiency, and social mobility” (p. 663). Illustrated by their research were “greater interactivity, greater individualization and customization, increased and varied social interactions, lower cost and greater accessibility, and having embedded assessment systems” (Choppin & Borys, 2017, p. 664). However, different assumptions are made about these qualities, depending upon the perspective group, as conceived by the researchers, which impact their transformative capacity. Table 6 illustrates briefly the four perspective groups and the features, relative discourse, and resource requirements. These perspectives, according to Choppin and Borys (2017), “highlight the complexity of the digital space, and the potential for the pace to become dominated by a limited range of discourses” (p. 670). Further, some digital product features ignore the needs and/or reduce the role of teachers.

Table 6

Tensions Between Perspectives in Terms of Design Features and Teacher Capacity

Emphasis and Impact	Perspectives on design and dissemination of resources			
	Designers	**Private Sector Entities**	**Policy Makers**	**Users**
Features emphasized	Highly interactive; strong emphasis on collective interactions; rich tasks	Adaptive assessment; individualized learning; learning management systems	Open education resources; individualized or customized learning	Resources that reduce administrative and management demands; resources that fit into existing practices and systems
Discourses used to justify features	Research on teaching and learning	Market-based discourses; managerial efficiency	Access; individualization and customization	Pragmatic; managerial efficiency
Resource requirements and potential to develop capacity related to features	High resource commitment; high potential to develop capacity	High resource commitment; low potential to develop capacity	For OER, low resource commitment; moderate potential to develop capacity	Mixed potential for high resource commitment; mixed potential to develop capacity

(Choppin & Borys, 2017, p. 671)

Level of Digital Use in Higher Education and Discourse Among Stakeholders

For fifteen years, the EDUCAUSE Center for Analysis and Research (ECAR) (Galanek & Gierdowski, 2018) has conducted an annual study of information technology and undergraduate students. The data is gathered "to understand students' perspectives on how technology impacts their academic experiences and how they are using technology to enhance their academic success" (p. 4). For the ECAR 2018 report, 64,536 students participated (the number representing nine countries, thirty-six American states, and 130 institutions). The researchers stressed that the "priorities, strategic vision, and culture of an institution will affect the meaning and use of the findings" (p. 4).

Key findings from The ECAR Undergraduate Students and Information Technology 2018 Study (Galanek & Gierdowski, 2018, pp. 5-6), include:

- Practically all college and university students have access to the most important technologies for their academic success.
- While laptops, hybrids, desktops, and smartphones continue to be rated as very to extremely important to student success, the importance of these devices differs considerably by student demographics.
- Students' overall technology experiences continue to be correlated with their evaluation of campus Wi-Fi reliability and ease of login.
- LMS [Learning Management System] use remains prevalent across higher education institutions, with continued high rates of use and student satisfaction.
- A majority [of students] continue to express preferences for learning environments that fall somewhere on the "blended" continuum (from mostly face-to-face to mostly online).
- Although a majority [of students] said their instructors use technology to enhance their pedagogy, improve communication, and carry out course tasks, there are limitations when it comes to personal device use.

- Nearly three-quarters of students (72%) who live off campus reported their internet connections at their home/off-campus residence are either good or excellent, and only 2% reported having no internet access at home.
- A plurality of students who self-identify as having a physical and/or learning disability requiring accessible or adaptive technologies for their coursework rated their institution's awareness of their needs as poor.
- Students continue to view student success tools as at least moderately useful.

Similarly, ECAR conducts annual faculty and information technology surveys. The latest available results are from 2017. Key findings from The ECAR Study of Faculty and Information Technology, 2017 (Pomerantz & Brooks, 2017, pp. 6-7), include:

- Faculty are quite happy with the technology and support provided by their institution.
- Technology training offered to faculty is an opportunity to "train the trainers."
- Faculty are critical to raising awareness among students about technology training offered to students.
- Faculty have confidence in their institution's ability to safeguard their data and that of their students.
- Many faculty [members] buy their own personal computing devices.
- Despite the increasingly widespread use of student success management systems in higher education, many faculty [members] do not use them.
- The LMS that is implemented at an institution has little impact on faculty members' use of it or their satisfaction with that use.

- Faculty have a love–hate relationship with online teaching and learning: They don’t want to do it but think they would be better instructors if they did.
- Faculty are self-selecting into the teaching modalities that they believe in.
- The greater a faculty member’s skill in classroom management, the more likely the faculty member is to encourage or require students to use devices in the classroom.

A third survey was conducted jointly by Gallup and Inside Higher Ed. Here are the key results from *Inside Higher Ed’s Key Findings – 2018 Survey of Faculty Attitudes on Technology* (Jaschik & Lederman, 2018, pp. 7-8):

- The proportion of faculty members who have taught online courses continues to increase.
- The [vast] majority of instructors who have taught online courses, 89 percent, say they have been involved in the design of those courses.
- A minority of faculty members have used an instructional designer to help create or revise an online or blended course (25 percent) or to create or revise a face-to-face course (22 percent).
- Professors who have worked with instructional designers have had good experiences with them: 93 percent say their experience was positive, and 37 percent say it was very positive.
- More than 7 in 10 faculty members who have taught online courses say the experience has taught them skills that have improved their teaching.

- Seventy-three percent of digital learning leaders and 33 percent of faculty members describe themselves as “early adopters” of new educational technologies.
- Three-quarters of faculty members, and nearly all digital learning leaders, say they fully or somewhat support the expanded use of educational technologies.
- Since 2013, increasing numbers of faculty members report they “always” use their institution’s learning management system (LMS).
- One in three faculty members say they use digital courseware offerings.
- Digital learning leaders believe far more than faculty members do that online courses can achieve learning outcomes that are equivalent to in-person courses at higher education institutions.
- Faculty members tend to believe in-person instruction is more effective than online teaching.
- Faculty members, including those with online teaching experience, are more likely to disagree than to agree that using digital educational tools can lower per-student cost of instruction without hurting quality.
- Majorities of faculty members (65 percent) and digital learning leaders (51 percent) agree that administrators and vendors who promote the use of technology in education exaggerate the potential financial benefits.
- Digital learning leaders tend to hold a positive view of their institution’s support for online learning programs.

- Just over half of faculty members (56 percent) say they are very or somewhat confident in the methods their institution uses to verify the identity of online students.
- Both faculty members and digital learning leaders tend to favor a limited role for online program management companies in higher education.
- Faculty members and digital learning leaders widely believe that textbooks cost too much (83 percent and 92 percent, respectively) and that colleges should embrace the use of free open educational resources (70 percent and 89 percent, respectively).
- Half of digital learning leaders and 40 percent of faculty members say inclusive access platforms are achieving their two primary goals of reducing course material costs for students and improving education outcomes.
- Faculty members tend to hold more negative than positive attitudes about assessment efforts designed to measure student learning and outcomes.
- Sixty-nine percent of faculty members say their institution provides training on how to make course materials compliant with the Americans with Disabilities Act.

Green (2018) conducts an annual survey related to information technology in American Higher Education. Oriented more on IT resources, highlights of the report conducted with 242 institutions, *Campus Computing 2018*, can be found in Table 7.

Table 7

Campus Computing 2018 Key Findings

Rank	Issues	Challenges
1	IT Data Security (86%)	• Just 35% rate IT security as "excellent"
2	Hiring/Retaining IT Talent (74%)	• Four-fifths (79%) report it is hard to hire/retain IT talent because of off-campus competition and salaries
3	Leveraging IT to Support Student Success (68%)	• Only 40% say IT investments to support student success efforts have been very effective
4	Assisting Faculty with the instructional integration of IT (58%)	• Just 15% rate IT training for faculty as "excellent" • Only an eighth (12%) of campuses include faculty IT instructional initiatives as appropriate for promotion
5	Learning and Managerial Analytics (57%)	• Less than a fifth (19%) rate investments in data analytics as "very effective"

(Green, 2018, p. 5)

Other data pulled from the *Campus Computing Report* illustrates how much faith campus CIOs have in the benefits of digital technologies. According to Green's (2018) findings:

- 96 percent of CIOs believe adaptive learning technology has great potential to improve learning outcomes for students.
- 92 percent believe digital curricular resources provide a richer and more personalized learning experience than traditional print materials.
- 94 percent believe digital curricular resources make learning more efficient and effective for students.

- 29 percent believe efforts to go “all digital” with course materials will be impeded by the fact that many students do not own the digital devices—computers or tablets—they need to access digital content and resources. (Green, 2018, p. 9)

The Level of Digital Awareness and Literacy in Higher Education

Webb (2016) identified a trend that affects companies (or institutions): “everyday people, not just programmers, are able to reconfigure smartphones to their liking, adding and removing apps as they design their own digital experiences” (p. 81). Though this won’t put IT professionals out of work at universities, it will move some burden to the faculty when requirements increase for a digital pedagogy. It is worth mentioning now, the different digital technologies and areas of concern that Webb and her team at the Future Today Institute (2019) have determined should be of interest to universities and colleges. Though many may not relate to the bounded study on instructional design, the list in Table 8 is daunting and makes one pay attention to digital literacy.

Table 8

Important Tech Trends for Education – Universities and Colleges

Important Tech Trends in Higher Education		
Consumer-Grade AI Applications	Customized Machine Learning	Virtual Reality
Ubiquitous Digital Assistants	AI for the Creative Process	Streamers
Bigger Role for Ambient Interfaces	Bots	Connected TVs WebRTC
Deployable AI Versions of You	Biometric Scanning	Streaming Social Video
Ongoing Bias in AI	Voiceprints	eSports
Accountability and Trust	Gesture Recognition	Mixed Reality Arcades
AI Cloud	Personality Recognition	MMOMRGs
Ambient Surveillance	Emotional Recognition	VR for Marketing
Proprietary, Homegrown AI Languages	Bone Recognition	Green Tech
Marketplaces for AI Algorithms	Genetic Recognition	Anthropocene Extreme
Real-Time Machine Learning	Universal Genetic Databases	Weather Events
Natural Language Understanding	Behavioral Biometrics	Human Migration Patterns Shift
Machine Reading Comprehension	Wi-Fi Recognition	Corporate Sustainability
Natural Language Generation	Ambient Tracking	Cannabis Technologies
Generative Algorithms for Voice, Sound, and Video	Persistent Recognition	Digital Addiction
Real-Time context in Machine Learning	Bias in Recognition Technologies	Patient-Generated Health Data
General Reinforcement Learning Algorithm	Security	The Big Nine's Health Initiatives
Machine Image Completion	Privacy	Interactive Mirrors
Hybrid Human-Computer Vision Analysis	Data	Vaping and E-Cigarettes
Predictive Machine Vision	EV Mechanics and AV Engineers	Wearables
Much Faster Deep Learning	Robot Abuse	Universal Basic Income (UBI)
Reinforcement Learning and Hierarchical RL	3D Printing	AI in Hiring
Continuous Learning	Natural Language Generation to Modulate Reading Levels	Productivity Bots
Multitask Learning	Crowd-Learning	Adaptive Learning
Generative Adversarial Networks (GANs)	Synthetic Data Sets	Nanodegrees
New Generative Modeling Techniques	The Case for Radical	Sharing Economy & Lendership
Capsule Networks	Transparency	Blockchain Technologies
Probabilistic Programming Languages	Next-Gen Native Video and	Cryptocurrencies
Automated Machine Learning (Auto-ML)	Audio Story Formats	Self-Sovereign Identity
	Digital Frailty	Web 3.0
	Algorithmic Fact Checking	Immutable Content
	Optimizing for Voice Search	Distributed Computing for a Cause
	Media Consolidation	Social Payments
	The First Amendment in a Digital Age	Smart Cities
	Social Tweaks to Social Network Algorithms	Smart City Initiatives
	Holograms	City-Level Cyber Security
	360-degree Video	Splinternets
	Augmented Reality	Trying to Regulate Big Tech

Source: Future Today Institute, 2019, pp. 39-40

Discourse in Higher Education

The traditional role of the professoriate is being challenged in this evolution of the learning space. A polarization of views has indeed begun to surface between the visionary academic and the traditional one. Georgia Tech educator DeMillo (2011) described the fate of American colleges and universities as "institutions on a path to marginal roles in a much different world" (p. 3) than that for which they were designed. DeMillo advocated the need to create a new value system that represents "universal access, open content, and reliance on new technologies" (p. 25), and he proclaimed the irony of a system in trouble, stating**,** "Paradoxically, mainstream universities—where much of the technology originated—have been slow to embrace these technologies, even as they became ubiquitous in other sectors of the economy" (p. 34). DeMillo stated:

> America faces a growing crisis in public postsecondary education, as an unprecedented fiscal meltdown plays out at a time of growing consensus about the urgent need to nearly double levels of degree attainment. Instead of taking steps to develop an investment strategy to reduce access and achievement gaps, we are moving in the opposite direction: reductions in state finances, increases in tuition, cutbacks in enrollments, and reductions in courses and programs students need to succeed.…We are moving in the opposite direction largely because there have been few great experiments in higher education for at least fifty years.…University leadership is often tied to the past, and therefore it is not always in control of change. (DeMillo, 2011, p. 41)

Further, in support of Christensen's (2016) theory of disruption, DeMillo stated that an institutional leader "must reduce investment in the sustaining improvements that have made it successful and begin investing in an inadequate approach that has little market acceptance today. The dilemma is that it requires management to do something that is irrational" (p. 113). The visionary believed many higher education leaders are out of touch with today's problems and that there are many competing interests at play—creating polarization. Note that DeMillo's thoughts are now 11 years in the past, and the problems remain.

Abeles (2017) believed "the business model of education in general, and postsecondary education in particular, is based on the control and certification of disciplinary knowledge…of predetermined paths…an individual's 'rent seeking' experience managed by the institution" (p. 211). What is missing is knowledge application. Some institutions address this need by creating certificate programs, but side-line those. Abeles contended this only "ensures the archaic model's perpetuity" (p. 211). Another point Abeles has made is the potential threat to individuals (the professoriate) who have built their identity around a discipline. Today, a rapid synthesis of knowledge is available through massive databases and "intelligent search-and-interpret engines" (p. 211) that can make access immediate from any location. This, according to Abeles, "questions the efficiency and efficacy of the path that must be taken if a 'discipline' label no longer provides an identity and an intellectual sinecure" (p. 211).

Macfadyen and Dawson (2012) referenced Rogers' theory of diffusion of innovation, but agreed that overwhelmingly, "an individual's reaction to change reflects their cognitive evaluation of the way in which a new event or context will affect their personal wellbeing" (p. 160). Concerns exist over how technology will diminish their performance evaluations, which the authors state "is not without foundation, as academic culture rewards teaching expertise, publication output," (p. 160) and independent achievement. Incentives are low for making online instructional design worth the time-commitment.

Amirault (2015) spoke of how Derek Bok, once president of Harvard University, reflected his view that "Technology is gradually causing a number of professors to reexamine the way they teach, away from a passive form of learning to a more interesting, and active form" (p. 7). Amirault felt that the advent of the computer (spurred by the space race) brought about new paradigms of learning, and subsequently created the field of instructional design (p. 8). The concern for Amirault, who taught at Illinois State University, was technology transience and the dilemma of constant program revision as new technologies come into view. In other words, his concern was how to continuously stay ahead of the technology curve.

Where We Are Today

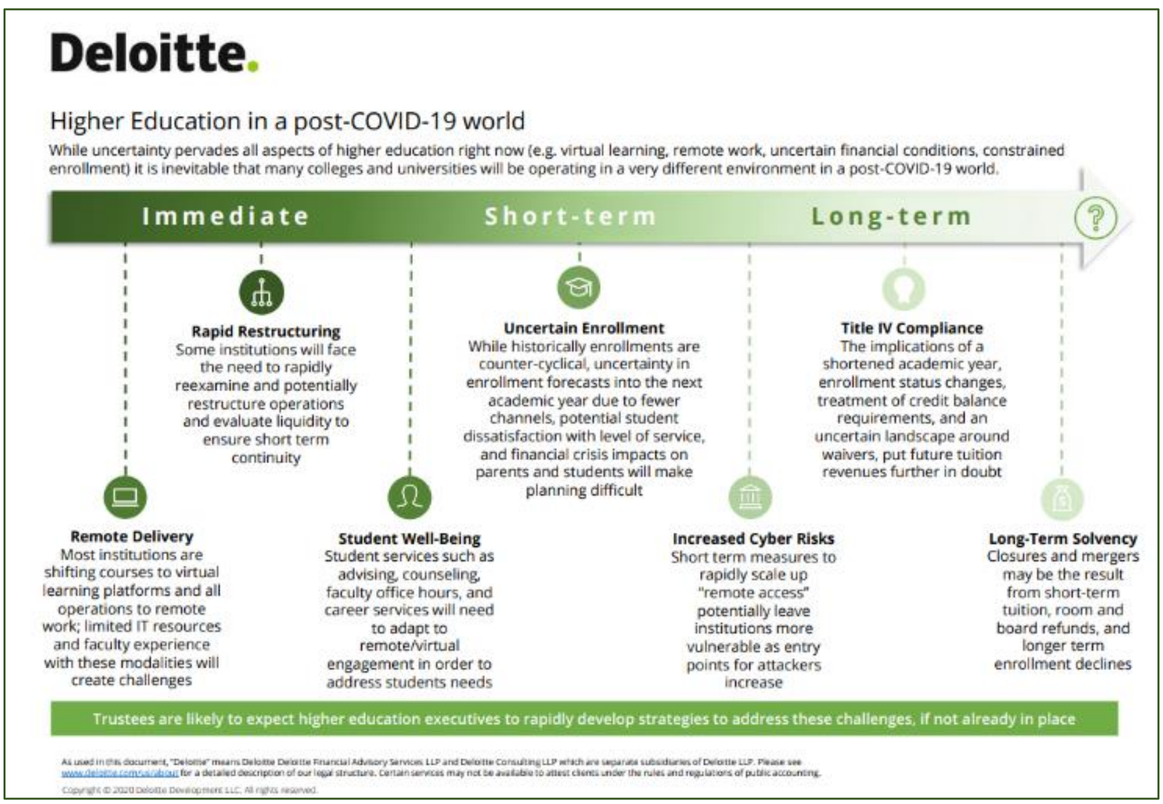
As of this writing, COVID-19, with a first case reported in the U.S on 1/21/2020, has caused 549 million cases and 6.3 million lives worldwide—88 million cases and 1.01 million lives in the U.S. alone (Johns Hopkins University, https://coronavirus.jhu.edu/). New variants have arisen, and the end is not yet in sight.

Economies are near collapse due to the requirements to socially distance and remain home. Healthcare systems are overwhelmed. Obviously, education across the board has been impacted beyond anyone's belief. Universities have had to move all academic work online much faster than anticipated—regardless of pedagogical preferences—to retain their student constituencies. A study by Deloitte Consulting (2020) cites an upending of "business as usual" for colleges and universities. The pandemic has incurred hefty financial challenges that require creative scenario planning. Figure 35 provides a snapshot of the consultancy's projection in a post-COVID world. So, it appears, this study has considerable implications, as Deloitte has concluded:

> Uncertainty will remain a fiscal fact of life at colleges and universities for many months to come. To survive in these difficult times, leadership will need to prepare for numerous possible scenarios, seek creative solutions, and stay flexible in the face of continuous change.

Figure 35

Higher Education in a post-COVID-19 world



(Deloitte Development LLC, 2020, p. 4)

At the Point of Intersection: Implications for This Study

The literature review has attempted to provide a full picture (albeit a wide net) surrounding the topic of unprecedented exponential digital technology growth, with an emphasis on how higher education institutions are approaching change and technical challenges. Undergirding the literature review are societal responses to technological innovation and how these are manifested in attitudes and actions. The intersection (focus point for the research questions) represents the point at which the two trajectories of technology diffusion and higher education knowledge diffusion have met, i.e., current day. The topic of disruption was introduced as a possible scenario, should higher education lose its grasp on mission in the face of exponential digital technology change. Though disruption represents an extreme example of conflict that could emerge, the literature review has illumined many causes for tensions, competing goals, polarization, challenges, and conflict—not only in the macro-sociotechnical sense, but in contrasts between stakeholder perspectives. The goal of this completed study will be to gain new observations and resolutions through this proposed contextual synthesis of trends in exponential technology, organizational capacity and change, focus on academic processes and structures, and to show the relevance of conflict studies in organizational settings experiencing sociotechnical change. Figure 36 again illustrates the concept. Support for the evidence of organizational/institutional conflict and the relevance of considering it as a dissertation topic, I hope, appeared throughout this paper. Now, onto some exploration of where to go from here.

Figure 36

Conceptual Understanding of the Conflict Case

Note. Trajectory drawing adapted from Ismail et al., 2014, p. 20.

How Institutional Technological Capacity May Be Assessed (Barrier Exploration)

The review of literature has revealed several barriers that may impede an institution of higher learning from innovating its instructional modality or curriculum. Given input from Dolata's (2014) Theory of Sociotechnical Change, I have conceived an assessment process, whereby these barriers or certain variables would be surfaced and could provide insight to the capacity for the institution to succeed. This "capacity assessment" would require review of relevant documents, materials, narratives of planning and introduction/rollout (administration, faculty, and instructional designers), stakeholder perceptions of innovation and process of change, how fears or emotional reactions are manifested, and perhaps find these variable examples in response to challenge or change: culture, autonomy, trust, respect, awareness, communication, experiences of relationships, subjective perceptions, training, digital literacy, etc. I would also look at structural constraints, institutional constructs/supports, and internal and external forces. I would explore the questions that Dolata posed for each segment to be studied, customizing my review in terms of an institution of higher learning, rather than at the higher "sector" level of Dolata's research.

How Technology May Be Adopted (Implementation)

Some of how adaptation is occurring would be discovered in the explorative exercise just presented. However, a real understanding of adaptation may be better done through face-to-face (or online, per COVID requirements) circumstances that provide a more descriptive understanding of how situations are encountered, and adaptation is manifested in reactions, skills, and feelings. Perceptions of adaptability, which may manifest in feelings of confidence, satisfaction, and/or support, would be gained through qualitative interviews and narratives of actual implementation (by administration, faculty, and instructional designers).

Need for Contextual Understanding Through Theory

Dolata's (2014) Sociotechnical Change theory inspired me toward the descriptive, quantitative aspects of my research questions, as it provides a blueprint for assessment.

Additional theories of group dynamics, organizational constructs, and institutional development and change will broaden the study through a qualitative perspective.

At this point, I wish to now overtly overlay the conflict lens on the above. As conflict studies are multidisciplinary (and can be found in group dynamics theory and organizational culture, for example), it has not been an easy task of narrowing the field. I have, however, determined to pursue implications for Organizational Development/Group Dynamics, Complex Adaptive Systems Theory (CAS), and Practice Theory of Change (PToC)—seeking points of convergence, departure, or synergy as they support a full contextual understanding or awareness of conflict in times of sociotechnical change in higher education (i.e., the combined impacts of technical trends, organizational capacity for change, and academic culture).

Theories of Organizational Development, Change, and Conflict

Though organizational development and change theory was first introduced in the early segment of this literature review, I planned to expound here at the end where it may now make sense. The highlighted theories are:

- Field Theory (Lewin)
- Group Dynamics (Lewin)
- Institutional Change and Dynamics (Poole & Van de Ven; Woodman & Dewett)
- Complex Adaptive Systems and Group-as-a-whole (Olson & Eoyang; Bion)
- Practice Theory of Change (Shapiro, Mitchell, Jabri, & Ross)

“Field Theory and Group Dynamics” – Change and Conflict

Kurt Lewin had a commitment to resolving social conflict that is useful, still, today. He made a valid contribution to the understanding of group behavior, the individuals within the group, the roles played in organizations, and a planned approach to change. Lewin believed that “the key to resolving social conflict was to facilitate learning and so enable individuals to understand and restructure their perceptions of the world around them” (Burnes, 2004, p. 981). He propelled the perspective that “the group to which an individual belongs is the ground for his perceptions, his feelings, and his actions” (p. 981).

Others, such as Coghlan and Brannick (2003), call Lewin the father of social psychology or social science. Though he never wrote a book, Lewin’s influence permeates contemporary management with papers about “running meetings, work design, training, team development, systems change, leadership styles, participative methods, survey feedback methods, consultation skills, change theory, and action research” (p. 31).

Lewin broke from the research employed in the physical sciences when he sought to change human systems, for to him (according to Coghlan and Brannick, 2003) “human systems could only be understood and changed if one involved the members of the system in the inquiry process itself” (p.32).

“Field Theory” was the name Lewin attributed to his study of group behavior in the context of the setting, whereby conditions or forces created sets of symbolic interactions amongst the individuals. He determined that individual behavior was a “function of the group environment or field”—or driving forces (Lewin, 1947, as cited by Burnes, 2004, p. 981). Lewin sought to help people “identify the power of these forces so they could not only understand responses to them, but also learn how to diminish or strengthen them to bring about change" (Burnes, 2004, p. 982).

Lewin's interest in the importance of the group led him to formulate "Group Dynamics Theory." It is believed Lewin had an interest in two questions: "What is it about the nature and characteristics of a particular group which causes it to respond (behave) as it does to the forces which impinge on it, and how can these forces be changed in order to elicit a more desirable form of behaviour?" (Lewin, 1939, as cited in Burnes, 2004, p. 982). Individuals are constrained by group behavior to conform. Therefore, according to Lewin's assessment, the "focus of change must be at the group level and should concentrate on factors such as group norms, roles, interactions, and socialization processes to create 'disequilibrium' and change" (p. 983).

Levinger (1957) extended Lewin's theories to "situations of conflict within and between social entities, because the conception that behavior is determined by forces or fields of forces lends itself readily to an analysis of conflict situations" (p. 331).

Theories Specific to "Institutional" Change and Innovation

In their introduction, Poole and Van de Ven, Eds. (2004) advanced thinking by integrating theories and establishing connections among theories from different fields and research traditions in the study of organizational and institutional change and innovation. There is new interest in organizational research and complex systems theories, providing rigorous *models* for understanding change. The editors warned, however, that today there are "few rigorous applications of complexity theory to organizational change and innovation" (p. xv). The editors also mentioned theories that speak to the dynamics of deep structures within organizations and how these often remain far below the surface or beneath layers of activity. “This makes research involving these hard-to-access structures challenging” (p. xv). Further, understanding change in organizations—or institutions—requires a “duality of theorizing and research that extends across the organization and individual levels of analysis” (Woodman & Dewett, 2004, p. 46).

Taylor and de Lourdes Machado (2006), aligning with Complex Adaptive Systems Theory (to be discussed shortly), stated that:

> Replicating (attempting to perpetuate) the present status quo will force an institution to fall behind and out of equilibrium with its external environment, while advancing too rapidly will thrust it into chaos. The adaptive institution must live on the edge of chaos (Waldrop, 1993). This creates a delicate balance between stability and instability that must be orchestrated by strong leadership. (p. 140)

The authors cited the exponential nature of change occurring today and a call for responsible institutional leadership, rather than maintaining a status quo. They also deemed higher education “an undying defender of the status quo and the last bastion of intractable resistance to change” (p. 146).

Implications for Complex Adaptive Systems Theory

A Complex Adaptive System (CAS) behaves/evolves according to three key principles: (1) order is emergent as opposed to hierarchical, (2) the system’s history is irreversible, and (3) the system’s future is often unpredictable. The basic building blocks of the CAS are agents. Agents are semi-autonomous units that seek to maximize some measure of goodness or fitness by evolving over time. (Dooley, 1996, as cited by Olson & Eoyang, 2001, p. 7)

The review of literature has evidenced that linear approaches to organizational change probably will not serve higher education at today's technical intersection. All systems involved are complex—the structure of the institution and the distributed network of technology. CAS considers a bottom up, self-organizing approach to encouraging and managing change. Viewing the research questions through a complex adaptive systems lens enables a broader view of what may be occurring in the context of my study. Past research on organizational change has led to multiple models, such as separate attention to productivity, teamwork, leadership, etc., but complexity theory speaks to a holistic view.

Olson and Eoyang (2001) shed additional light on previously stated theories in this literature review. Though leadership has an important role in a self-organizing system, creative and sustainable "change depends on the work of many individuals at many different levels and places in the organization" (p. 5). Change agents are critical in a complex adaptive system, as they create ripples of change. Organizational reinvention begins as parts of the system (the agents) interact over multiple cycles, causing patterns to "emerge from the system as a whole" (Lewin, 1931, 1935; Trist, 1981). When old patterns give way to new ones, the organization makes adjustments. Olson and Eoyang (2001) cited this as the "parts affecting the whole" (p. 10). However, the whole affects the parts, as well, because every time new patterns emerge, the agents may still be influenced by old patterns. Patterns of "corporate culture, group norms, and documented procedures" are examples (p. 10). The authors acknowledged that certain structures offer needed stability. However, "too much dependence on old patterns of behavior locks individuals and groups into habits that may not be adaptive in new circumstances" (p.

10). The implication that individuals are shaped by their organizations, and vice versa, as made by the aforementioned authors, represents an interesting intersection of individual identity and group identity. It is where conscious and unconscious choices in behavior have been made that shape the group dynamics and create what is called “group-as-a-whole” (Bion as cited in Katz, 2015). Group-as-a-whole is a complex theory and an entity that emerges with unique energies, dynamic forces, and a collective identity.

Implications for Practice Theory of Change as an Assessment Process

Program evaluation techniques and theories of change (combined as Practice Theory of Change—PToC) are important tools for synthesizing the discourse about contextual understanding or awareness of conflict in times of sociotechnical change in higher education (Clark & Taplin, 2012).

One specific methodology was introduced by Shapiro (2005) which had as its premise, a consideration of strategies and action toward evolving a “theory of change” with positive “intended effects” (p. 1). The Shapiro framework included the following components in its attempt to bring about intended change: 1) problem framing; 2) intervention framing and goals; 3) methods; 4) how change happens; and 5) intended effects. As stated, this is an evaluation tool for intervention, which I would reframe for this project as an “assessment process,” as the researcher is not intending to intervene. A visual depiction of the general thought process is illustrated in Figure 37, which represents a synthesis of inquiry drawn from several sources for the purpose of assessing PToC (specifically: Shapiro, 2005, 2006; Mitchell, 2006; Jabri, 2006; & Ross, 2000). When a colleague and I conceived it during a period of coursework, I had hoped it might become a useful tool for future case evaluations.

Figure 37

Practice Theory of Change

Note. Questions Informed by Shapiro (2005, 2006); Mitchell (2006); Jabri (2006); and Ross (2000); Watkins-Richardson & Walsh (2016) [unpublished presentation]

Shapiro (2005) believed that intervention programs should have a hopeful vision for change (p. 5). He felt that organizations operate at their peak when individuals who are transformed take the lead in needed “structural change,” or reciprocally, that “changing policies and practices should lead to the transformation of individuals” within that organization—illustrating that intervention strategies can have different starting points for change (p. 10). This revelation reflects the literature on organizational behavior.

The take-away from the PToC exercise is that organizations, more often than sole individuals, shall find themselves in conflict. Therefore, what the conflict resolution practitioner can learn from new understandings of the organizational mindset, and interject in a Practice Theory of Change, will offer a valuable expansion in grounded theory for conflict intervention in a specific circumstance.

Shapiro (2005) stated that “clearly articulating a program’s theory of change can be difficult because of normal variations and inconsistencies within programs” (p. 11). Despite this problem he believed that “stronger links should be fostered between theory and practice by surfacing the underlying theories of individual, relational, and social change that shape practice” (p. 11).

Chapter 2 Summary

This study attempts to take a comprehensive look at corporate or organizational strategy and how it may traditionally overlook the roots of conflict that impede progress. From my literature review assessment, strategy is dealt in a vacuum, and is dependent upon the strategist’s philosophy or area of expertise, be it psychology, financial, management, sociology, etc. Hard as it is, a comprehensive view, through an organizational conflict lens, provides an analysis of opportunities where conflict is most likely to emerge, and how it may be processed effectively. Hence, this study addresses these research questions:

1. How is exponential digital technology growth and organizational change perceived and experienced for decision-makers, faculty, and instructional designers in higher education, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes? What are the differences in responses between the three participant groups: faculty, administrators, and instructional designers?
2. What are the ideas or opinions regarding how much change has been or will be required? How are pressures for change being handled?
3. What are the consequential conflicts that may impede success, how or where do they emerge, and how are they managed?

My goal is to inform the identifiable requirements of sociotechnical organizational change (mechanisms through which institutions may assess, address, and adapt) as experienced in a higher education setting. To that end, the next chapter identifies my considerations and approach to the primary research.

Chapter 3: Methodology

The Mixed Methods Paradigm

This chapter describes decisions I made regarding the methodology of research to employ for this study, which incorporated both quantitative survey (specifically surfacing a descriptive analysis) and qualitative interviews (specifically employing Theoretical Reflexive Thematic Analysis, as described best by Braun and Clarke, 2019a)—all assessed within a case study framework. Chapter sub-topics address research design and objectives, population and sampling units of analysis, instruments, quality assurance, research procedures, data analysis and presenting results, ethical considerations and pitfalls, and finally, a summary with thoughts on implications and contributions.

Methodology Overview

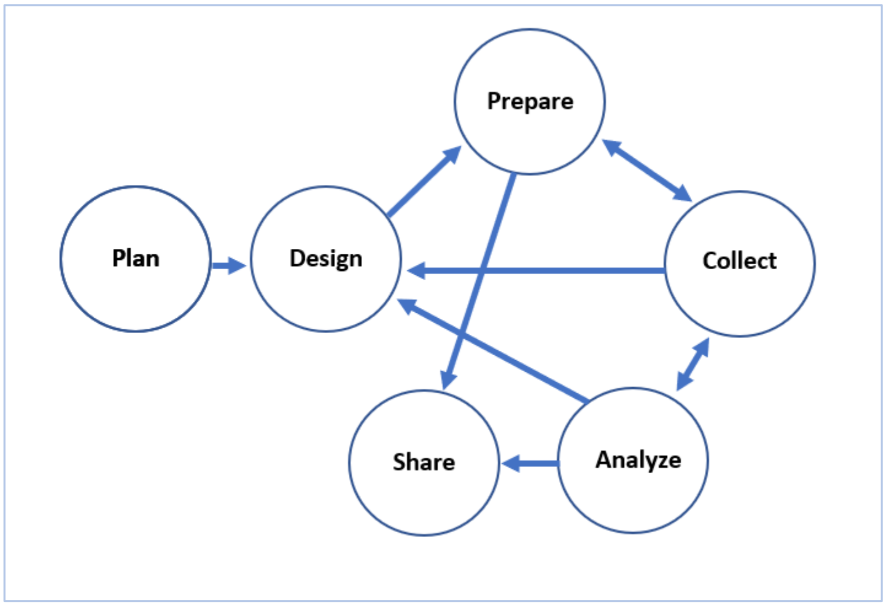
My researcher's axiology (belief about what is ethical and valuable) has been inspired by the acknowledgement that digital technology has permeated our everyday existence, with many advantages, but less certainty about the costs. Study of the change that occurs at the intersection of exponential technology growth and the academic instructional mission—through a multidisciplinary conflict lens—offers the potential to discover missing analytical value for a problem with downstream implications. I have also sensed a need for objective data collection and analysis (quantitative methodology), while capturing meanings from viewpoints and subjective truths (qualitative methodology), as it is the combination that shall provide a complete picture about reality, i.e., my ontology. Finally, my research role (epistemology) during the research process had multiple facets: (1) as a detached data tabulator of quantitative responses, (2) analyzing relevant documents and electronic information, and (3) evoking a trusting, interactive rapport with interviewed participants. Knowledge was constructed from all three relationships developed during the research process. The chosen approach follows that stated by Terrell (2016):

- The quantitative and qualitative methods are strands of the study; each strand represents the component parts of that given approach, i.e., the research question, how data are collected, how data are analyzed;
- The quantitative strand must be deductive and value-free, with the researcher as an independent objective observer;
- The qualitative strand calls for the researcher to be in close contact with the participants, with a fair, respectful, and trusting rapport established between all parties. The data collected is within the context of the study and must be respected input from multiple participants;
- [Hence] using both implies that both strands are needed to answer the research question(s). (Terrell, 2016, p. 207)

Yin (2014) illustrated the case study design (alone) as linear, but iterative (p. 1). See Figure 38 that follows.

Figure 38

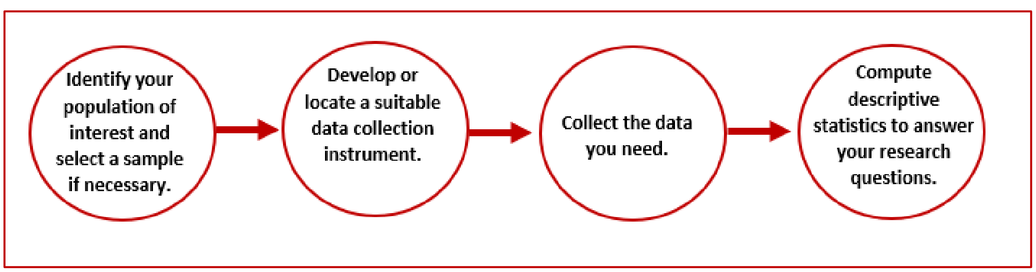
Qualitative Case Study Design



In Figure 39, Terrell (2016) illustrated the descriptive design, quantitative (p. 99).

Figure 39

Quantitative Descriptive Design



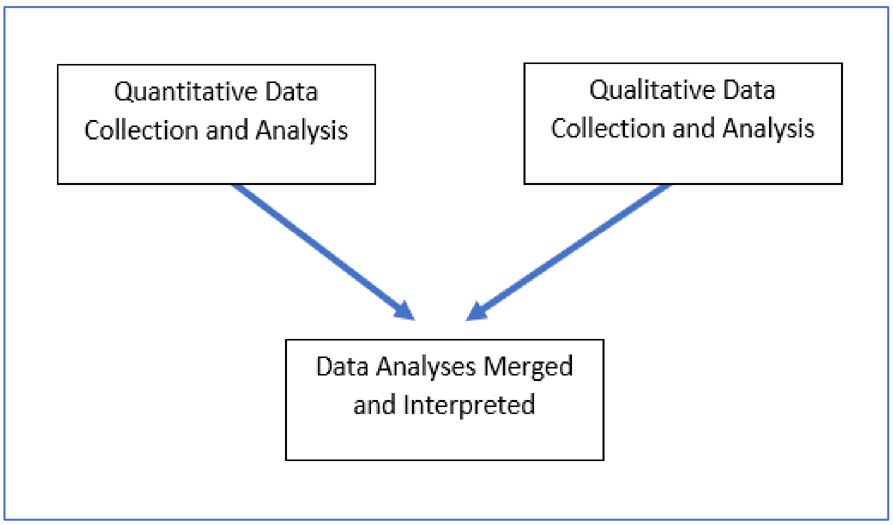
It is believed that this is a good approach when trying to find out something about people's views, opinions, knowledge, experiences, or values.

Research Design

In further responding to the viewpoint of Terrell (2016), my research design intended to be convergent—with the implication that my two research strands would be independent of each other, of equal importance and emphasis, executed concurrently, and finally the results mixed during an interpretation phase. The convergent design is pictured in Figure 40. In other words, this design has been determined to provide the best understanding of the area of study from two vantage points that are analyzed separately, merging the two sets of results, and then interpreting them together.

Figure 40

Convergent Design



Source: Terrell, 2016, p. 211

As pertains to the qualitative aspect of the area of study, I employed a single case study approach and Thematic Analysis (TA)—more specifically, Theoretical TA, which is analysis guided by theory and the researcher's epistemology (Braun & Clarke, 2013, p. 175). (Note that in a 2019 discussion of their methodology, Braun and Clarke have added the term "reflexive" to differentiate their approach from other thematic approaches. The researchers believe TA to be an umbrella term and their reflexive TA is "theoretically flexible, characterized by its foregrounding of researcher subjectivity" (Braun & Clarke, 2019a)). Theoretical TA is a deductive approach that involves the mapping of preconceived themes with the data that arises from interview inquiry or questioning—the goal being to present and explain how the theoretical information is replicated in the responses or, in other words, how theory is used to interpret and explain the responses. This justifies an emic, insider, perspective of the researcher to be present (whether virtually or physically) during a specific time and to gain an understanding of what an experience means to a person, or small group of people, who are undergoing an actual event and can retell their stories of their experiences. One case study research characteristic is that it is “particular”—such that the focus is on a specific group’s implementation of digital technology within a university but reflecting a general exercise across the higher education sector. The study shall remain at a “descriptive level” (another characteristic), meaning that “many factors may contribute to the complexity of the case and may include information coming from a wide variety of sources…presented in different ways…illustrating the influence of personalities and opinions on the issue” (Terrell, 2016, p. 159). A last characteristic pertains to the “background, evaluation, and summary” of a case study approach. The background and reasons for a particular problem are explained; intervention attempts are illustrated as having worked or failed; alternatives are illumined; and others may learn from the summarization and conclusion (p. 159).

More understanding of case study research can be gained from Yin (2014), who identified a “descriptive design” as one that “traces a sequence of events…discovers a phenomenon (the case) in its real-world context” (p. 238). The researcher’s use of survey may answer questions, such as: who, what, where, how many, how much? The use of interviews utilizing TA within a case study rounds out the how? and why*?* Case study research attempts to inform a decision (or set of decisions): “why they were taken, how they were implemented, and with what result" (Schramm, 1971, as cited in Yin, 2014, p. 15). It is significant that "the boundaries between phenomenon and context may not be clearly evident" and that various sources of evidence are relied upon so as to triangulate them for a newly revealed result (pp. 16-17).

Yin (2014) prescribed the development of different "propositions to guide data collection and analysis" (p. 17). The combination of case study and TA called for further identifying themes and patterns of meaning across the dataset (Braun & Clarke, 2013, p. 178). The more distinctive TA employed was Theoretical TA because theoretical propositions have been identified through the literature review that stimulate further inquiry. These will be described shortly. For the moment, consider these research objectives, which were first stated in Chapter 1, and will be tied to theoretical propositions. Anticipated data has been added, so as to link data collection to the research objectives:

- To inform the identifiable requirements of sociotechnical organizational change and transformation (mechanisms through which institutions may assess, address or act, and adapt) due to "a diverse range of actors with a diverse range of guiding principles, routines, and patterns of organization that are embedded in a diverse range of structures and institutional milieus" (Dolata, 2014, p. 91);
    - Anticipated data: actors, timing, mechanisms, actions, statements of worldview, emotions, experiences, pressures, digital literacy, instructional skill, trust, respect, relationships, plans/strategies, processes, demographics, communication, support;

- To illumine heightened concerns for trends in academia that impact its sector response to technological disruption;
    - Anticipated data: actors, culture, ingroup/outgroup behavior, institutional structures, policies, barriers, resistance to change, systems, student-centered/faculty-centered, knowledge diffusion, polarization, faculty identity, fears, tensions, statements of worldview, pace of change, complexity of technology;
- To narrow the study to instructional design technologies (though these are influenced by a broader range of digital technologies);
    - Anticipated data: digital literacy, instructional literacy, student-centered/faculty-centered, knowledge diffusion/instructional design theory, technology diffusion, co-construction;
- To illustrate the relevance of organizational conflict studies in today's technical climate;
    - Anticipated data: ingroup/outgroup behavior and dynamics, statements of worldview/positions, social response to technology, polarization, complex adaptive systems, position in the system, theory of change.

Population and Sampling Units of Analysis

As framed, the population of study concerned faculty and administrators in higher education—and an additional category: instructional designers or learning specialists. The quantitative analysis involved a prominent public technical university—chosen for the researcher's familiarity, as well as accessibility.

The qualitative case study involved entrée via a specific college and its schools within the university. Correspondence with the chairman of the School (which nests within the College of Engineering) signaled a welcomed opportunity for research slated to begin as they implemented a new plan for instructional design. The new plan included instructional technology, as well as many different technologies and how they might be deployed—"things such as short technical video modules, small lab kits that enable students to build and then execute and experiment, texting hours (in addition to office hours), tutoring by students, etc." (personal communication, March 4, 2019). A later correspondence provided more detail, stating that the School's educational reform effort would be called the "[School] Engulfing Educational Experience (AE4) task force." Though at the time of correspondence in 2019 the task force had started shaping the effort, and in the upcoming year would produce a detailed plan, plus establish any needed infrastructure to launch the program during academic year AY2021 (personal communication, May 29, 2019), all was disrupted by the advent of the COVID-19 pandemic. Given two weeks' notice, the college staff underwent a complete change from in-person instruction to fully online. Therefore, the unit of analysis became the online instructional (disruptive) event occurring within the College and the themes or patterns of experience that arose from data collection. The design also required a look at multiple embedded units within that unit, such as separate process parts of the initiative or multiple initiatives. Semi-structured interviews were conducted with members from each role subgroup and from multiple schools within the College of Engineering, acquired through snowball sampling. As per this technique, a few participants were recommended/selected, and they, in turn, recommended or recruited other potential participants. This provided a non-probabilistic perspective (see Terrell, 2016, pp. 76-77). The case study research was bound by a semester-long period of engagement, which, due to COVID, became a virtual engagement.

For the quantitative strand, a stratified, random selection from each identified role group (faculty, administrators, and designers) was sought. In addition, statistical information was found through associations in higher education, governmental statistical web sites, national surveys, and university documentation and artifacts (see Terrell, 2016, pp. 73-77), to add context.

The mixed methods approach was comparable to a model illustrated in Yin (2014): A Case Study Within a Survey, whereby a survey of multiple units is used in conjunction with a case study of a subset of the surveyed units (p. 65). Table 9 provides a snapshot of the logic being employed to address the research questions. Note that as the pandemic changed the initial concept of assessing a technology initiative, I was still able to assess the initiative alongside the impact of a switch from fully in-person to fully online teaching.

Table 9

Case Study Overview

Context	Phenomenon Within a Real-World Context	Single-Case Study	Embedded Units of Analysis (general to specific)	Mixed Method (concurrent; seeking patterns & differing realities)
Innovation and Digital Technology in Society U.S. Higher Education Sector/Domain (especially national survey re: technology implementation) Management of Change in Organizations Organizational Conflict Theories and Studies	Change and emerging conflict at the notional intersection of exponential digital technology growth and the mission of higher education	A university's rollout of a new technology plan for instructional design AND The impact of disruption caused by going from in-person classes to fully online during a pandemic.	College of Engineering New program(s) and/or new instructional modes Individual roles: • Administration • Faculty • Instructional Designers	Document analysis and virtual interviews via theoretical thematic analysis Survey at university (engineering college or broader sample for context)

It was anticipated that a survey tool would focus on specific recollections of a technology program or new initiative implementation, i.e., the who, what, where, how many, and how much. Previous "impact of technology" research on university faculty, and administrators would also provide context and comparison. Two established copyright owners of higher education surveys granted me permission for use and/or modification. New questions were inserted that drew from sociotechnical change and conflict theories. The data was to be used to build technical profiles, thereby assessing activity, capacity, and adaptability.

The dependent variable (outcome) was identified as:

- Adaptability to technology-induced change for instructional design, i.e., the structural and institutional conditions for adaptability
    - Anticipated data: subjective perceptions of adaptability, confidence levels, satisfaction with support levels, how adaptation is manifested in participant reactions of confidence, skill, feelings

Independent variables to be considered were:

- Dynamics, variations, patterns, priorities, confrontations, barriers, power influences (socially and technologically based), i.e., mechanisms that facilitate or block adaptation and potentially, transform the organization
    - Anticipated data:
        - actors, actions, timing, statements of worldview, emotions, experiences, pressures, digital literacy levels, instructional skill levels, trust, respect, relationships, plans/strategies, processes, demographics, communication, support
        - culture, ingroup/outgroup behavior, institutional structures, policies, barriers, resistance to change, systems, student-centered/faculty-centered, knowledge diffusion, faculty identity, fears, tensions, statements of worldview;
        - knowledge diffusion/instructional design theory, technology diffusion, co-construction;
        - social response to technology, polarization, complex adaptive systems, position in the system, theory of change.

The semi-structured interviews focused on how experiences are explained, and why. The data was useful in developing patterns and themes, utilizing Theoretical Thematic Analysis (Braun & Clarke, 2013, p. 175). The stages prescribed when undertaking Theoretical TA included: (1) transcribing the interviews, (2) reading and re-reading the transcriptions and taking note of items of potential interest, (3) coding across the entire dataset of interview transcriptions, (4) identifying themes, (5) creating a thematic map of provisional themes and subthemes and their relationships, (6) defining and naming dominant themes, and (7) writing the final analysis of themes and patterns, with supporting elements from the transcripts (pp. 202-203). This method required a minimum of 6-10 interviews to provide sufficient data (p. 50). I conducted 18 interviews. More detail is offered on each stage in the section on procedures that follows.

The combined results of the quantitative and qualitative were cross analyzed to discern where and how conflict emerged, enabling a “holistic understanding of the phenomenon being studied” (Baxter & Jack, 2008, p. 554, as cited in Terrell, 2016, p. 168).

Ensuring Quality of the Research Design

Embodiment of Theory

Though this is not a standard Chapter 3 sub-heading, it resonates for the task of conducting Theoretical Reflexive Thematic Analysis (TA) within a case study framework. According to Yin (2014), projecting a theory of what is being studied completes the research design by providing logic for “connecting data to propositions and criteria for interpreting findings” (p. 38). The bulleted list below describes the researcher’s “Theoretical Propositions” (as stated prior to actual research):

- A lack of full contextual understanding or awareness of conflict (i.e., the combined impacts of societal technical trends, organizational capacity for change, and academic culture) may contribute to potential disruption (severe state of conflict) in higher education.
- “Societal level” – Little is known today about the impacts of exponential digital technology (or sociotechnical change) on society as a whole, nor our response to the changes that may spread to our organizational settings. [context]
- “Sector level” – Though Academia has a history of weathering change, the fast pace of technological change may prove a challenge. Dolata’s (2014) and Christensen’s (2016) theories of sociotechnical change and disruption will form the basis for questioning, as well as Trist’s (1981) & Lewin’s (1931, 1935) theories of organizational behavior. [context]
- “Institutional level” – the College of Engineering was emboldened to roll out a new instructional technology program, and then found itself disrupted by a pandemic, during which it was forced to instruct fully online. I seek to understand how, why, and what is happening, the impacts or outcomes—that is, how adaptation is manifested in the stakeholder reactions—and where conflict may emerge. Rogers’ (2003) diffusion of innovation theory will emerge in the questioning.
- “Group level” – Through observation and subsequent questioning of work teams (departments), networks, program, and stakeholder relations/consensus/disconnects, both exploratory and descriptive findings

will reveal group dynamics, patterns, and when the patterns are challenged, i.e., the emergence of conflict variables that impact at the institutional level.

- “Individual level” – Observation and subsequent questioning at an individual level will be both exploratory and descriptive, revealing subjective perceptions, interactions, tensions, and issues, i.e., the emergence of conflict variables that impact at the group and institutional levels.

Assessing Reliability and Validity in the Research Design

Yin (2014) described reliability and validity for case study research in the following manner:

- Reliability – measures what was intended to be measured
- Validity – measures what it is assumed to measure
  - Construct validity;
  - Internal validity;
  - External validity;
  - Reliability. (Yin, 2014, pp. 45-47)

I intended to demonstrate “construct validity (correct operational measures) by using multiple sources of evidence” (Yin, 2014, p. 127), i.e., former studies, for context, comparison, and potential convergent lines of inquiry during data collection. Because several of the national surveys are issued on an annual basis, it is assumed construct validity has been established. By surveying multiple university parts, a chain of evidence developed.

Internal validity would not necessarily apply to the study at hand because the researcher is not on an explanatory or causal result course seeking to justify relationships.

External validity, however, was relevant in determining if the study's findings can be generalized for its domain or sector. Theoretical propositions were initiated for the development of a starting point for the study. Themes that arose from this study were added for a more complete product. Reliability (i.e., the procedures for data collection and results can be replicated) was demonstrated by carefully documenting the procedures. To achieve such credibility, I intended to spend enough time in the research environment (prolonged virtual engagement) to gain a broad understanding and establish rapport with participants and program administrators, and to gain a depth of understanding through openness. Information gathered from primary surveys, published surveys, and interviews were triangulated for optimal input. I sought assistance from colleagues in review of surveys, interview questions, transcripts, and data analysis. I was also cognizant of themes during data collection that may contradict the prescribed theoretical propositions, being careful to remain open and objective in the event. Referential adequacy was considered as a means of separating the data, analyzing one portion before analyzing the remainder, and comparing the results. Finally, member checking enabled those interviewed to review the transcripts to ensure accurate capture of their input.

Utilizing recommendations from Yin (2014), an additional effort was performed: A Case Study Protocol was communicated to the college champion that gave an overview of the case study and data collection procedures (pp. 84-91).

Research Procedures

Quantitative Instrument Design and Informational Recruitment Letter

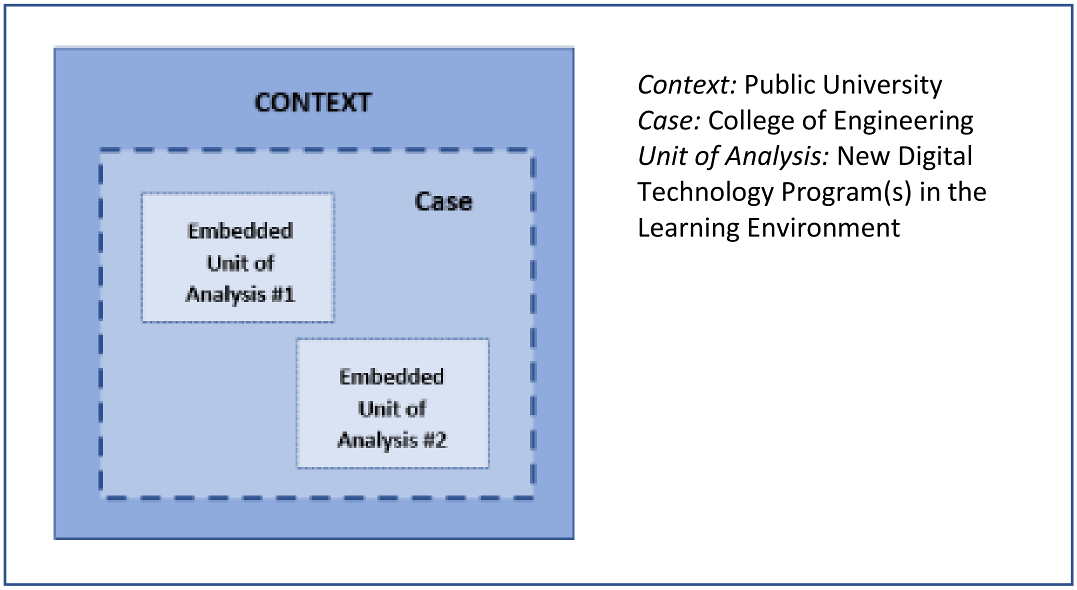
Before beginning the actual study, I sought inputs from available research pertaining to technology deployment in higher education environments. I then compiled a questionnaire based upon the existing two national surveys, for which I had been granted permission-for-use, and I added questions pertaining to conflict and sociotechnical change. Initial pre-qualifying questions and demographic questions were also be inserted. The resulting tool was pilot tested for comprehension and relevance to the research objectives with a group of willing participants who represent the population of interest. The survey, when issued, was accompanied by a letter describing the study and an informed consent form.

Case Study at a Technical University

Early in the process, an in-depth discussion took place between me and the chair of the School of XX Engineering, to gather a full understanding of the initiative in mind (for both parties) and to enable appropriate access to participants, events, and documentation. It was unknown at the time whether several different technology initiatives/programs were being rolled out simultaneously. If so, the researcher would treat each program and associated role grouping as a separate unit of analysis, i.e., an "embedded unit of analysis within the larger case of the school." The public university would represent context for the study, with its college of engineering as the case study. A visual explanation is offered in Figure 41.

Figure 41

Illustration of a Single Case Design with Multiple Embedded Units of Analysis



(Yin, 2014, p. 50)

At the outset of the study, I met virtually with members of the College of Engineering (CoE) who offered assistance in deploying the recruitment email and survey to relevant faculty members, administrators, and instructional designers, as was my target. This was managed through departmental newsletters and personal referrals. A snowball approach obtained individuals to interview from each the three role groups. After obtaining signed consent forms indicating their understanding of privacy, confidentiality, and participation issues, one-hour interviews were scheduled at a time of convenience. The sessions were recorded and transcribed. Once all data was collected, data analysis began.

Theoretical (Reflexive) Thematic Analysis

There are different orientations implicit in Reflexive Thematic Analysis (TA), in general (Braun & Clarke, 2019a). One is to determine whether the research should be conducted in an "inductive" versus "deductive" manner. If inductive, coding and theme development are derived from the content of the data. In a deductive approach, the coding and theme development are informed by existing concepts or ideas determined by the researcher. As I planned to deploy theory as a basis for this study, I used a deductive methodology. Another orientation is to choose between a "semantic" approach or a "latent" approach to the analysis of data. A semantic approach involves analyzing the explicit content of the data. A latent approach involves reading into the subtext and assumptions underlying the data. It is a question of determining if the interest of the researcher lies in the stated opinions of the participants (semantic), or what their statements reveal about their assumptions and social context (latent). A third orientation in Reflexive Thematic Analysis is whether to consider a "critical" focus on the data or a "constructionist" one. In the former, reality is perceived as evident in the data itself. A constructionist approach sees the reality as created by the data. As Braun and Clarke have stated, these choices tend to cluster together. Therefore, I determined I would exercise a deductive, latent, and constructionist approach. Though it is difficult to draw hard lines between these approaches, it is more imperative that "the analysis is theoretically coherent and consistent" (paras. 15-17).

The following describes the stages or process required of this methodology, in detail. First, one must outline the theoretical framework. Three steps involve:

1. Identifying key concepts
2. Evaluating and explaining relevant theories
3. Showing how the research fits in

The aim of this last point is to test whether a theory holds in a specific context; use theory as a basis for interpreting the results; critiquing or challenging a theory or theories; and/or combining different theories in new or unique ways.

The procedural steps or stages, based on Braun and Clarke (2019a), are explained below.

1. **Familiarization with the Data.** Getting to know the collected data, which may involve transcribing an audio recording, paired with notes taken during the interviews.
2. **Coding.** Coming up with labels or “codes” to describe passages of the text. Each code describes the idea or feeling expressed in the sentences or phrases. Thoroughness is required to review each interview and highlight everything that jumps out as relevant or interesting. Codes are repeated, but new ones are also added. After all text has been reviewed, the data is collated into groups identified by code. This step allows the researcher to gain a condensed overview of the main points and common meanings that recur throughout the data. (Note Braun and Clarke, p. 5, 2019b, consider coding to be an “active and reflexive process that inevitably and inescapably bears the mark of the researcher.”)
3. **Generating Initial Themes.** Identifying patterns amongst the codes that evolve into higher level themes. Some codes may be deemed too vague or irrelevant, so they can be discarded. Other codes may surface as themes in their own right, thereby retaining a position as a theme. What is decided is

determined by what the researcher is trying to learn—that is, what is telling and helpful about the data for research purposes.

4. **Reviewing Themes.** Determining, upon review of all themes, whether they are useful and accurate representations of the data. Themes are compared against the dataset to determine if something was missed, if the themes are present in the data, and if the themes should be changed. Themes may need to be split, combined with others, or discarded. The drawing of a thematic map is a helpful activity. (Braun and Clarke, p. 5, 2019b, conceptualized themes as "analytic outputs, created from codes and through the researcher's active engagement with their data.")
5. **Defining and Naming Themes.** Formulating what is meant by each theme and how it helps to understand the data. This step involves the creation of succinct and understandable names for each theme. (Again, Braun and Clarke, p. 4, 2019b, provided clarity to what they termed a "central organizing" concept that captures the essence, or summarizes the "core point of a coherent and meaningful pattern in the data." This greatly helps to formulate substantiated themes.)
6. **Writing Up.** The analysis of the data requires a revisit to the research question(s), goals, and research approach. Not only is the methodology explained again, but how the thematic analysis was conducted. Each theme is examined separately as to how it arose and its meaning, with examples from the data to support it. A conclusion is written to explain the main takeaways and to show how the analysis has answered the research question(s). Morse

(1995, as cited in Javadi & Zarea, 2016), believed an essence of the theme should be identifiable—something achievable through the following:

a. Recognizing and listing cognitive data (parts of patterns) or nursing observations and experiences;
b. Combination of related data and patterns into meaningful units based on having relationship with bigger units that are known as theme;
c. Recognizing subthemes and sub-patterns and determining the way they become related to patterns and themes;
d. Synthesis of several small themes for obtaining a general, comprehensive, and broad view;
e. Formulation of phrases of themes or patterns for more retesting or reconfirmation of the phenomena. (paras. 18-19)

Quantitative Study

After acquiring primary communication contacts at the university, I enlisted cooperation for distribution of the electronic quantitative survey introductory email and link to appropriate faculty, administrators, and instructional designers. Once on the survey site, the participant reviewed an information letter, consent form, and proceeded to complete the survey. The number of responses was monitored. It took multiple communications to recruit participants.

Data Analysis

Regarding the qualitative case study interviews, the transcripts were reviewed while observing the video tapes to ensure accurate accounts. University documentation and other sources of evidence were included. Patterns were identified through Reflexive

Thematic Analysis (TA), following the process steps recommended by Braun & Clarke (2013, 2019a). After both sets of data were analyzed, they were merged and synthesized to identify themes or patterns of sociotechnical change that arose, and the conflict that emerged, during the process of introducing digital instructional technology to the curriculum.

Ethical Considerations and Pitfalls

As explained in the informed consent form issued to all participants, privacy rights were advised, as well as the right to withdraw from the study at their request; data would remain anonymous; and no participants would be identified by name or organization during or after the study was completed. All data will be stored for a period of one year, then destroyed. The Institutional Review Boards (IRB) from Nova Southeastern and the case study university vetted the project.

Regarding potential pitfalls, Theoretical TA must be unbiased. The researcher must continuously check against seeing something desired in the data, as opposed to what is actually there, which would lead to biased conclusions. Further, if the analysis is good and interesting, but does not explain the theoretical connection or purpose, it will lack crucial information and therefore be deficient in achieving a viable conclusion.

Presenting Results

Upon completion of the research, findings and conclusions have been presented in subsequent chapters 4 and 5 of this Dissertation. The results include perceived common areas of change, concern, success, or conflict that impacted goals, when considering new technical processes and products for instruction—and as experienced through “a COVID year.” There are several publications and conferences within the higher education and organizational development spheres where talks and/or articles on aspects of the study will be relevant.

Summary, Implications, and Contributions

This study, as designed, is an organizational assessment process, protocol, and set of theoretical tools that aim to identify discernable disruptive changes and conflicts that arise from the current digital technology climate and may impact higher education's academic mission. Using the mixed methods approach of a "Case Study Within a Survey," context was developed through the quantitative survey strand, while specific experiences were examined through interviews, i.e., the equally important, and concurrent, qualitative Theoretical Reflexive TA strand. The study centered on a public university's college of engineering (survey and case study interviews). Specifically, the units of analysis were new instructional programs with a digital technology thrust by individuals tasked with implementation. After data collection, the descriptive results of the surveys and the thematic insights from the interviews were merged and synthesized to identify patterns of sociotechnical change that arose, and the conflict that emerged, during the activity of introducing into the curriculum, new digital instructional technology and process. The intent was to illumine the decisions that were made and how they were interpreted, how change was experienced, as well as how conflict was managed. It is believed this dissertation is a first step toward developing an assessment based on the multidisciplinary approach enabled through a conflict analysis and resolution lens—making a viable contribution to the study of sociotechnical change in organizations and institutions.

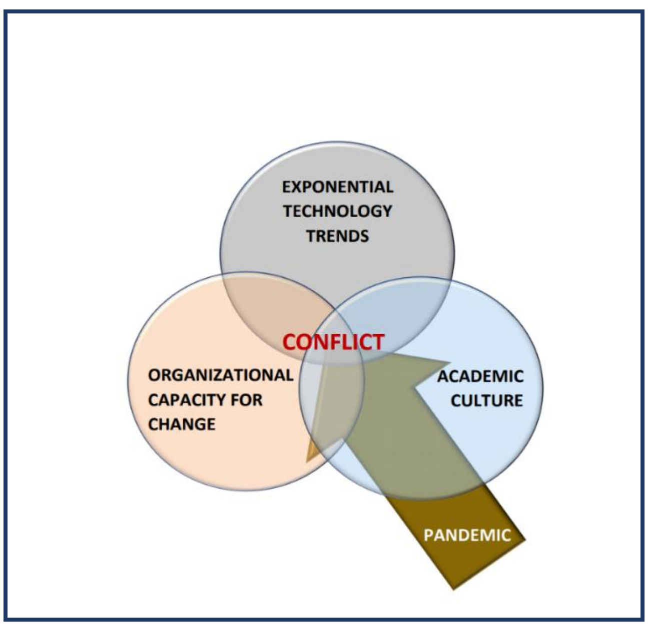
Chapter 4: Results

Introduction

The intent of my research was to understand an organization's capacity for change and its ability to recognize, address, and manage—given its culture, confrontation with exponential digital technology trends, and a global pandemic—the conflicts that might emerge. Visually, the concept has been portrayed in Figure 42. I used as my case study an engineering college within a large public university. The unit of study was digital technology in the learning space and a sample of three specific staff positions: faculty member, administrator, and instructional designer (or learning specialist, as was the name of the position described by the participants). The timing of the study coincided with the 18-month mark since the noticeable beginning of the COVID-19 pandemic. The results described in this chapter encapsulate the operational framework created by the three research questions and secondary qualitative and quantitative questions.

Figure 42

Visual of Conceptual Framework for Study



Restatement of Research Questions

1. How is exponential digital technology growth and organizational change perceived and experienced for decision-makers, faculty, and instructional designers (learning specialists) in higher education, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes? What are the differences in responses between the participant groups?
2. What are the ideas or opinions regarding how much change has been or will be required? How are pressures for change being handled?
3. What are the consequential conflicts that may impede success, how or where do they emerge, and how are they managed?

Qualitative Sub-Questions

- Can current, or recent, implementation or adoption scenarios be described?
- How do stakeholders understand, cope with, mitigate, or exploit the impacts of digital technology?
- What drives behavior and illumines motivations or priorities?
- How do tensions or conflicts emerge; how are they managed?

Quantitative Sub-Question

- What is the level of awareness and spectrum of attitudes of faculty, decision-makers, and designers in higher education toward potential trends in digital technology and the changes that may occur to their operations and/or mission—short- and long-term?

Through interviews of eighteen individuals, I was able to ascertain not only answers to those questions, but a full complement of themes and findings that tell a compelling story. Though anticipating a mixed method approach, I determined that the quantitative survey, due to low response, would be addressed in one of the qualitative findings—and ultimately the conclusion.

This chapter will begin with a brief description of the case study college—the name of which is withheld for confidentiality. I will then explain my acquisition and interaction with the college and the study participants—how the participants were recruited, how the interviews were conducted, and how they were member-checked. The process of analysis will be offered, and an overview of the four dominant themes and thirteen sub-theme findings will lead to an in-depth look at each.

Case Study Background

As part of a university established in the late 1800s, the college of engineering under study is large, diverse, and highly regarded. The college is home to eight separate engineering schools, all of which are ranked in the top 4 nation-wide. The college awards over 2,200 B.S. degrees in engineering per year. The parent university has 23,200 graduate students and another 16,600 undergraduates (academic year 2020-2021)—a total student population of approximately 39,800.

Interviews and Analysis

As framed, the population of study concerns the college of engineering and three specific staff positions: administrators, faculty members, and instructional designers. As I began to work with the college, I learned that the term "learning specialist" was more familiar in this environment, so I changed my descriptor of instructional designer to learning specialist. My plan was to assess a digital learning initiative or event that could invoke perceived experiences from each of the three participant groups through interviews. Due to timing, the sudden requirement to go virtual amid the pandemic became the central initiative. So, discussions focused on the process and experience of taking all courses online and what that meant to individuals from their various perspectives. There was one school-specific initiative that several participants chose to also discuss. Though it is innovative, it does not require a pervasive digital technology approach. Interview participants were acquired through a snow-ball sampling approach and electronic recruitment flyers and emails sent through college and school newsletters. Several participants made recommendations of colleagues to be interviewed and forwarded the emails to help inform. Though I anticipated three groups, I found overlap between administrators and faculty, as many perform both duties. Given how they described themselves and their roles, I coded each position in the order of the dominant role. Therefore, some were identified as administrator/faculty (A/F - larger administration role), others as faculty/administrator (F/A - larger faculty role). Those who were learning specialists were identified as LS. A few had multiple identifiers, as they had multiple roles. After scheduling meeting times through their video conferencing platform of choice, BlueJeans, I conducted interviews from August through November 2021. Seven questions and prompts (when needed) enabled the interviews to flow in a semi-structured format. Most lasted 45 minutes to an hour and were recorded, as well as transcribed simultaneously. Each participant’s raw transcript was member-checked. Only one corrected a few grammatical errors. The others signaled they were comfortable with the information. When I captured quotes for this chapter, I did some scrubbing of data to eliminate filler words. Table 10 provides a list of participants, by pseudonym and position.

Table 10

Interview Participants – Pseudonyms and Roles

9 Faculty		6 Administrator/Faculty		3 Learning Specialist	
Molly	Faculty	**Carter**	Administrator	**Flynn**	Learning Specialist
Don	Faculty	**Teague**	Administrator & Faculty	**Douglas**	Learning Specialist, Faculty , & Administrator
Gabriel	Faculty	**Ren**	Administrator & Faculty	**Jane**	Administrator & Learning Specialist
Dean	Faculty	**William**	Administrator & Faculty		
Ann	Faculty	**Lyn**	Faculty & Administrator		
Oliver	Faculty	**Brandon**	Faculty & Administrator		
Beckett	Faculty				
Jeff	Faculty (former Admin)				
Declan	Faculty				

Analysis of the data progressed in stages, utilizing Theoretical Thematic Analysis (Braun & Clarke, 2013). Interview transcripts were read multiple times and coded, then coded across the entire dataset. As themes were identified, I created maps with sub-themes (findings) and their relationships. The maps continued to re-shape as examination of the material was reiterated. Four dominant themes were produced from the data:

1. Pressure, Tension, Disruption, and Challenges to Identity – Telling it Like it Is
2. Uncertainty About Whether the Center Will Hold—Stakeholders' Sense of Operating
3. Innovation Elevated Through the Science of Learning
4. Creating Best Practices for Change and Technology Readiness

Overall Results

Theme #1: Pressure, Tension, Disruption, and Challenges to Identity (Figure 43)

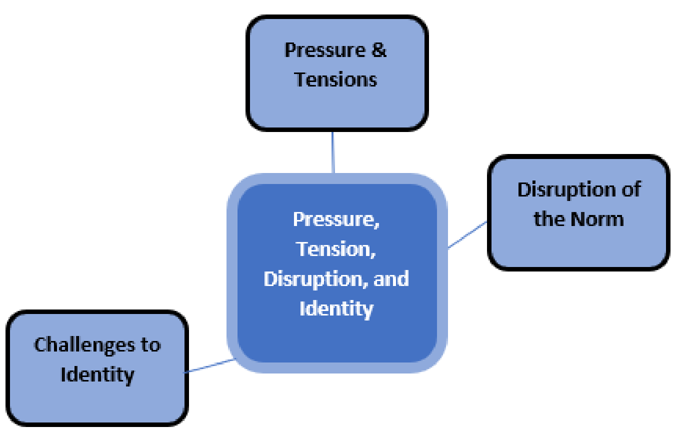
Finding 1: "Pressure, Tension, Disruption, and Conflict" are found in deliberate word choices and constructed topics

Finding 2: "Disruption of the Norm" describes the amount of work and fear of not going back to "normal."

Finding 3: "Challenges to Professorial Identity" include the pedagogical shift toward digital technology—away from the familiar mantra of "teaching is a performing art" with a classroom (stage), a whiteboard, and the podium (props).

Figure 43

Theme One: Pressure, Tension, Disruption, and Challenges to Identity – Telling it Like it Is (Finding Thematic Map)



Theme #2: Uncertainty About Whether the Center Will Hold—Stakeholders' Sense of Operating (Figure 44)

Finding 4: "Traditional Academic Philosophy" – Revelations of WHY the mindset informs the pedagogy

Finding 5: "Environment" – Revelations on the impacts of WHAT is taught and HOW participants operate and behave

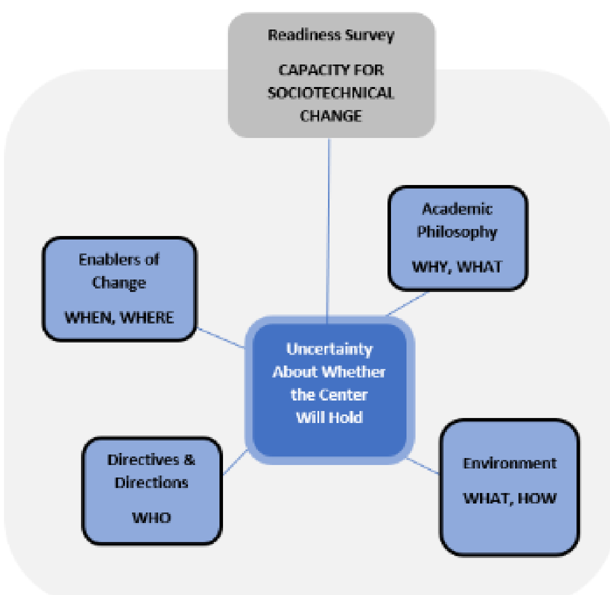
Finding 6: "Directives and Directions (Real or Implied)" – Revelations of WHO accepts the vision and sets requirements

Finding 7: "Enablers of Change" – Revelations of WHEN and WHERE something different happens

Finding 8: "Readiness Assessment" informs minimal capacity for sociotechnical change, and therefore, technology adoption

Figure 44

Theme Two: Uncertainty About Whether the Center Will Hold—Stakeholders' Sense of Operating (Finding Thematic Map)



Theme #3: Innovation Elevated Through the Science of Learning (Figure 45)

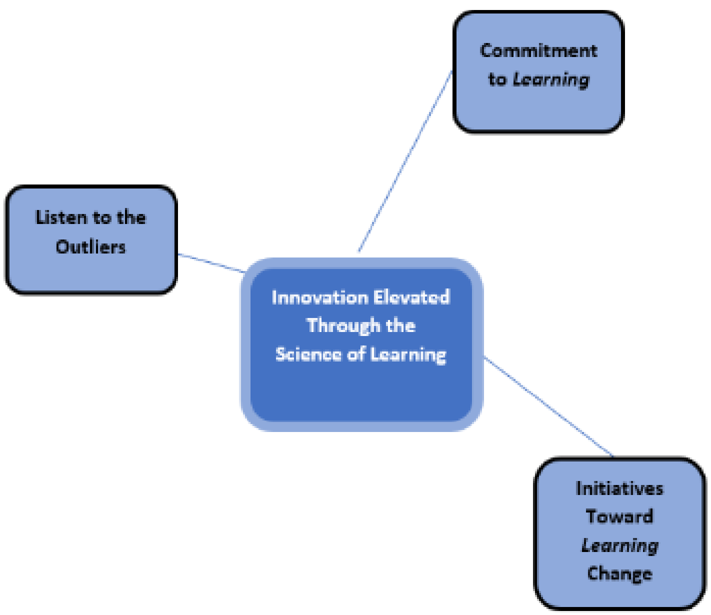
Finding 9: Diverse levels of "Commitment to Learning" – Mechanisms employed for endurance and optimism amid lagging quality

Finding 10: Initiatives toward "Learning Change" – Broadening the student and teaching to learn

Finding 11: Listen to the "Outliers" – Champions of change exhibit openness to different skills and perspectives

Figure 45

Theme Three: Innovation Elevated Through the Science of Learning (Finding Thematic Map)



Theme #4: Creating Best Practices for Change and Technology Readiness (Figure 46)

Finding 12: How "Current Best Practices" are defined

Finding 13: "Informing change" through thoughtful management, intentional design, and running a pilot to de-mystify digital teaching and learning—for starters

Figure 46

Theme Four: Creating Best Practices for Change and Technology Readiness (Finding Thematic Map)

Table 11 presents an analysis of the number of times each participant was quoted, by themes 1-4. The highest counts are highlighted in yellow.

Table 11

Participant Quotation Count

	Pseudonym	Position(s)	Theme 1	Theme 2	Theme 3	Theme 4	Total
1	Brandon	F A	6	6	0	2	14
2	Lyn	F A	1	9	1	5	16
3	William	A F	1	5	3	1	10
4	Beckett	F	1	3	4	2	10
5	Flynn	LS	0	6	2	6	14
6	Ann	F	0	0	0	1	1
7	Teague	A F	0	9	1	3	13
8	Carter	A	0	2	2	2	6
9	Molly	F	1	5	5	3	14
10	Don	F	0	5	4	2	11
11	Ren	A F	0	3	2	0	5
12	Gabriel	F	0	1	5	0	6
13	Dean	F	2	6	1	0	9
14	Oliver	F	2	6	4	2	14
15	Jeff	F (A)	2	2	1	2	7
16	Declan	F	0	11	1	4	16
17	Douglas	LS F A	3	3	10	0	16
18	Jane	A LS	1	1	6	4	12

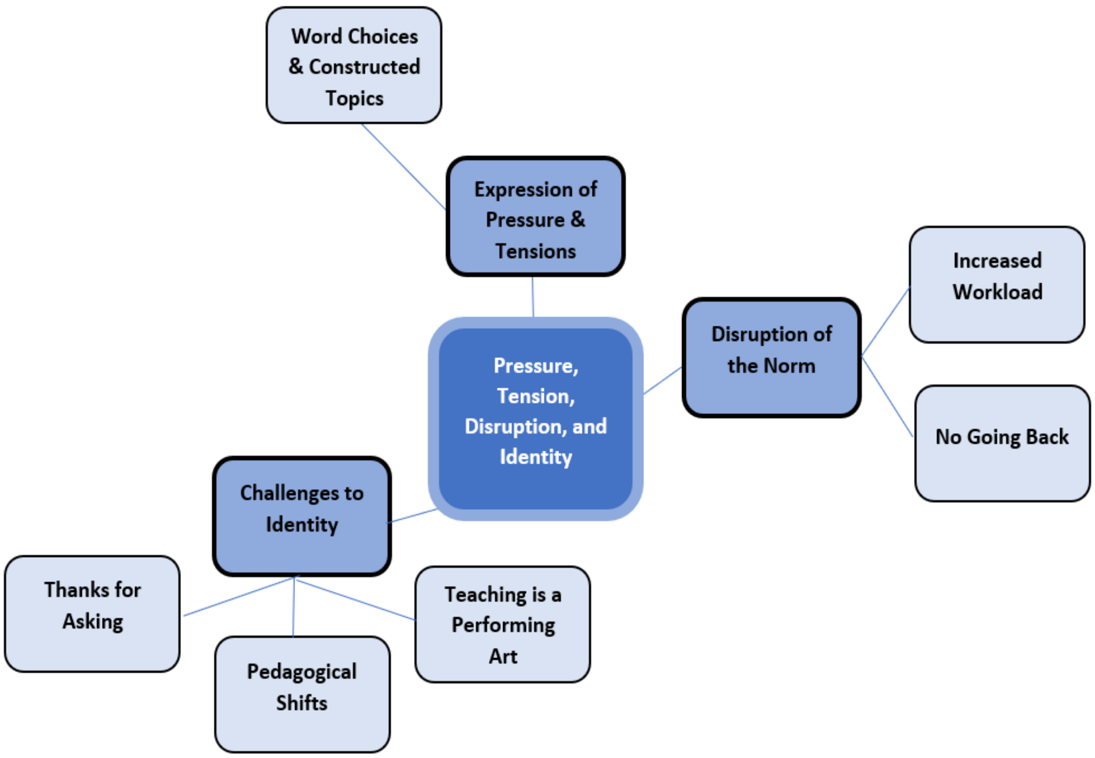
Theme 1: Pressure, Tension, Disruption, and Challenges to Identity – Telling it Like it Is

Consider this a theme of first impressions…expressions without substantiated evidence or explanation given, as yet…early thoughts that deepen as the interview grows. This theme represents one set of responses that address the research question: How is exponential digital technology growth and organizational change perceived and experienced, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes?

Within this overarching theme are very specific statements and use of words, as administrators, faculty, and learning specialists recalled the experience of moving rapidly from on-campus, or in-class, to online course delivery in the winter of 2020—the start of the COVID-19 pandemic—and 18 months in this instructional mode at the time of the interviews. Excerpts and descriptions in this section relay positions on self-worth, inability to anticipate change, and resistance to change. In general, this section is the entry point—the tip of the iceberg—whereby perceptions are introduced, then more deeply evolve under later top-level themes. This is because a pattern developed amongst the interviews. They would each start with a sort of burst of descriptive language, in response to the question, “How’s it going?”, then would ramp up to much more detail that supported the burst as the interview continued. Within this introductory theme, I captured three sub-themes or findings. First, *Pressure and Tension* are found in deliberate word choices and constructed topics; second, *Disruption of the Teaching Norm* describes the amount of work and fear of not going back to “normal.” Under the third sub-theme, *Challenges to Professorial Identity*, “Teaching as a performing art” surfaced for the first time, and thus the challenges that ensued include the pedagogical shift toward digital technology—away from the familiar classroom stage with a whiteboard and the podium (props). This theme concludes with some expressions of appreciation by some of the participants for my willingness to listen to their thoughts. A complete thematic mapping of Theme 1 is found in Figure 47, with parts separated at each finding to further clarify.

Figure 47

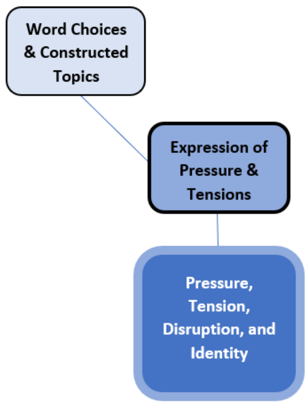
Theme One: Pressure, Tension, Disruption, and Challenges to Identity (Complete Thematic Map)



Finding 1: "Pressure, Tension, Disruption, and Conflict" are Found in Deliberate Word Choices and Constructed Topics (See Figure 48)

Figure 48

Finding 1: Sub-Finding Thematic Map



The selection of words and phrases below reveals much about emotions that were experienced by academics during the first 18-month span of the pandemic. An impact is made simply by reading over them, one after another. Some of these will be repeated in context later in this chapter, within other themes or findings.

- All professors had to scramble
- Horrible struggle
- Overkill
- Exhausting
- Hands in the air
- Train wreck
- Hellacious
- Difficult time
- Everyone was stressed; big source of stress

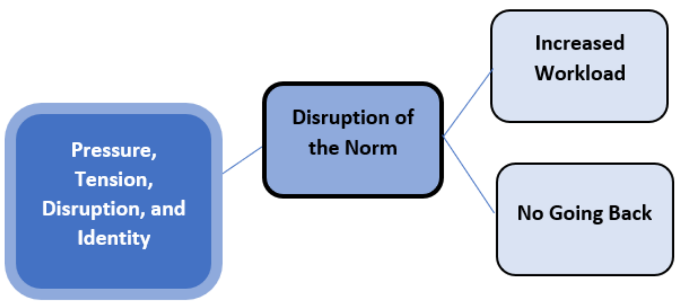
- Rules keep changing
- Drives me nuts; it drove everybody nuts
- Couldn’t keep up – people are confused
- Different sides – misinformation
- No plan B
- Laid bare many shortcomings
- I fear for education
- Nightmare
- World fell apart
- All this madness
- The Wild West of technologies
- Threw everything out the window
- Forcing homogeneity
- So many things were lost
- Jeopardized trust
- Forced innovation
- Faculty were thrown off a cliff
- We’ve really lost something for the future; the culture has completely changed
- Conflicting pressures on democratizing higher education
- Wishy-washy statements
- What we're losing, and have lost, we're never going to get it back

This list puts into words—texturizes—tensions that present themselves in various ways. They help to explain the pain caused by the *disruption of the participants' norm*—and by extension, their *professorial identity*. These will be examined in the next two findings.

Finding 2: "Disruption of the Norm" is Described in the Amount of Work and Fear of Not Going Back to "Normal" (See Figure 49)

Figure 49

Finding 2: Sub-Finding Thematic Map



In March 2020, major portions of the university switched from fully in person to fully virtual. The announcement read: "two weeks from now everything's going online." A great deal was experienced, given that little warning and preparation time.

Increased Workload

Participants relayed the tremendous amount of work. Some cited publishers who offer online material with integrated assessment systems. Lyn (pseudonym), a faculty member who is also an administrator, stated the inability to find the type of solution she needs, adding, "Some [publishers] are close, but there's really nothing that is easy to implement. I still have to do a lot of my own stuff. So it ends up being just a lot of work at the end of the day" (Lyn, F/A).

A new faculty member experienced a workload change…

> …one semester of "normal instruction," and then the world fell apart. I had a plan, and it was going great. And now you have to switch your job, and you're virtual for as long as you can imagine. So I would say that pretty much at this point, I threw everything out the window and just started over from a blank slate. Every class has looked different because it's really based on what that class is teaching, what the learning objectives are, and how that content is best delivered. (Molly, F)

Going online is not a "one size fits all" scenario, as Molly points out, which multiplies the effort. To "start over from a blank slate" is a statement that reflects the impact of disruption. Finally, "virtual for as long as you can imagine" foretells the anxiety and fear of not seeing the end in sight—of not knowing how long to operate in the new mode.

No Going Back – A Fear for Education – Madness

When asked "How different would tomorrow be if you had the power to make changes?", an administrator responded…

> [I would] have physical proctors at different locations; have faculty back on campus; students back; staff back. I don't think that's going to happen. I think we've really lost something for the future, even K-12. I fear for education. The culture has completely changed. There's no substitute for having the student in my office, but my staff doesn't want to come back because they are saying they were successful doing this online advising for the last year and a half, and it's like, "yeah, but it's not the same," but people don't want to hear that. So, it's very difficult. (William, A/F)

Witnessed, here, is the desire to return to status quo. This administrator also discouraged overuse of digital technology, stating, “[There’s] nothing bad about technology. There’s great things that can be done with technology, but it’s not the answer to everything.”

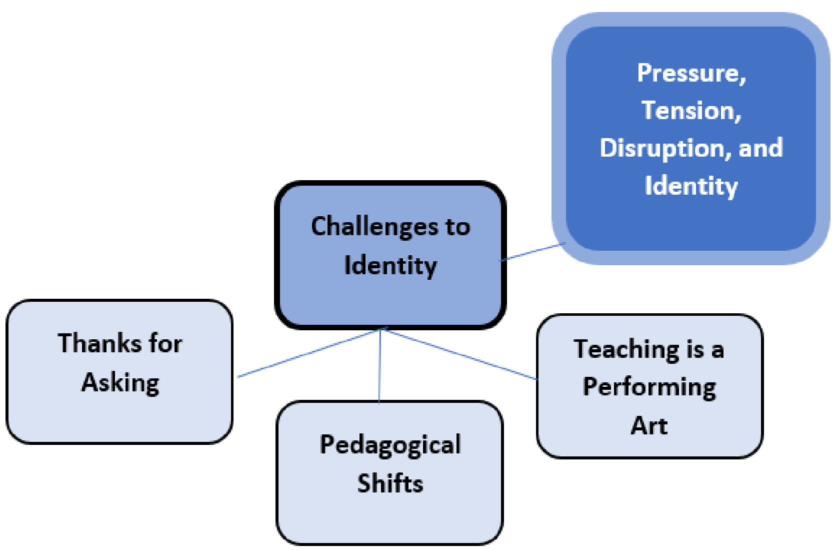
“Prior to all this madness, I was involved with developing an educational game [but no more],” stated Dean, a faculty member. Again, this statement reflects a reminiscence for the pre-COVID days—before disruption.

Finding 3: “Challenges to Professorial Identity” Include the Pedagogical Shift Toward Digital Technology—Away From the Familiar Mantra of “Teaching is a Performing Art” with a Classroom (stage), a Whiteboard, and the Podium (props)

(See Figure 50)

Figure 50

Finding 3: Sub-Finding Thematic Map



Teaching is a Performing Art

The sudden requirement to go digital created challenges that impacted the commonly stated belief that teaching is a performing art. There was great concern expressed as “a very real problem” about not being in person, not getting feedback, not being able to use all the “normal” facial expressions, hand gestures, and bodily movement from the podium, and not getting the sense of interaction. One faculty member decried,

> Everything gets diluted. To get people engaged requires physical cues that you don’t get online. Our instrument of teaching is our entire body. It’s not just our voice—so gestures—we are like actors—so you’re performing in front of your students. And I think that’s the part of it that gets lost. The feedback and the body language: two way experience. (Dean, F)

Further, with the different sense of communication occurring, issues of trust, intellectual stimulation, and learning outcomes were raised—all, again, relevant to professorial identity. Jeff, a faculty member, relayed, “The lack of eye contact probably will jeopardize thrust, human trust.” The significance of the whiteboard was broached, and Jeff further stated, “The stage is the classroom. Live drawing on the whiteboard facilitates intellectual stimulation, not just for professors but also for students.” A ramification from this new delivery mode was stated rather bluntly:

> Given these [pandemic] circumstances, you have to change expectations. It’s not going to be a regular course. We’re putting an asterisk next to this course that will mean it will count for the same amount of credit, but don’t expect the student outcomes to be exactly the same.” (Brandon, F/A)

This statement hints at later references to the uneven handling of course delivery via digital means, and thus some courses and professors would not foster the learning outcomes they would have guaranteed in an in-person class setting. It was mentioned that for those who care about teaching, a lot of time is spent designing the course, delivering it, having one-on-ones with students, and cultivating teamwork. One such professor said, “it was very tough for me dealing with a remote situation.” The reference to “very tough” expresses an undesired change in instructional style and methods.

Pedagogical Shifts

Prior to COVID, the university had a separation of online and on-campus programs. The onset of the pandemic “forced innovation.” College administrators and faculty had to come up to speed, not only with the technology, but the pedagogy of how to teach within this technology framework—something the learning specialists had already employed on the “online side” and in other parts of the university.

The overabundance of technology choices also caused overwhelm and raised concerns about affordability and student accessibility. This aspect of overabundance was described as the “wild west of technologies and techniques” for delivering content. Leadership of the college unit gave a great deal of autonomy to the professoriate to navigate the multitude of technology choices, but there was challenge seen in the amount of knowledge needed to best utilize each piece of software or new tool. As stated by faculty member Brandon who also performs an administrative role,

> This university is a big ship – hard to turn. Some folks are doing really well. Some folks are not doing so well. Some technologies are working well, some not. Runs the gamut. In general, it’s going okay. The right people have to buy-in. We had to be able to teach a class in a hybrid fashion, so you had to get more adept with technology. We’re trying different technologies to try to do slightly different things, to meet students where they are, from a student perspective. (Brandon, F)

Brandon has raised the fact that the university is a large organization, which makes it difficult to effect change and adoption rapidly or smoothly. Importantly, he alluded to having to get the "right people to buy-in." This statement will mean more in a later theme about the academic philosophy. For the time being, it seems to reference a set of academics who may exhibit peer leadership or early adoption. He also described the university culture as "an incremental place, so tomorrow won't show any real change." Brandon further stated something that is very illustrative of the audience I surveyed:

> If you think about it mathematically, like a derivative, the degree to the first derivative, I think "that" gradient…I think you could change that pretty quickly. But the overall index…it's a hard ship to steer, so it's hard to make change. That's by design. Most of my colleagues like that. It's a tradition-bound place. (Brandon, F)

This is the first of many references in the findings to "change, resistance to change," and the "traditional landscape" of this case study unit.

Technical challenges impacted the pedagogy. These included poor audio and "on the spot" troubleshooting while in an online class session. Some volumes were like "gunfire" and others like a "whisper." Multiple online meeting platforms, such as BlueJeans, WebEx, Zoom, Skype, GoToMeeting, and Google Hangouts, seemed to make meetings that much longer than before. One faculty member complained of being on calls or online meetings from 8 AM to 5 PM daily. An administrator felt that meetings had increased three-fold from pre-COVID times.

As mentioned, the learning specialists were unfettered by the need to shift gears. At the onset of the pandemic, a special segment of the university, a center for teaching and learning, offered a boot camp for faculty to meet and work with educational designers. In pre-pandemic times, the center would spend six to nine months working with any faculty who requested help on course design or course blueprinting. They would record in a studio and produce the video, creating a “nicely packaged learning environment,” as stated by an administrator. This was cited by half of my interviewees as beneficial, while the other half stated that working with a designer was useful, but it was not easy, or was not productive, so they would “go it alone” in designing their own courses. For example, “I understand the amount of effort that goes into designed classes, and I get it. I would want 5% of that, 10% of that, but not 90% of that.” (Brandon, F/A)

Within this university college of engineering, the tools of the trade, so to speak, have always been the whiteboard and the lecture. A learning specialist, Douglas, who is also a faculty member and an administrator stated, “I felt like it laid bare, the complete and utter inadequacy of the lecture. Everyone thought all we had to do was move what we do in class to online. Easy. What faculty found out is it was a nightmare.” What this participant was implying is that if the lecture is critical, there should have been no problem transitioning. Not only the act of doing a lecture, but the need to cover all aspects of a topic was brought out as he went on to say:

> …And the reason is the transmission model of education, which is a fallacy--it's not how people learn—but many people have this belief. That transmission model drives me nuts...A few years ago when I would talk to professors, particularly, physiology professors, they’d say, “I have to cover X, Y, and Z. How am I going to cover this if we do that [go online]?” I call it the myth of coverage, which emanates from the transmission model that [implies] if you believe people learn

because you're transmitting all your knowledge to them, which is kind of like cracking the skull open and pouring your knowledge into them, then yes, you're gonna feel like, “If I don't cover everything, something has been lost.” Actually, that’s not how people learn. It does not help people. And so I feel the reason why faculty were struggling was because it's actually not about transmission. You can transmit just as well on your PowerPoint slides on Zoom as you can in front of the class.

[Alternatively], so many other things are lost there [online]: the nonverbal communication, the side conversations that students have with each other, or the side conversations before and after class you have with your students. And of course, you can do stuff on Zoom, but it's much harder, and if you're not prepared for it, it won't happen. So I just think it laid bare the many shortcomings of the lecture, and for the fact that they [faculty] were still trying to do things that way. I think they learned a lot in a very short period of time. (Douglas, LS/F/A)

Similarly, another faculty member, Beckett, relayed, “They were trying to graph their traditional lecturing and test style on to systems where they had to use technologies.” The reason for the struggle is reflected in Brandon’s statement, “I’m not an early adopter, and I’m at a certain age that I don’t necessarily like to do these [new technologies]. This is not one of my strengths or passions.”

Finally, a statement regarding increased use of digital technology in the learning environment was particularly interesting: “There are conflicting pressures on democratizing higher education and providing meaningful learning opportunities.” [Oliver, F] The reference to “conflicting pressures” materialized in polarized views about teaching, learning, and digital technology, which becomes more pronounced in later themes.

Thanks for Asking

I am including within this theme various unsolicited statements I received about the research:

- I’m excited you’re doing this work. I love talking about this stuff, as you can tell. Wow, great questions! (Douglas, LS/F/A)
- By the way, great questions, and you can tell I love talking about these things. I never had anyone I could tell about these things. (Oliver, F)
- Thank you so much for giving me this opportunity to share my thoughts. I consider this interview intellectually stimulating, for me, and I appreciate that. And I want to thank you. (Jeff, F)
- And if there's anything else that I can help you with during this process, just let me know. It sounds like it's gonna be very interesting. I'm really curious about your outcomes and your research. So let’s please stay in touch. (Jane, A/LS)
- This university is a singular place. I have heard if you can get it to work with us, you can get it to work with any. (Brandon, F/A)

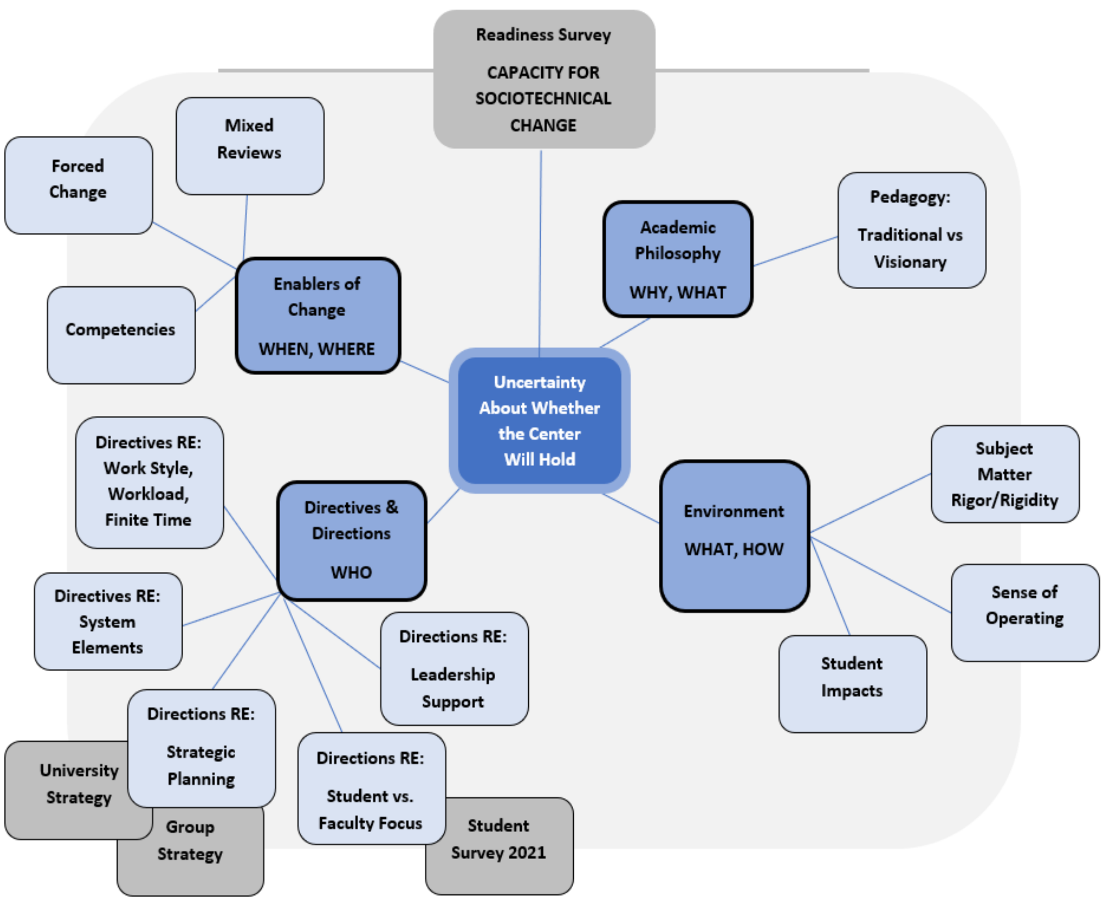
The need to be heard and understood are not traits unique to college professors, but the appreciation paid for allowing the free flow of thought—and listening—are not insignificant when expanded upon in the context of the later theme about the science of learning.

Theme #2: Uncertainty About Whether the Center Will Hold —Stakeholders' Sense of Operating

As I became more and more familiar with the transcripts of my interviews, a picture of the organization—a profile—evolved. Revealed was an academic climate and environment with components inferred by participant descriptions. Figure 51 provides the overview about to be described.

Figure 51

Theme Two: Uncertainty About Whether the Center Will Hold—Stakeholders' Sense of Operating (Complete Thematic Map)



My understanding came to light as I identified an ecosystem built (on one side) upon an academic philosophy of tradition required of the discipline being taught, as well as, established system elements and implied directives. However, new thought, new direction, new pedagogical ideas, and enablers of change surfaced as another aspect of the case study profile. The common undercurrent for all was the rapid force of change caused by the pandemic. This part of the data analysis became a dominant theme because of its breadth and depth. Moreover, the diversity of comments from all sides made me feel as though they were pulling me away from a center spot I endeavored to find. I was reminded of thoughts of power, control, and center as an “old cultural order of oneness” found in the writings of Foucault (as cited in Lemert, 2013). Hence, this theme came to be called “Uncertainty About Whether the Center Will Hold.” These views concerning structure, process, and change relate to the overarching research question:

> How is exponential digital technology growth and organizational change perceived and experienced for decision-makers, faculty, and instructional designers in higher education, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes?

This theme can be mapped to additional qualitative research sub-questions:

- What are the ideas or opinions regarding how much change has been or will be required? How are pressures for change being handled?
- What are the consequential conflicts that may impede success, how or where do they emerge, and how are they managed?
- Can current, or recent, implementation or adoption scenarios be described?

- How do stakeholders understand, cope with, mitigate, or exploit the impacts of digital technology?
- What drives behavior and illumines motivations or priorities?

The organizational structure and approach to academia evidenced in this case study was uncovered through responses to all seven interview questions. Responses aligned to this theme came from questions that weren't necessarily intended to capture these ideas. Required then, given the amount of data, was a thorough examination of who was speaking, what was said, when, where, why, and how—known as the 5W's and H in grammar—so that responses, codes, and subsequent themes could be dissected and clustered to form an understanding of mindset and behavior. I hesitate to use the broad term "culture," though it appeared in one interview question because it is a relatable word, but it is the tip of the iceberg regarding all that really encompasses organizational culture. Therefore, the following five sub-themes emerged (with annotations of how understanding could be assisted by the 5W's and H). These represent the pieces of the whole organization as analyzed through participant responses:

1. Traditional Academic Philosophy (pedagogy, teaching approach, mindset)
   - "Why" the organization behaves as it does because of "What" its members believe
2. Environment (subject matter rigor and sense of operating)
   - "What" the discipline of engineering requires and "How" it is taught
3. Directive and Direction (tradition, strategy, systems)
   - "Who" establishes directives; "Who" sets the direction?
4. Enablers of Change (competencies, innovativeness)

- "When" and "Where" changes happens

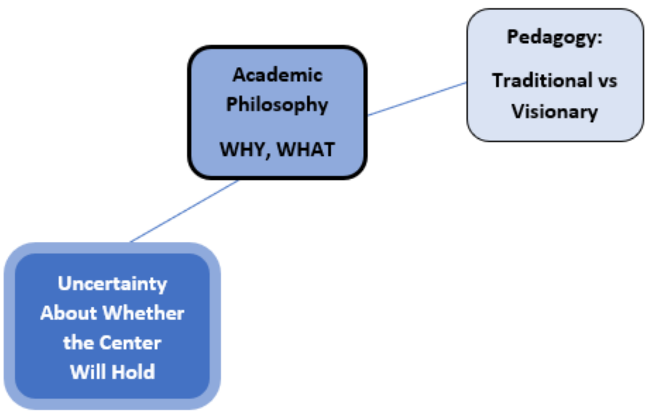
5. Readiness Assessment (quantitative insights)

  - All of the above

Finding 4: "Traditional Academic Philosophy" – Revelations of WHY the Mindset Informs the Pedagogy (See Figure 52)

Figure 52

Finding 4: Sub-Finding Thematic Map



Many of the participants in the study believe in traditional academic values. "We are very traditional, but I think that isn't always a negative," said one faculty member—though he spoke for most respondents (Don, F). Another faculty member, who is also an administrator, added, "My father was a mechanical engineer, and I studied mechanical and aerospace. I can tell you he understood the experience I had in the classroom because he had the same one. Things have not changed (Lyn, F/A).

The tradition-bound philosophy forms the pedagogy—that the rigor and rigidity of engineering, as a discipline, must be upheld, and there's a long-standing way to do it. There's a commitment to "fulfill the mission without sacrificing the rigor, (Don, F)" and in doing so license is given, so to speak, to place at bay instructional approaches that are perceived to threaten the rigor.

A faculty member explained,

> I don’t think they [professors] refuse to do something new as much as they really believe in what they do. They perceive, “I believe that what I do is the best, and I've been doing it for 40 years.” So it's a belief in the superiority of their method, more than a refusal to embrace anything new. (Molly, F)

A learning specialist conveyed,

> Everyone is nice, even those who really resist change in terms of those who kind of approach it like “well, this is the way I was taught. And so, this is the right way to do this. This is how we do things,” because they went to the best universities in the world—even those that are kind of misguided are so well intentioned. (Flynn**,** LS)

A “conservative mindset” was described, and because of this it was “a mad scramble” to put everything online, according to Lyn, a faculty member and administrator. However, even after a full semester of working virtually, she stated,

> We still had a number of faculty that basically sort of threw up their hands in the air and said, “Here are my notes in PDF. I'm just going to email them to the students and just ask the questions online, but I'm not going to lecture [online].” …Engineering people, especially, are really sort of set in their ways. A lot of it has to do with the training itself—that it is a very rigid field. And it has to be that way because if you tweak things, [something could go wrong and] kill people with that… There is good reason behind this rigidity. (Lyn, F/A)

Lyn’s statements reflect a creed that failure is not an option—a belief that there is no room for mistakes in the real world so you can't make mistakes as a student in the engineering program. To that philosophy, a faculty member retorted,

> “You make a mistake in the real world, [and] your bridge collapses.” Well that's not actually true, not how it works. There's lots of layers checking and finding mistakes. I don't know that I have a good answer on how to get that particular subset, where they've been teaching from the same set of notes with the same assignments in the same exams for the last 40 years. I don't know that we're going to get change to happen. (Molly, F)

Openness to try new things was expressed by those who encourage change. These were called “visionaries.” When one faculty participant was asked if he was familiar with the writings of a colleague within his college of engineering, the participant had this to say:

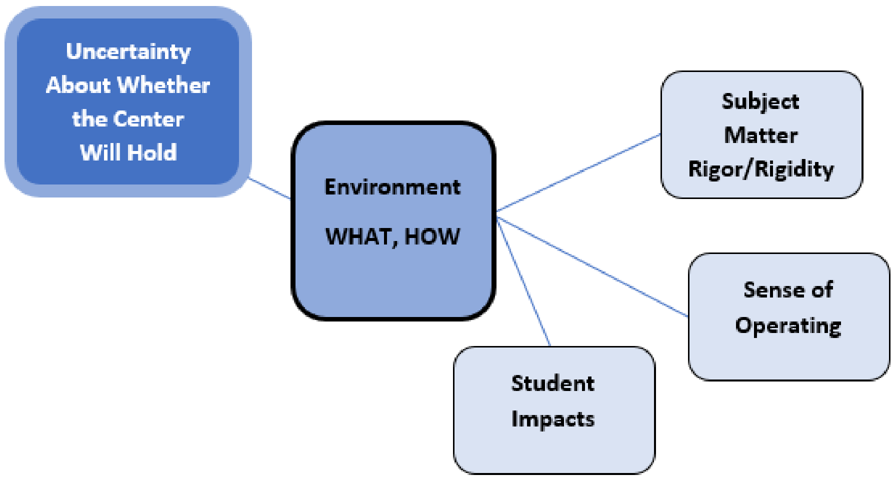
> I think he's a very inspirational person. I think he's a little bit less able to get the bricks and the mortar to work, but he's very visionary…created some special force to create a new vision…I didn’t pay much attention to it because it was stuff at a much higher level than I was interested in. (Declan, F)

This statement says a great deal: that the participant, though “inspired” by the vision, doesn’t want to engage with it. This mindset is further touched upon by learning specialist, Flynn, who illumined, “there are two faculty groups: (1) those who have interest in improving teaching, engagement, learning and will volunteer for a project like this [my interview], and (2) the engineering professional who just wants to teach the content.” She added, “When you start super far apart, there’s a lot more ground you got to cover to get to the middle, and to get to where you want to be." Her testimonial established the initial sound bites of polarization.

Finding 5: "Environment" – Revelations on the Impacts of WHAT is Taught and HOW Participants Operate and Behave (See Figure 53)

Figure 53

Finding 5: Sub-Finding Thematic Map



Engineering is not fun—a sentiment stated many times by all three university positions questioned. There's a belief that one must have a natural love for, or interest in, engineering to survive the academic rigor. This was reflected by faculty/administrator, Lyn:

> The undergraduate degree is just not fun, and there's just no getting around it. It is what it is. So, with that in mind, the students in general are pretty unhappy when they graduate here. However, two years later, down the road, when they realize the value of the degree, they're much more grateful, but the time in class, it's tough. (Lyn, F/A)

As characterized in Finding 4, engineering has traditionally been taught the same way. Several faculty members identified themselves as part of a generation of engineers and that the teaching style has worked well so far. Lyn went on to say,

> We do things the way we talk [what comes naturally], and it applies to all sorts of things including the way we teach, so that makes it really hard to change. There's just certain skills and technology that you have to teach the way it is. Optimizing won't work. (Lyn, F/A)

There are consequences, however, that impact student success—a point brought up in three different ways: students with potential, leaving the program; an undercurrent of hazing; and increasing student suicide. Students with potential are those who could do well as engineers, but don't have the requisite skills coming out of high school. They are ill-prepared for the level and speed of the program. Lyn went on to say, "So they manage by the skin of their teeth to get into college, and to pursue engineering, and then after the first engineering class, they get blown out of the water and end up in something else." Her comment speaks to the unfortunate case of losing a student who may have had promise—who could have brought a unique perspective to the engineering discipline—but was not cultivated.

With regard to hazing, one faculty member conveyed,

> You know engineering used to be a little bit of hazing. I was in the classes where the high grade was a 12. If you got a seven, you were so happy about that seven out of 100, because at least you weren't one of the people who just got no credit on the three hour exam. (Molly, F)

Several participants mentioned the importance of the score of 12. More alarming was the issue of suicide. This learning specialist stated:

> I don't have very glowing things to say about what it is like to be a student at [this university], from what I have observed. We have a problem with suicide. There's at least one every semester, and it's hyper competitive. Students are amazingly gifted—never cease to surprise and amaze me with the job offers they get and the projects they produce. Incredibly capable. They wow me—even the ones who are struggling. (Flynn, LS)

Faculty member Oliver agreed that there had been "a couple of suicides in the department…. I feel it's very important that we are obviously about creating intellectual property and creating new knowledge, but I don't think it can come at the detriment of well-being and the human connection." He went on to state that he believes, "the seeds [the signs] of this are here for a discussion about suicide." This reaction is disconcerting and speaks to the ultimate conflict: a climate of student suicide.

The above discussion touched on climate. Now I will relay proclamations about the environment—that is, the sense of how faculty members operate within the college—which came with multiple, similar descriptors. The environment was defined as entrepreneurial, independent, siloed, fiefdoms, individualistic, isolated, stope-piped, pragmatic, autonomous, ego-driven, no bosses. A faculty member stated,

> There are individuals who step up and take the lead. There are others who will lag behind because of that culture. Culturally, faculty in general don't like to be told what to do. We're in this job because we like the independence. Teaching is very

entrepreneurial. There's an incredible amount of freedom and flexibility to do what you want to do. (Brandon, F/A)

Ren, an administrator who is also a faculty member told me, "People have ideas for research that they want to do for the ways they want to teach courses and one of the great things about it: [the university] does embrace that, that entrepreneurial spirit for faculty." He added,

> Professors very much have ideas for their courses, and they implement them. We would like these good ideas to be used by a broad audience. So, that is part of the challenge for people who teach a certain way—for them to be willing to listen to other ideas and integrate, because at [this university] when you're the instructor of record, you go into the classroom, and you teach it as you see fit. (Ren, A/F)

Pragmatism was signaled by this comment from faculty member and administrator, Brandon: "Just give me the parameters, tell me your expectations, give me the options, and then let me figure it out. You don't get a lot of 'wise ones' who say, 'let's move on this.'" Brandon's statement amplified the challenge Ren mentioned—of getting faculty to listen to other ideas.

Another faculty member, in further acceptance of the environment, said,

> Nobody's my boss, or at least not really my boss. And, I haven't had any responsibilities to do anything other than what I wanted to do, or the students that worked with me, or my colleagues immediately around me, and so I've loved that. (Declan, F)

On one hand described as a collaborative, very positive, supportive culture (Molly, F), the environment was also styled by faculty member Dean as "not a cohesive unit—a bunch of people do a lot of things, but mostly have their own system" and "collaboration is not rewarded" (more about "reward" will be provided in another sub-theme/finding). Despite the physical separation imposed by the pandemic, there was a good reflection upon the administrative leadership, as this faculty member also said, "even though we're kind of scattered, at least the good thing is that the chair and associate chairs were very aware of the situation. I never felt, 'I'm in this mess, nobody understands me'"(Dean, F). Clearly, there are different perspectives regarding cohesion.

Operational descriptors such as separatist, individual silos, and fiefdoms were underscored by learning specialist Flynn, who stated, "It depends on the school you're in…My school is a little silo away from aerospace, away from civil, away from mechanical, and computer science [all schools within the college of engineering]. And my God, you leave the College of Engineering, and you've gone off a cliff!" She also cited a needless replication of services, as well as a separation of extra-curricular student development from academic life, that results from this go-it-alone environment.

Given the autonomy enabled for faculty, I asked the question about how change is handled. A faculty/administrator relayed,

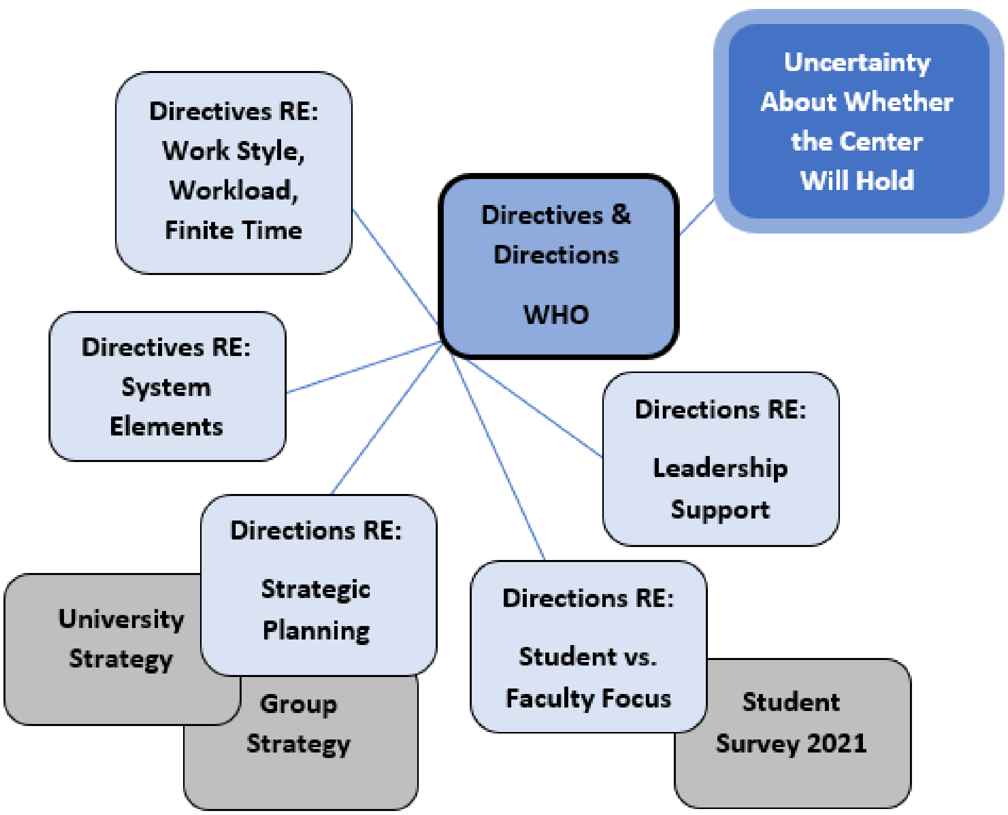
> That's a really good question. For something brand new, you can get "buy-in" because you'll be able to select faculty who are genuinely interested in this experiment, and so you basically select the folks that are willing. But to tell someone, a random faculty member in engineering, "oh you need to teach this way." It will not work. (Lyn, F/A)

Faculty member and administrator Brandon disclosed the label "ego-driven" for the current environment and suggested that people in the school felt they were not being listened to, respected, or “not getting the recognition they deserved.” Thus, these statements reveal an operating behavior of autonomy encapsulated within silos and egos, serving a tradition-bound, rigorous academic program—on the premise of encouraging student success.

Finding 6: “Directives and Directions (Real or Implied)” – Revelations of WHO Accepts the Vision and Sets Requirements (See Figure 54)

Figure 54

Finding 6: Sub-Finding Thematic Map



To set the context for this finding, I conceived the term “directives” to express an “imposed” action. “Direction,” on the other hand, is a function of something that “guides” action. Participant responses divulged both directives and direction. The emergency response to the pandemic shed light on how these terms are perceived.

Directives Regarding Work Style, Workload, and Finite Time

Directives, whether real or structurally implied by the broader institution of higher education, or forced by COVID, took on various forms from discussions of work style/instructional mode to workload and finite time issues, to structural elements inherent in the system of higher education.

Work and Instructional Style – Forcing Functions Due to COVID. Work style is a category that seemed appropriate for responses that brought up “the hybrid” instruction mode and its propensity to create certain workplace inequalities and lack of transparency. It was said that this teaching or staff operational mode had people working harder, and longer, than in a pre-COVID time. However, one administrator/faculty member, Teague, said, “They're probably more efficient, but I know that a lot of people have also used this as an excuse to totally do nothing. So someone else is carrying them.” He went on to say that after a while everyone stopped sharing their video during BlueJeans sessions, which indicated a disrespect for—a rudeness to—the other participants.

Faculty member Oliver felt that there was a forcing function on teaching that came from a higher level in the university—that was instigated by students. Though he did not elaborate, he stated that “there is a minority who care about teaching, but then a minority within the minority who actually can do it well.” He elaborated:

> There’s a lack of transparency on the arrangements that are being made. So it's almost like there's an equity issue. What do I mean by that? We learned that some

> folks had worked out deals on the side where they don't have to do the hybrid. It would have been better if there was some honesty and transparency on these arrangements, and because that wasn't there it wasn’t fair…I did learn that actually some people are still doing fully online. (Oliver, F)

This comment came across as a “venting” but has been illumined by other comments presented in Theme Three about the science of learning.

After a year into the pandemic, attendance on campus was still indecisive, with several mentions of going “into the office” and finding no staff or fellow professors there—a work mode that many feared will continue for the future. Further, people on the staff and administrative side were leaving the college. It was a problem, as it affected students desiring to meet with advisors who were only on campus a few hours a week, or who had permanently left.

Additional opposition for a fully online offering came from the viewpoint that students coming out of high school need a few years to develop critical thinking skills and develop professionally, which faculty felt was more conducive in a functioning, on-campus classroom, as opposed to a fully online program.

Pertaining to college research, as well, there was discontent with the hybrid working model. A faculty member conveyed,

> At a PhD level, if it's a virtual [meeting], it's not easy to conduct in depth discussions, and it's also very difficult to have intellectual simulations, because in virtual mode people tend to present whatever they want to convey to the other party, instead of having an environment that allows all parties to jointly focus on specific issues. (Jeff, F)

Jeff's statement about research meetings touched upon the same lack of spontaneity and interaction that is perceived in the online teaching mode. It also reflects the directive to meet virtually.

The directive to manage exams and proctoring, using online software, created angst because of the use of an "intrusive" camera that catches cheating. One administrator/faculty member called it predatorial. Another concerned faculty member said, "If I can't trust my students, I don't want to teach…. I'd rather try to teach them to be honorable than to try to catch them in the act" (Declan, F).

Some of those interviewed felt they had developed a comfort with online and/or hybrid teaching. However, this is not a mode they want to be directed to do indefinitely. A faculty member stated,

> If I have to be in my job from now on, and it is always having to teach online, I will get another job. Lots of my colleagues say the same thing. I think people choose to be professors, no matter how much they talk about research, being with the students is the big part. (Dean, F)

Beckett, another faculty member, said:

> Long term, I fear that there will be a push to always have a hybrid environment where students can choose to come or not to come. And I do fear that technology has been used in the past year that is not the correct way to deliver a college education… So now, you will forever be required and expected to broadcast your lectures simultaneously. So that you get all the students. And if I could change one day—I could do one thing—it would be to make sure that doesn't happen. (Beckett, F)

Lastly, work directives—real or implied—created stress. When asked what he would do if he had the power, Dean responded:

> If I had the power to make changes, I would make vaccines and masks mandatory. That's a big source of stress right now….I understand 20 years old. They don't have much problem [with COVID], but I have a 4-year-old at home. So I think the worries of the faculty are in a different place. In undergraduate classes, 20% to 30% are not wearing a mask. (Dean, F)

When asked about the source of his angst, Dean replied that it comes from the government. "We are a state institution. A lot of the things that are allowed to do or not to do are 100% political. We should 'just follow the science.' There is actually no politics in the science." His political reference has to do with the state and the politicians involved, relevant to the case study location.

Administrator and faculty member William added,

> There's things you can change and influence and things that you can't, and so you do the best you can. I'm sure I'm viewed as very, very harsh in making my people come back, but you can only control what you can control. (William, A/F)

He, too, was talking about enforcing a directive to return to work and to class—and described an inability to control outcomes.

Workload and Finite Time—Directives Impact Relationships and Resources. Expressed as one of the biggest challenges the university faces is: "everybody's so busy that it's, it's difficult to make time to get to know other people" (Ren, A/F). Further, to utilize some of the resources available, such as the center for teaching and learning, or the professional education department, would require more effort than it takes to make lecture slides on one’s own. As a faculty member put it,

> That could easily be a fault of mine; that might be a very unfounded fear, or concern. But you know what? I have finite time, I just haven't attempted this to see if it would work because I'm afraid I would waste time there, and then have to fall back onto myself… The faculty I know tend to prefer, for better or worse, to try to do things themselves, which probably means we don't take good advantage of some of these resources as the administration wishes we would. (Beckett, F)

A significant reason for finite time rests with a dichotomy between class size versus quality and individual student contact or stated another way: the issue of democratizing higher education and providing meaningful learning opportunities. The respondents spoke of normal class sizes of 90 to 100 students, which makes it extremely difficult to develop relationships. As one faculty member pointed out,

> We have the worst student to faculty ratio….You know all the public health issues and the suicide. To a large extent, it’s because we have less time with the students, providing meaningful learning opportunities and experience…and we don’t have the discussion for these things. Being in office hours all the time and on Sunday evening after 8 pm. That’s just not sustainable. Not sustainable. (Oliver, F)

And another faculty member said, “If you're going to be spending three to six hours to record a one hour lecture, you don't have time to also spend another hour or two in an office situation” (Gabriel, F). This is a reference to the directive to return to campus but continue to conduct hybrid classes and hold advisory sessions with students.

Also on the topic of workload, often stated was how much work is involved with the hybrid mode of teaching. As stated by a faculty member, “The hybrid was a tremendous amount of work on my end, compared to the regular way. So for the little payoff that I saw, to me, was not worth it” (Lyn, F/A).

Workload and finite time were issues that surfaced as a result of the directive to move all on-campus classes to online, and then, as COVID seemed to be easing, a decision to partially return to campus for the fall 2021 term. As if the situation just described is not weighty enough, elements of the system of higher education added an ever-present layer of directives—many of which are inescapable if one desires to retain a career in academia.

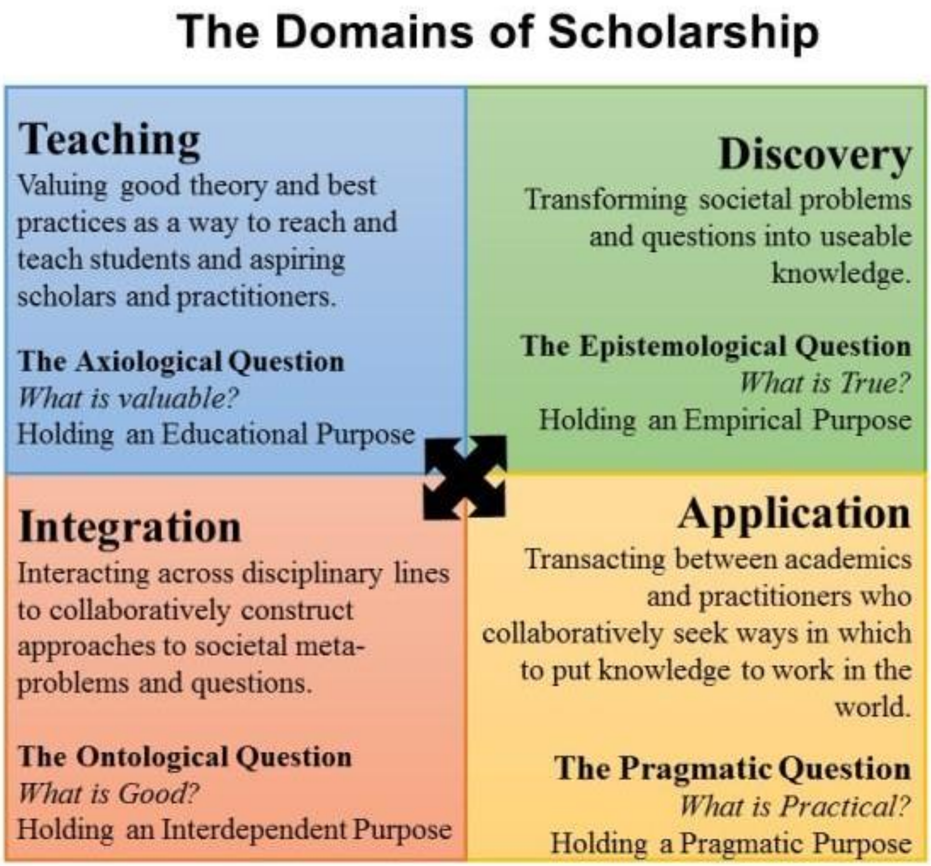
Directives Regarding Higher Education System Elements

The literature review included a discussion about the very entrenched elements of the university faculty job description. These include—and were repeated in the interview responses—the tenure track, publish or perish, research and grants, levels of bureaucracy, model of scholarship, and promotions and penalties.

I will begin with the model of scholarship, as it is extraordinarily foundational to mission and faculty identity, as evidenced by the responses. I was provided the following “Domains of Scholarship” (Figure 55) by Douglas, who is a faculty member and administrator, with a definite bent toward learning science.

Figure 55

The Domains of Scholarship



- The **Scholarship of Discovery** encompasses those scholarly activities that extend the stock of human knowledge, such as through basic research.
- The **Scholarship of Application** encompasses scholarly activities that seek to relate the knowledge in one's field to the affairs of society and crafting solutions to problems that will affect people or our planet.
- The **Scholarship of Teaching** encompasses scholarly activities that are directly related to pedagogy. Such scholarship seeks to improve the teaching and advising of students through discovery, evaluation, and transmission of information about the learning process as it relates to teaching methodology or

learning outcomes, learning theory development, and the development and/or testing of educational models.

- The **Scholarship of Integration** encompasses scholarly activities that are primarily interdisciplinary or interpretive in nature. It synthesizes, interprets, and connects the findings in a way that brings new meaning to those facts. (Boyer, 1997, as mentioned by Douglas, LS/F/A)

This model was provided to me as foundation for understanding the system of promotion in higher education. The academic community (and system) has certain expectations about what it takes to get promoted. Participants in my interviews indicated that faculty may have done the same things for many years, but it isn't until they win awards and grants that they get promoted. This implies a focus on the quadrants of "Discovery" and "Application." Douglas acknowledged that in his tenure/promotion package he used an atypical combination of the model quadrants. He went on to say,

> But it wasn't until you get the big prize and they money that they're like, okay, time to be promoted. It is not a negative, because I think it's part of the larger culture of academics, where they're looking for people to get papers and grants and graduate students, and that's not what I did. So I took a risk and it ultimately paid off. (Douglas, LS/F/A)

A faculty member supported the importance of the system element: tenure track, by stating,

> We're a research institute with faculty and tenure track faculty who have a lot of pressures with research and bringing in dollars in graduate student research. It's hard to put in the amount of time that you would like to do it [teaching]. If it's

> more part of your tenure track, faculty members don’t get a lot of carrots for doing great teaching. They’re going to get promoted because they're doing research and bringing in grants and contracts, they're not going to get promoted because of things that they've done innovatively in teaching. (William, A/F)

A descriptor of the college under study is that it is a research institution, which some participants felt gave permission to focus on certain quadrants. William spoke of a reason for less emphasis on teaching, given that he works for a research institution:

> If they're horrible teachers, it will keep them from getting tenure, but for most cases, they're just doing it as good as they can, given the limited amount of time they can put into it, and so that's understandable. I mean it's just, that's the way the system works, particularly at a research institution…If you go to other schools, smaller schools, ones that are more teaching-oriented/student-centered or oriented, it's going to be different. Then again, they're not bringing in, you know $50 million in research grants and contracts, and it's not a research enterprise, so you can't be great at everything….Engineers typically are very heavily research oriented. (William, A/F)

Given William’s statement, the “Teaching” quadrant is underappreciated. Likewise, earlier in this theme discussion I mentioned a statement by Dean, a faculty member, who recounted, “collaboration is not rewarded.” Faculty collaboration fits within the “Integration” quadrant of the scholarship model. He feels that area of scholarship is unappreciated.

There are several levels of bureaucracy at the university system level, with policies and procedures, that some said stifle innovation. Additional ones at the university level make things even more challenging. Those interviewed spoke of surplus work that was policy-related, hiring-related, or technology onboarding that seemed to place a burden on their time. Another interesting mention is that the tenure process may be changing, as one administrator/faculty member said faculty once operated like "independent city states." They would "catch their own clientele but are now being "reeled in" by taking away tenure and instead giving contracts. He went on to say:

> Admin determines how money gets distributed, or who gets raises. Seven college deans…another layer is president and his cabinet of VPs. All are not accountable. Progressively you have, I don't know, an infrastructure, with many, many layers. And there is a magical point where you get paralysis on things. (Teague, A/F)

"Publish or perish" is a directive relevant to university systems, which is another reason given for lack of interest in digital technology and the current state of virtual teaching. A faculty member informed, "I don't think many faculty that are trying to juggle a research load, graduate student supervision, and everything have time to spend on this technology…Nobody has been able to break that cycle at the top tier universities" (Declan, F).

So the question arises: how do you gain in any innovation or technology, given the system constraints? An administrator and learning specialist said,

> It's especially at the research institution that the currency is research, publications, and grants. Any time that you carve out from your day is going to damage something. You can add hours to the day—you're prioritizing, and the outcome of that prioritization needs to be beneficial to the faculty career so that's

> one challenge that is, I think, across the board, though especially at research institutions. We've used different strategies to entice faculty. (Jane, A/LS)

It was stated several times that spending time thinking about technology in teaching is not going to help careers (Declan, F). One comment also highlighted a "statistic" that "when you telework, you are usually left behind in terms of promotions and raises, because you're not playing the social game. I think also it seems to be penalizing you in your career progression" (Teague, A/F). This informs the aversion to virtual work or online instruction as a permanent solution.

I now turn to the concept of direction, which I hold as providing a set of values, strategy, and objectives that enables individuals to determine what actions support those values. This portion of Finding 6 came about as participants discussed strategic plans, student- versus faculty-focus, and desire for leadership support.

Direction Regarding Strategic Planning

As evidenced thus far, there is most often a polarization of views. Many enjoy their independence, while others are seeking direction from above. There was an innovative strategic plan until just prior to COVID, when a new president took the lead at the university. A faculty member felt, "There are incredible opportunities [in the new plan]. But here's the framework, so as soon as you put stuff down on paper, you are boxed in a little bit, but it's okay. It's not a tight box. It's pretty big" (Brandon, F/A).

Strategic Plans. As part of this study, I reviewed documentation related to the Institute Strategic Plan, the College Strategic Plan, and the Foundation Grant Proposal done at the school level. The key points from these documents relate to the vision of strategic direction intended by the authors. An opening paragraph from a letter by the new president—about the new Institute strategy—is provided below:

> We envision an institution that leverages its unmatched scale and resources to address the most crucial challenges of our time. An engine of innovation and entrepreneurship that helps position our city and state as vibrant hubs of economic opportunity and dynamism. A global institution that develops committed, global leaders who can build bridges of collaboration around the world. An inclusive academic community committed to expanding access so that more voices, more minds, and more perspectives can contribute to creating a better future. (p. 1)

The ten-year Institute Strategic Plan states several times that its core value and top priority is its students and that it champions innovation, inclusion, diversity, access, excellence, impact, collaboration, ethics, freedom of inquiry and expression, and leadership by example—having involved in the plan development more than 5,700 individuals, a 64-member steering committee, and six working groups comprised of 250 students, faculty, staff, and alumni. The plan states a mission as a public research university "committed to developing leaders who advance technology and improve the human condition."

The college of engineering has a strategic plan, as well. It's mantra is "adapt and accelerate…community, learning, and discovery" as it endures a global pandemic. Further, it states,

> We've developed new methods of hybrid teaching to keep faculty and students engaged. Our research operations have safely continued, fueling technological innovation across the Institute. And, the call for change in the face of social

inequities across our nation has prompted the College to reexamine what it means to be truly inclusive, not just in our words, but in our actions.

The foundation grant that was recently awarded to three schools within the college has three components: storytelling, experimentation, and social learning spaces. From the perspective of direction offered by the Foundation Proposal—a focused level in the local system—opening statements include references from, and reflect the premise of, the institute and college-level plans:

> Several specific actions will be taken to fulfill the strategic focus areas including:
>
> 1. providing all students with transformative learning experiences to grow as creative, ethical, globally aware, technologically sophisticated leaders who can define and solve problems to improve the human condition,
> 2. creating new academic programs at the intersection of arts and technology and incorporate learning experiences into the curriculum to develop creativity of students across disciplines, and
> 3. developing and expanding student programs in social innovation and entrepreneurship. This new strategic plan shows that [this university's] leadership will be highly receptive and supportive of the pedagogical approaches proposed in this [foundation grant] proposal.

All documents illustrate a shared vision, and the group strategy of the foundation proposal extends the prescribed vision by suggesting an intersection, or multi-disciplinary approach to learning.

Participant interviews, however, spoke less of any strategic vision and reflected the broader state university system when it came to understanding direction. This appears reasonable, given the emergency mode of operation.

Regarding direction from the state university system, an administrator stated,

> Well, you hope that you're going to get some instructions from the top, but they haven't come. [This university] is a state entity. The governor is a Republican. She controls the university system, the governance, the Board of Regents. So they have pretty much told everybody if you want to keep your job you show up at work. Everybody has to be back. Pre-COVID there was no limitation on how many people you put in the classroom, in the dormitory, and the like, which is totally contrary to what's happening right now. So we're telling everybody to come back because they are giving us wishy washy statements like, it is not a requirement. It's a recommendation. Well what if someone doesn't want to put on that mask, what do you want us to do with that person right now? Then they want us to teach with them on -- that's like a three hour class for me with a mask. So I don't know that these are all half-baked ideas, you know. (Teague, A/F)

Teague also mentioned:

> The new president of the university got his hand slapped by the [state] system—had to retract proclamations of change. Lost face. Democratic mayor of [city] wanted something else. Constant friction. Now, fast forward 15 months, you have a situation where no comments are made of any kind. (Teague, A/F)

A faculty member added, “Part of this is the university system of [state] has more control and forcing us—all 23 or 27 institutions—to be the same. That doesn’t work. The research institutions are very different from two-year institutions. Forcing homogeneity." (Brandon, F/A)

Another faculty member said, "At some point you have to pull the trigger. I think when change comes about what would be better or helpful is if someone kind of simplifies the change and tells us exactly" (Don, F). Students came back in the classroom in the Fall of 2021, with a goal to get as close to normal as possible. Administrator Carter said, "There's a looming sentiment that if things continue to get worse, no one knows what to do. It has not been addressed explicitly."

A faculty member relayed,

> This semester teaching in person with students, I've had probably 10% --maybe a little bit more of students that have caught COVID…They don't have to tell me. The rules, don't get me going on this, but the rules that we're under that, that I'm not allowed to ask if they're sick, is it COVID? When I get an email from the dean that says this student is out for medical reasons, they won't tell me what it is – COVID or not--have I been exposed? Have I not been exposed? No, you can't ask students a question, it's crazy. It's absolutely crazy. (Declan, F)

The Question of Student-Centered versus Faculty-Centered. After three terms of virtual instruction, the aerospace school within the college of engineering conducted a student online survey in January 2021, in collaboration with aerospace schools at two other major universities. The goal was to seek student feedback to help faculty determine the best online strategies for the Spring 2021 term. The responses totaled nearly 600 (204 of which were identified as students within the aerospace school of this case study), with a large majority (80 percent) being undergraduate students. I was provided access to the results. Key findings are indicated by the following.

- Given the ideal mix of live versus recorded courses: students prefer live synchronous online courses (but recorded for later reference)
- The best use of live: presenting worked examples (comments indicated they don’t like professors reading their slides)
- Best features of live (synchronous) online class periods: Access to live discussion with the professor; regular schedule; certain material is better presented live; (comment: makes me more accountable to pay attention and not skip around the video)
- Best use of recorded (asynchronous) content for learning: presenting worked examples; presenting theory development; presenting supporting information
- Best feature of recorded (asynchronous) material: Ability to review material; flexibility in scheduling; (comment: I find learning asynchronous akin to YouTube learning. It sticks for a day and then it is gone. Need more active learning and discussions that are “live”)
- Ideal video length for recorded lecture segments: 20 min; 30 min
- Best lecture presentation (live or recorded) format for learning: 50 percent PPT presentations, 50 percent handwritten presentations; (comments: it depends on the instructor and the material; “Dr. XX’s PPTs are works of art and replace all need for a textbook;” “best format is ancillary to the professor’s ability to clearly convey a concept and the needed tools.”)

- Best testing approaches: Practical problems (obtain qualitative result) showing all work; qualitative problems (describe key factors or a procedure for a problem)
- Best approaches to eliminate cheating: Project based assessments; employ more lower stakes quizzes; group assignments and assessments

The last question was open-ended, with a variety of ideas submitted that touched on many topics. As with the study interviews, responses were mixed regarding the perceived value of in-class versus online instruction.

- Live classes enable easier doubt clearing and concept understanding and following the thought process and the lecture of the professor as it is more interactive.
- The verbal communication of the professor is vital in imparting valuable insights into learning the content.
- The professor is the most important aspect of an online course since it is often more intimate than in-person. A professor that is enthusiastic or innovative in their teaching method and one that is willing to share their out-of-classroom life with us through video motivates me to engage in the class more.
- Seeing pre-recorded lectures tells me the professor is prepared for online and will be prepared for any online challenges.
- The biggest issue I faced learning online was a lack of communication from professors. Since all contact is mainly through email, it was incredibly frustrating when professors took days to respond on Piazza or weeks to submit grades, or when they did not communicate information about exams/projects

until near the due date. Uncertainty and worry about grades is going to create more motivation for students to cheat or skip classes when they feel like they are not following along at all.

- Having a full schedule of lessons ahead of time, clear syllabus, extra time to submit exams (to give time for scanning and submission), and plenty of office hours.
- Online students in a hybrid class tend to be neglected, better engagement with the online class would be good
- The recorded videos for online courses should stay away from the traditional lecture formats and aim instead to make high quality media to present the information effectively given the medium. Some great educational content creators which I think should inspire the professors include Khan Academy, Brilliant.org, and others. These content creators evolved online and thus have become optimized for the internet; as a result they are easy to watch and understand. More effort needs to be specifically dedicated to helping professors produce better online content.
- One thing I really wish would happen is that students [and professors] would turn on their camera during office hours or lecture. It really changes the sense of community…I felt very isolated and frustrated all the time.
- Using mini quizzes to engage students during live lectures or finding another way to get students to interact with the class. This would make the lectures more engaging since many students feel isolated from the normal classroom experience.

- Online courses it is very difficult especially for someone like me who been away from school for about 15 years. I am used to in class format and following with teacher as they go step by step. Fall of 2020 was a disaster for me, I was going on like 3 or 4 hours of sleep every night so I can catch up with all these lectures.
- Gamify the system. Group assignments disincline cheating as having the assignment grouped rather than individual will already seem like an advantage. Plus, in working together students will have to reflect on their knowledge of different subjects and how to Convey or Express that knowledge.
- Personally, I would like to have the option of choosing to attend a course fully online.
- I prefer online classes because it gives me flexibility in my schedule and lets me learn on my own terms. Oftentimes in person classes move too fast for me, so online is the perfect way for me to learn. Having occasional Q&A sessions and having office hours helps for when I have questions that aren't addressed in an online recording.
- I learn much better in person, and I stayed in school for my masters for that in person instruction, rather than taking classes remotely while working. I look forward to getting back in person as quickly as possible.
- This online format it is much more difficult than being in class and it is hard for students to stay motivated, but what helps me to stay motivated to learn is the professor, if the professor is enthusiastic and excited about teaching and if

> explain the concepts enough for me to follow with then I feel like I want to learn more and I am always excited to be in her/his lecture.

In summary, the student perspective speaks to a desire for creative instruction on the part of faculty. Preferred is an animated, caring, humanistic, hand-drawn, live delivery of content—to include detailed workings of example engineering problems. They appreciate recorded sessions for theory development and supporting materials that they can revisit and review on their own time. Students like to work in groups, especially during the pandemic, because they learn well from each other, and they need to fend off a sense of isolation. Finally, students want a communicated schedule, so they know what to expect. Everything stated above requires preparation on the part of faculty, and it is noticed when that occurs.

The importance of gathering student viewpoints is especially helpful in this study, which had a scope that was intentionally bounded by a focus on staff perspectives and internal emerging conflict. The bonus is that I was able to see the other side of the situation. Moreover, the results of these surveys provide one insight that is significant within this theme: the school approached students to get their perspective, and this hints at a “student-focused” philosophy.

There is meaning in having either a dominant student focus or, alternatively, faculty focus. Through the study’s participant interviews, both perspectives were stated. An administrator/faculty member said,

> There’s still a lot of faculty-centered stuff going on, but you have a lot of faculty who are more willing to do more student-centered stuff and do more things in the

> classroom that are not so traditional. I would say it’s still heavily faculty-centered. (William, A/F)

Another described a student-focused view:

> I think it's student-focused in the sense that I think everybody is trying to do what they can to benefit the students. We don't necessarily view students as customers. There's a sense that we shouldn't bend over backwards to make the students happy, but we should do what we can to benefit the students. And I think there was generally an embrace of speaking specifically during the COVID year, we call it that, I think there was generally an embrace of moving towards technologies that can aid in in the lectures. And I didn't see people trying to do revolutionary things like flipped classroom, for example, but I did see people make earnest efforts to figure out how they can deliver lectures in a high quality way, using online tools. (Beckett, F)

The administration had suggested the flipped classroom approach, which shuffles the normal order of teaching so that students are requested to view pre-recorded lectures first, engage in problem-solving exercises outside of the classroom, then work through the problems during virtual (synchronous) class time.

Leadership Support is an Expression of Direction

When COVID hit, administrative support came swiftly for extra laptops, web cameras, software, and extra graduate students. “You cannot throw Camtasia or Canvas or any of these things in front of a teacher and expect them to all of a sudden perform at a new level without a lot of help,” was stated by faculty member, Declan. Simultaneous to the switch to online, the university shifted to a new learning management system (LMS), Canvas. This same faculty member made another compelling point:

> The differences can be overwhelming when you're trying to teach the same darn class all over again. You know you've done this three times before and now you’ve got to do it a fourth time, it's really demoralizing when you can't do what you used to be able to do. It's not a matter of “oh, this is new I can do this, it's how the hell do I do what I was doing before,” and you need that support. And it could be that this new tool but it's much better. Well it's not much better if I don't know how to use it. So, the support for that is really where it needs to be.
>
> (Declan, F)

Noted is the use of the word, demoralizing, which supports the impact of having to re-do and re-learn on faculty identity in the new environment brought about by digital technology. This participant is calling for more support.

When asked what the university could do to better support, many answers referred to “leadership.” Some felt leaders were doing too much, others, not enough. A faculty member voiced the system element mentioned earlier about the lack of support for those who value teaching. He said,

> It’s a leadership issue. Teaching is not supported. No one is saying “I’m going to support or promote people who care about teaching.” I balance my teaching and research roles because they are intertwined. In one of my courses, the students return a project, and they work on research with me, and then those get turned into publications, like meaningful research, research output, so I don’t make that distinction, even though the students and the faculty make that distinction…that is

> a 1980s mentality. More support? I would say, more empowerment. I feel like zero empowered. (Oliver, F)

Oliver speaks to not feeling empowered because innovative teaching lacks leadership (and system) support. Here is another similar comment: "My vision is very narrow and focused on what I'm doing and what I want to do in the classroom, and I guess what I would hope is to see the support for that" (Declan, F).

Other calls for support came for more resources (money) and greater flexibility (less bureaucracy)—raising the issue that workflow has become cumbersome in recent years. There was also a call for help with the technology—for faculty who "threw their hands in the air." A faculty member decried there was some support, "far from sufficient…I think most everyone would tell you it wasn't the best or the most comprehensive or the easiest" (Lyn, F/A).

Given an uneven description of support, a faculty member confessed,

> I got the support I needed. It was a difficult time, and everybody was stressed, but I felt, for the nuts and bolts, they were good people [those in the Center for Teaching and Learning, as well as those in Professional Education]. One of the problems for me, though, is that I know a lot of people, and they know me. I have been here a long time, so I get better attention than most people do. (Brandon, F/A)

Concerning values (such as the ones stated in strategic plans), incentives, and support, faculty member Oliver conveyed:

> There's a lack of transparency and care, having a set of values articulated. I would ask that incentives align with the kind of behavior that we value, we would want

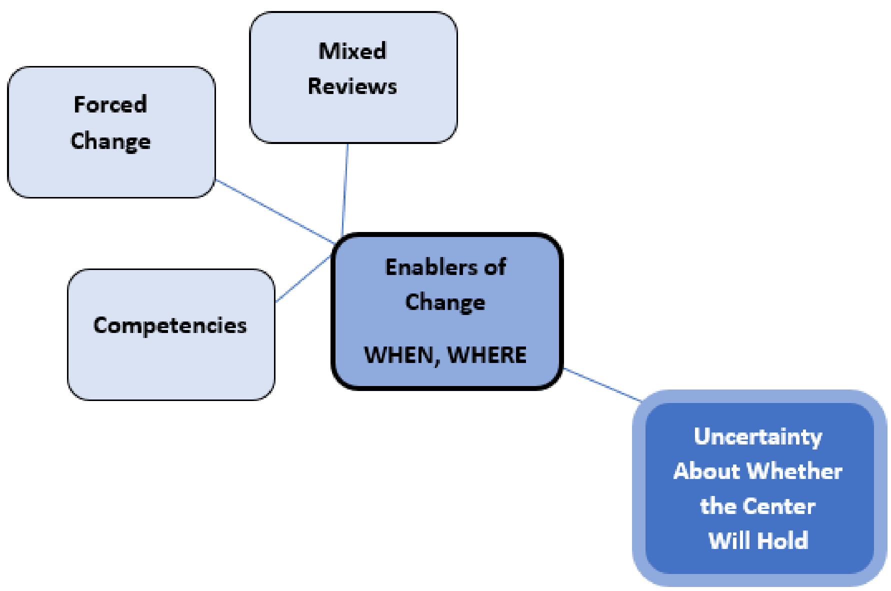
> to value. There are leadership issues. Things that appear as casual recklessness, are just lack of bandwidth. (Oliver, F)

This appears to be a mixed assessment of leadership—on one hand criticizing, and on the other, providing a justification.

Finding 7: "Enablers of Change"—Revelations of WHEN and WHERE Something Different Happens (See Figure 56)

Figure 56

Finding 7: Sub-Finding Thematic Map



Comments about agility, open mind, openness to change, willingness to learn, and desire to do better surfaced—shedding light on an apparent recognition by some that all is not lost in the digital environment they were forced to embrace. Many acknowledged their chair and associate chairs for being competent and flexible and enabling an agile adjustment to the change in March 2020, the start of the pandemic. Likening innovation at the university to "turning the Titanic" (a reference made several times in the interviews), learning specialist Flynn illumined the fact that one school within the college was relatively new, and it was started by a learning scientist who challenged the way everybody who joined the department thought about teaching and learning—creating a "we're not going to do things the same way that they've always been done, because of an always done that way culture." She went on to say, "When faculty interview today, it is communicated to them, which is why we get so many grants. So, the department is always focused on change and making our students more inclusive and including more inclusivity concepts into our program" (Flynn, LS).

Certain attitudes enable change. Sub-themes that surfaced under this finding speak to what it seems to take to enable change. These include: *certain competencies*, *forced change via pandemic*, and the detractors or *mixed reviews* concerning the response to change.

Change is Enabled by Certain Competencies

Asked in the interviews was the question of competencies required for successful implementation of innovation and/or digital technology. Some responses cited that change happens with an open mind and willingness to listen to others and other ideas—resulting in new skill-building. Ren, an administrator and faculty member, spoke to openness:

> That's really certainly [needed] across the "storytelling elements" that we're going to inject in the courses, and then also the "do it yourself experiments," because we have certain experiments that we've done for years and years and years, and we're thinking about changing that up. People are a little resistant, so I think an openness to change in terms of faculty, that's probably the biggest needed competency. (Ren, A/F)

Ren acknowledged the resistance to change but seemed encouraged by the work coming out of the new foundation grant for the four units that would be implementing it, and that it would open minds.

Not only the pandemic, but the increasing class sizes justified the need to use digital technology. Learning how to use new software to achieve teaching objectives became a competency. Don, a faculty member, suggested that a tool called Piazza was useful for question and answer forums because it inspired engagement, exclaiming, “When it really takes off in a class, it’s magic because everybody becomes engaged in the conversation online, and you can reply very fast. You have access to your students, you don’t go through email, which is super cumbersome.” This suggests his mind was opened as he tried a technology. Note, however, that a student survey comment indicated frustration when professors took days to respond on Piazza.

Another software, Camtasia, was offered with online training from one of the company’s instructors, which was a great benefit that helped to inspire trial. Faculty member Declan touted, “I've got some first class videos now. I've got 150 videos that I've made with Camtasia.”

The more the “COVID year” continued, the more comfortable faculty became with the virtual environment, citing more new skills and verbiage such as breakout rooms, recording and sharing video, and screen sharing presentations. An administrator/faculty member agreed,

> Young people seem to have picked it up very quickly. There’s maybe ten or so skills that you just develop and then you pretty much have the hang of it. So using

> the tool, so it's kind of like my cell phone, I don't know how that works, but it's easy to use. I can open my e-mail. I could do this. (Teague, A/F)

This highlights the attribute to be a willing learner, take advice from professionals, and change, even as others appear more proficient—as opposed to:

> “This is what I want to do (my way or no way).” When you force that—the use of technology—you get that. So, willingly change, and take advantage of what can be done better. Identify them [innovative technologies] and really exploit that. We can always do better. My own digital literacy is a “C,” and I’m proud of that! (Brandon, F/A)

Brandon suggested that change rests with the individual’s willingness to change, but once convinced on the value or benefit of an innovative technology, the willingness follows.

To be able to accomplish goals and to do one’s job, learning specialist Flynn conveyed another competency—that of building relationships, saying,

> When you’re building relationships with folks and you help them, they help you, that starts to establish and chip away at any credibility issues you have. Within, too, it helps because they see hope: “You can get stuff done. I’m willing to work with you because I thought that this actually yielded a good change in my students.” (Flynn, LS)

Flynn spoke not only of the importance of building relationships, but of the responsibility to keep them strong by effectively producing outcomes.

Change is Enabled by Forced Change—Pandemic

Though instructional innovations had been considered pre-COVID, the pandemic forced the broad implementation of digital technology in the learning environment—forcing great change. Carter, who is an administrator, acknowledged,

> The pandemic really forced us to do the broad implementation and put it up in our classrooms. And we had some things in there [plans in place before pandemic], but it wasn't all the classrooms, and it was kind of limited, and it [the pandemic] really made us say, “okay we're gonna do this review of baseline technology to where it's not too difficult to do remote teaching from the classroom. It still takes a lot more time, which is something that a lot of faculty don't realize, compared to just walking in delivering a lecture or writing on the whiteboard. Yes, there's prep time for that, but it's not the same level as producing material that's recorded and put online, even if it's easy to do it in the amount of time, it is still significant. (Carter, A)

Another faculty member stated:

> Well, I think COVID has done wonders for this whole thing, because all of a sudden, the university’s administrators woke up and realized my God we're going to have to teach remotely, how do we do that? And the faculty were thrown off the cliff, literally, and in some universities, I can't imagine how they fared. We at least had an IT group and administrators who were willing to spend money for the technology that they thought would be useful and put it out in front of us. I had to learn how to use it. (Declan, F)

Further, Teague, an administrator/faculty, recognized, “Changes were made, that will have taken decades to happen, out of necessity.” He is referring to the challenge of “turning the Titanic” to get significant change to occur in this university environment—whereby the pandemic sped up the process.

The desire to always improve was voiced in this statement by a faculty member:

> If we stopped thinking about how we can do better, then that's sort of the worst thing we can do. If we just are happy with how it is, we're gonna stagnate. I don't think any change is going to happen overnight. I think it's going to be little steps along the way. But I think we can always… every semester just keep saying, “How can we do this better?” (Molly, F)

Molly raised the topic of incremental (little steps) versus radical (turning the Titanic) change.

Mixed Reviews Concerning the Response to Change

More characterizations on the enablers of change were mixed. The respondents expressed a reluctant acceptance that a hybrid situation is in the making. One stated,

> As an employer, I was very reluctant to let people not come to work -- just work from home. But now I can see as I'm trying to bring them back, that they're very used to this, and they find it more effective. They don't see the value of spending endless hours in traffic. I think we're going to start seeing something hybrid like people are going to start expecting not to go [in]to work every day. I think more and more people are thinking about quality of life—there is no quality of life during the week, I mean, you were exhausted by the time you get home. So you

> live for the weekend. Forty percent of the workforce does not want to go back, and they will probably change jobs rather than go back to that one. (Teague, A/F)

Citing long-term pandemic impacts, an administrator/faculty member said, “My students online are doing horribly; it's gotten worse and worse…and as soon as you offer a student an online option they won’t come to class (William, A/F).” Further, he stated, “that's pretty discouraging being an old school guy who's been around education for many years. I just see a lot of what we're losing, and have lost, and I fear that we're never going to get it back” (William, A/F).

Faculty member Don added, “One of the drawbacks of being in a large institution is that sometimes when change happens, it is sort of ‘shoved down your throat.’ You just cannot get everybody’s input or make sure everybody’s happy.”

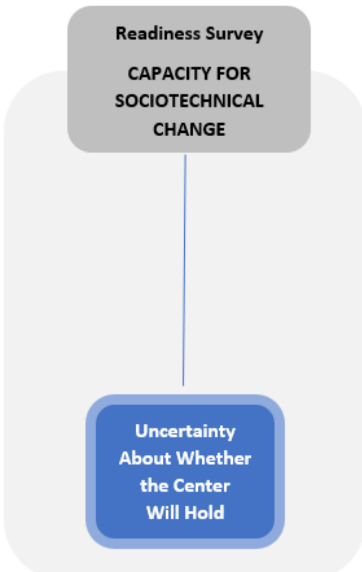
Another complaint was “In some cases, they have rolled out software that is so clunky, untested, ridiculous, and every time you complain they say well these are growing pains -- you need more training. My goodness. Well if I didn't have to pay for the training…” (Teague, A/F).

A former administrator, now back to teaching full time, said in response to the disruption of COVID, “We are pretty much in a passive-aggressive-reactive mode. Face the reality: we are forced to switch to virtual mode for instructional delivery, but we are responding in a passive mode—trying to utilize the best possible tools available to us by passive mode” (Jeff, F). This is a very insightful comment that reflects a sense, on the part of the participants, of a temporary-ness of the pandemic situation, and thereby a temporary adoption of digital instruction. For these, it’s only a matter of time until things go back to normal, and there will be no more reason to deal with digital technology.

Finding 8: "Readiness Assessment" Informs Minimal Capacity for Sociotechnical Change, and Therefore, Technology Adoption (See Figure 57)

Figure 57

Finding 8: Sub-Finding Thematic Map



Simultaneous to the qualitative interviews, I conducted an online quantitative survey. The intent of the survey was to assess organizational readiness for successful digital technology adoption in the learning environment. Adapted with permission from the Community College Research Center's Readiness for Technology Adoption (RTA) framework (Karp & Fletcher, 2014), the results were intended to help round out the organization's profile and to provide insight to whether digital technology can be readily adopted, not just implemented. My tool attempted to assess across two system levels in my case study: the institution or college level and the group or project level. These levels were, in turn, studied along two parameters: technology and culture. The findings would reveal readiness at three altitudes:

- poised for action, i.e., highly ready for digital technology adoption

- moderately ready, or
- minimally ready

Previous research and validation fieldwork suggested that “successful adoption requires more than technological and project management capacity…and therefore, the RTA framework focuses on the cultural context of a college as well as its infrastructure and management” (p. 2). The original instrument held three premises—within which I note the parts of my survey that relate below.

1. **Adoption-ready colleges attend to the cultural characteristics that influence their ability to support the hard work of reform.**
   - Clarity of mission
   - Communication
   - Decision-making process
   - Openness to change
2. **Getting a technology to a point where it can be reliably used by college personnel is a critical first step toward adoption.**
   - Technology in the Learning Environment
   - Online Learning
   - Classroom Technologies
   - Institutional Priorities for Technology Change
3. **In addition to technological resources, a college must have the logistical and structural resources to ensure that the project can be completed.**
   - IT System Stability
   - Past Experience with Digital Implementation

- Administrative and Technical Resources
- Training
- Ongoing support
- Incentives
- Motivations

Figure 58 illustrates my survey framework.

Figure 58

Survey Framework: Readiness for Technology Adoption

SURVEY FRAMEWORK: READINESS FOR TECHNOLOGY ADOPTION		
	Technology	**Culture**
Institution/College Level	**Technological Readiness** • Technology in the Learning Environment • Online Learning • Classroom Technologies • Institutional Priorities for Technology Change	**Organizational Readiness** • Clarity of mission • Communication • Decision-making process • Openness to change
Group/Project Level	**Group Readiness** • IT System Stability • Experience with Digital Implementation • Administrative and Technical Resources	**Motivational Readiness** • Training • Ongoing support • Incentives • Motivations

As may be acceptable during the pandemic and the altered workload of the population sought, the survey response rate was low (51 partial/38 complete surveys), making it difficult to manage a descriptive analysis of the results. There is disappointment, as it would have been illuminating to understand the adoption-readiness level. This, paired with the interview findings, would provide a more complete context for the study in its endeavor to recognize and address conflict that emerges from digital change.

However, I was able to make some assessment from the responses I did receive from the survey and how they mirrored (or did not mirror) related interview responses, and it serves as a very useful exercise for the future, should this tool be used again. Most of the survey questions were designed as statements seeking agreement on a scale of 1-5, with 1 = strongly disagree; 5 = strongly agree; and a don't know option. One question rated on a scale of 0-5, with 0 = not at all important; 1 = somewhat important; 3 = neutral; 4 = somewhat important; 5 = very important; and a don't know option. Here is the breakdown of participation by position:

Faculty	79%
Instruction/Curriculum Design	5%
Administration or Program Management	16%

"Years of experience in each position" (greatest and next-greatest count):

Faculty	greater than 26 years; 1-5 years
Instructional or curriculum design	none; greater than 26 years
Administration	1-5 years; none

There was equal graduate and undergraduate as the stated level of involvement. When asked to select a self-assessed propensity toward technology adoption, the responses ranged:

I am an innovator	16%
I am an early adopter	37%
I typically wait to adopt new technologies	42%
No opinion	5%

Based upon the literature about the use of the original tool, I made notations by component. Exhibits of moderate or low, versus high readiness are meant to inform where additional planning would be beneficial. In my evaluation with the limited data, I deemed scores in the lower third percentile to suggest minimal readiness; scores hovering around the 50 percent level suggested moderate readiness; and scores that exceeded 50% suggested a high readiness level. It was interesting to see how little agreement there was and how often responses had a three-way tie across a spectrum. Again, the data drawn from the survey responses is not significant enough to draw conclusions; however, given that some of the interviews provided information complementary and corroborative to the survey, I implemented the cross-referencing exercise to learn how to potentially use this survey tool to gain a component understanding of the organization. Appendix D houses the complete effort.

Given the examination of survey responses and overlay with select interview responses, my notional readiness assessment by quadrant has been included in the Figure 59 framework and more detailed descriptions that follow.

Figure 59

Survey Framework: Readiness for Technology Adoption with Notional Assessment

SURVEY FRAMEWORK: READINESS FOR TECHNOLOGY ADOPTION		
	Technology	**Culture**
Institution/College Level	**Technological Readiness** • Technology in the Learning Environment • Online Learning • Classroom Technologies • Institutional Priorities for Technology Change **MINIMAL/MODERATE READINESS**	**Organizational Readiness** • Clarity of mission • Communication • Decision-making process • Openness to change **MODERATE READINESS**
Group/Project Level	**Group Readiness** • IT System Stability • Experience with Digital Implementation • Administrative and Technical Resources **MINIMAL READINESS**	**Motivational Readiness** • Training • Ongoing support • Incentives • Motivations **MINIMAL READINESS**

Organizational Readiness (Cultural Characteristics): Overall - Moderate

- Survey:
  - Clarity of mission - moderate readiness
  - Communication - moderate readiness
  - Decision-making - minimal readiness

    - Openness to change - moderate readiness
- Documents:
    - University strategic plan's key words: students are top priority; champion innovation, inclusion, diversity, access, excellence, impact, collaboration, ethics, freedom of inquiry and expression, leadership by example.
    - College strategic plan's key words: adapt and accelerate community, learning, and discovery; inspire transformative learning experiences
- Interviews:
    - Little mention of strategic vision or mission--mostly reflecting upon the broader state university system and levels of bureaucracy
    - Student-focus and faculty-focus were both mentioned
    - Communication tends to occur within departments; limited cross-communication or collaboration
    - Some individuals feel excluded from communication channels.
    - Decision-making was described as having lack of transparency and equity; other statements gave leadership high marks
    - There is no clear plan for helping individuals learn about the benefits of intended change
    - Most projects are driven and led by a small number of individuals
    - Workload increases and finite time were described
    - Change is slow; most individuals are skeptical of educational technology; traditional mindset; entrepreneurial mindset

    - Some academic structures seem to impede change; reviews about change and how it should come about are mixed

Technological Readiness: Overall - Minimal/Moderate

- Survey:
    - Technology for learning – minimal-to-moderate readiness
    - Online learning – moderate readiness
    - Classroom technologies used – minimal readiness
    - Institutional priorities for change – moderate readiness
- Documents:
    - Student assessment indicates students prefer synchronous classes for problem-solving and asynchronous videos for lectures
- Interviews:
    - Called "learning specialists" or "learning scientists" in this case, though helpful, were not used consistently during the pandemic
    - Comments were made about learning specialists not understanding the discipline of engineering enough to be useful in course design; this was countered by the learning specialists.
    - Opposition to fully online; more acceptance of hybrid or flipped class instruction mode
    - Perceived lack of student spontaneity and interaction in online teaching mode
    - Perception that current pandemic use of online is temporary; in-person classes will resume; some faculty will continue to conduct in hybrid mode

- Some faculty feel they lose trust and control of attention and interactions online.
- Indecisive about whether students do better or worse online;
- There is agreement that online mode reaches a greater number of students.
- Faculty would like more assistance with technology incorporation in teaching
- Upgrading IT campus resources does not seem to be a need
- Creating more physical collaborative spaces aligns with faculty who prefer in-person instruction

Group/Project Readiness (Logistical/Structural Resources): Overall - Minimal

- Survey:
  - IT system stability – minimal readiness
  - Past experience with digital implementation – minimal readiness
  - Administrative and technical resources – minimal readiness
  - Training – minimal readiness
  - Ongoing support – minimal readiness
  - Incentives – minimal readiness
- Interviews:
  - Disruption of the norm repeatedly mentioned
  - New university president created a new strategic plan
  - Difficulty in switching from in-person to online seemed related to the learning curve required of digital instructional technologies and platforms

- Incremental versus radical change exhibited differing views largely based upon audience: faculty/admin versus learning specialists
- Small amount of previous experiences were described
- Due to forced changed resulting from pandemic, implementation going forward has not been fully described
- Project-level descriptions of a new grant and its components have been clearly described, as well as having an executive champion [documentation]. However, these employ a minimal amount of digital technology.
- Group/project level interview responses largely addressed current initiatives to teach online. Responses suggest individual approaches to challenges and initiatives.
- The disruption that was experienced by individuals did not enable examination of many of the points in this part of the survey.
- Staff capacity and resource requirements were not a planned consideration as the pandemic forced the change in instructional mode to online.
- Training was offered and appreciated, but individuals required more.
- Support sought for the following:
    - Teaching value
    - Digital tech training
    - Flexibility
    - Incentives aligned with values
    - Workload/release time

- Shared resources and experiences

Theme #3: Innovation Elevated Through the Science of Learning

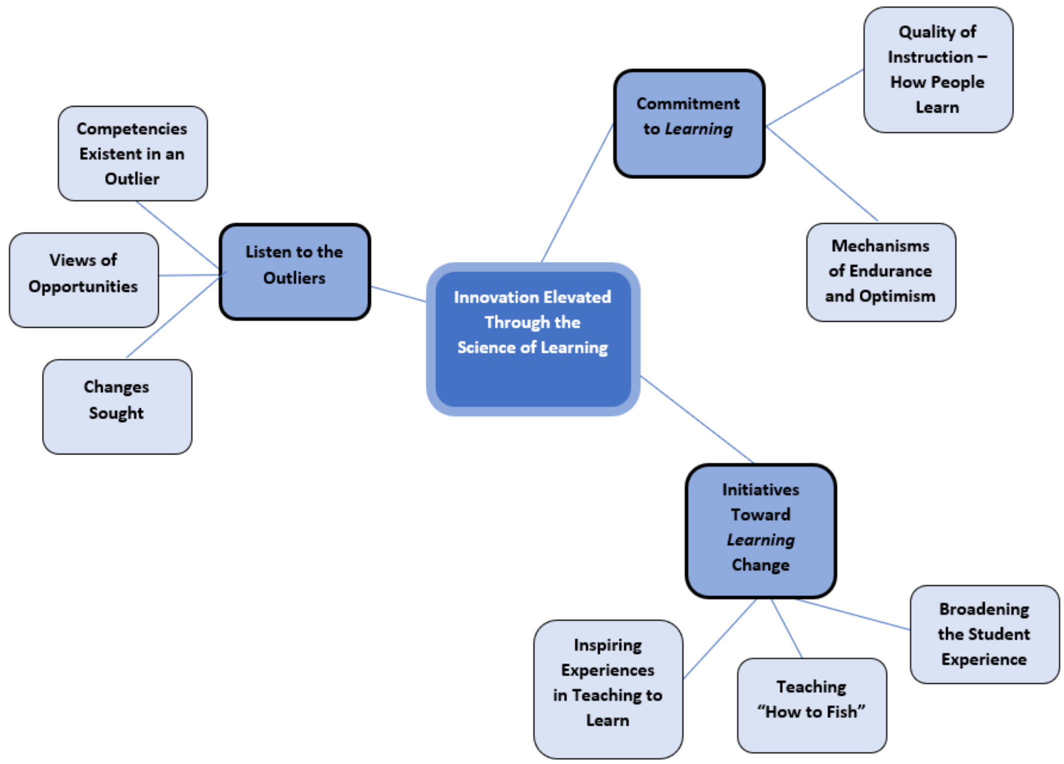
Theme Three speaks to the science of learning—an innovation that has increasingly infiltrated the higher education arena. While universities attempt to weather this storm of change, significant research is occurring in the field of instructional design and learning outcomes. When conducting my literature review, I found so much information on the topic of “learning science” that would have increased my topic to an unwieldly point, so I had to retain a tighter focus. I chose to maintain a thrust on “teaching” and stopped short of entering the realm of “learning outcomes." Now that I’ve analyzed my interviews, the topic of learning has appeared despite my efforts. Responses and coding generated a theme unto itself. (See the overview in Figure 60.)

The theme and its findings address the same research questions as the previous two themes, but additionally reflect this research question:

> What is the level of awareness and spectrum of attitudes of faculty, decision-makers, and designers in higher education toward potential trends in digital technology and the changes that may occur to their operations and/or mission—short- and long-term?

Figure 60

Theme Three: Innovation Elevated Through the Science of Learning (Complete Thematic Map)



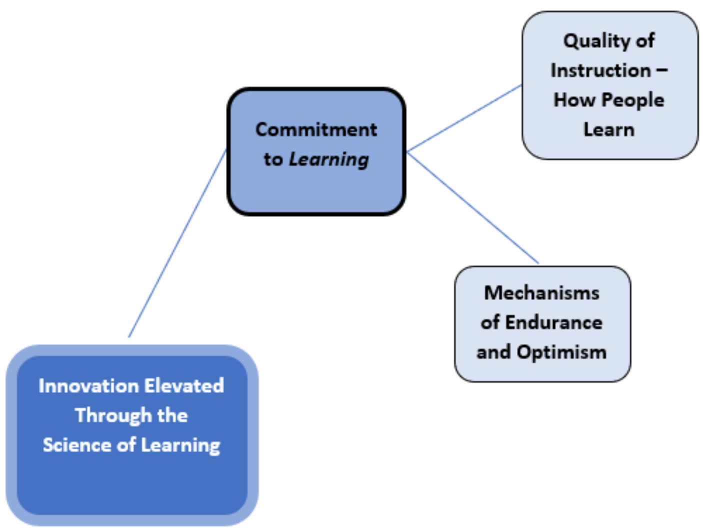
To fulfill my three-pronged approach for gathering data from faculty members, administrators, and curriculum specialists or designers, it became difficult to find designers in the college of engineering to interview. In fact, my label quickly changed to “learning specialists” because that was how this specialty was noted by participants. I secured two who held that title, but I also discerned a faculty member who possessed the mindset of a learning specialist. I brought that individual into the classification, and thus three out of the 18 interview participants carried a strong expression of a learning specialist. Others showed glimpses of similar thinking, but not enough to cluster them fully into the category.

What this theme breeds is the polarization of thought between traditional and digital pedagogy. Three findings emerged: *commitment to learning*, *initiatives toward change*, and *a view from the outliers.*

Finding 9: Diverse Levels of "Commitment to Learning"—Mechanisms for (a) Building Quality of Instruction or (b) Endurance and Optimism Amid Lagging Quality (See Figure 61)

Figure 61

Finding 9: Sub-Finding Thematic Map



Certain technologies were described as "kind of a given:" Learning Management Systems (LMS), Web CT, and Google Suites, as they were intuitive and easy, saved paper, enabled the storage of resources, and provided announcement functionality. The university had not invested in a very good learning management system and/or updated it—until COVID—and faculty weren't using it much. Learning specialist Flynn said, "It was kind of weird for the students, too. They hadn't figured it out." This comment set the baseline expectation for digital use at the college.

Mechanisms for Building Quality of Instruction

One faculty member, Oliver, raised an important "downside to online" issue, and it is about discrimination. He stated that there is a distribution of students, "an estimated 20-30%" who actually do better in-person than online [and who fell behind during COVID]. "Some students may have gotten 70 percent of what they usually would get in class, some got 90 percent; and some got 40 percent." Further, Oliver said,

> There's a diversity of people and way of thinking and way of dealing. There's a diversity of ways of learning, and I feel we have to be mindful of these different ways, and the online definitely discriminates against some group. (Oliver, F)

There's been an increasing push for technology. Several participants felt it should be in support of a core of teaching, but not the central part of the teaching experience or the faculty relationship with the material. However, others illustrated an acumen for technology. Here is an example. While interviewing, faculty member Oliver asked if he could share his electronic whiteboard, and he did. I think it important to show his work (see Figure 62). He explained:

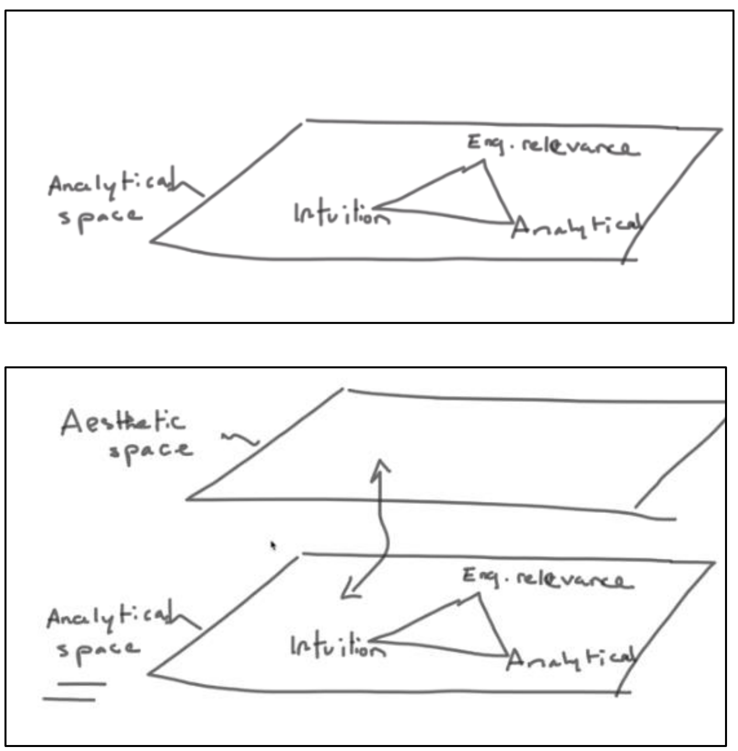
> So this goes to your question and to my attitude about teaching and the incorporation of technology. I tell my students, "this is my philosophy of teaching, and this is what I'm going to try to deliver on. And at the end of the semester, I'm going to be held accountable…we're going to revisit this…" and I ask for their feedback in class and in writing to see how I can do better, but here are the three things I tell them…[proceeds to draw]. And I tell them look, what we do is beautiful, and you have to be able to see not just the analytical aspect of the problems that we deal with, but the settings of this stuff, and I tell them this is

> about equations, but you know, a helicopter is something that is absolutely beautiful, and I want you to see the beauty of it, not just the engineering aspect of it. So, trying to build this connection here is very, very important. (Oliver, F)

This professor also plays opera music during class to illustrate that the helicopter lifting off the ground is the opera crescendo equivalent for engineers. Oliver added, “If you don't have the relationship with the material, no technology can help you.” Through this exercise, I was given an opportunity to experience his technique, first-hand, and it was consoling to observe the art appearing, fascinating, and deeply instructional, while he exhibited his comfort with the technology.

Figure 62

Example Use of Electronic Whiteboard



Contrast this technique to another by faculty member, Gabriel, who told me, **“**I hope they will get it [the online content], but they may not have because, you know, I just regurgitate whatever is on my slide, and so that's a negative side of it." Note that the student survey identified this technique as below standard.

I asked administrator Carter whether it matters to the students that faculty teach differently. He responded that he thought it would matter to the students. He went on to say,

> Some of our faculty are lagging far enough behind that I worry about what is happening in their classrooms…there's concern about, compared to what they normally do [in the live classroom], with the quality of instruction. We spent a lot of time worrying about that this past year. (Carter, A)

This administrator voiced concern for the quality of instruction, which is dependent upon faculty acceptance of, and proficiency in, new digital delivery methods. There was support via some workshops, but administrator Carter feared that was not enough support, due to the speed and the number of faculty who needed help. Those who were competent were already managing online courses and online degree programs, by choice. There was a different level of commitment. Administrator Carter added, "That's quite a bit different than saying 'two weeks from now everything's going online.' It's a different level of intensity."

Exhibiting a commitment to learning, faculty member Molly expressed an interest in how people learn—in fact, she did a great deal of research on the topic and different teaching methods. Attention spans, given video viewing, are short, and learning in isolation is hard, according to her:

> So how do we mitigate knowing that learning in isolation is hard? How can we create more collaboration? I tried different things at times that I abandoned. I tried

> doing some discussion board stuff, and it didn't really go that well. If they weren't forced to participate, they didn't want to participate and are doing the minimum amount they can. They're not really engaging. And I think part of that is [because] engineering is not a topic that lends itself too well to discussion boards. I tried to put in things that link it to the real world, so I would say “go on a scavenger hunt and find a truss in real life. What kind of structure was it supporting?” If they can connect it to the world they see around them, they're more interested. Teaching is a topic that interests me. (Molly, F)

Faculty Oliver described it as “the elephant in the room,” stating,

> In the ten-plus years I've been here, we probably had less than one percent discussion of teaching effectiveness…And it is almost like you have this big elephant in the room and people want to talk about the clicks or the little meaningless things on the side…The big picture of teaching is where I adopt technologies—whatever can help me. I can tell you that on the aesthetic space, technology has helped me enormously. (Oliver, F)

The “elephant in the room” reference signaled a mechanism that thematically presented as “endurance” (until normalcy resumes) and “optimism” (that things aren’t that bad). Statements included, “Everything is going well—I’m doing just fine.” Others expressed the sense that all the online work during the “COVID year” was too hard and thankfully, temporary, and that everything would revert back to “normal” in-class instruction. Yet others were excited to be working on a new grant, which did not reflect any new thrust into digital technologies. So these conversations raised the question of whether the experiences were stated in terms of endurance or optimism—and how the participants defined innovation.

Mechanisms for Endurance and Optimism Amid Lagging Quality

Endurance (until things go back to normal) was exhibited by this comment from faculty member Dean:

> Honestly, I see it [online] most as a way of running universities to generate more revenue. But I don't think it's going to be something to improve the quality of education… I think some of these [video] lessons will be incorporated, but mostly I think we're going to go back to the way things were before. The ability to get exposed to this technology that otherwise would not have been, was fine…I don't think it's going to be anything like central to the class, at least in high quality institutions. (Dean, F)

Another faculty member stated, “Meeting in person is much more fulfilling because, you know, that's what we're here for. And their moms and dads send them long ways from home, here. And they expect people to be in the classroom to talk to them” (Gabriel, F).

A cross into optimism occurred when participants began to discuss competencies in the digital environment. Those who felt competent mentioned use of not just PowerPoint, but the iPad that could stream to the PC. Others became good at video-taping themselves without the help of an IT expert. Lectures were a mix of synchronous and asynchronous delivery. It was advised that instructors learn to anticipate problems with Internet speed and have a smart phone with a hotspot as a backup. As stated earlier, the independent operating nature of the faculty led them to refuse help when offered from those versed in online teaching. An administrator/faculty member William stated, “Faculty would say, ‘I'm not going to ask the teaching and learning center because they don't know anything about engineering, I'll go ask XX how he made this work.’ And so, we did the best we can. I think in general we did quite well.” He emphasized further,

> They learned how to record their classes and, you know, in varying degrees, they were able to present their material and stuff. It's very decentralized. There’s not a lot of enforcement, other than if you're doing a terrible job. People kind of let you do what you're doing. As long as you’re getting results, [all is] okay. (William, A/F)

William reveals the “elephant in the room” again by dismissing the need to present material within a high quality standard. One only gets reprimanded if they do a “terrible job.”

Another perspective came from faculty Jeff, who determined that “Professors don't need to become a master of digital technologies themselves. As a user, the key to success is, given the digital environment, how to improve the content. I would consider that a big challenge.” He placed value on content over mastering the digital technology.

Curriculum innovation is on the mind of several participants, but not necessarily in a digital manner. One administrator/faculty member is instrumentally involved in the foundation grant the college has acquired. In his role, he is charged with “continuously trying to innovate in the curriculum.” As described earlier, the grant is enabling three components: storytelling, do-it-yourself experimental kits, and social learning spaces. In his words,

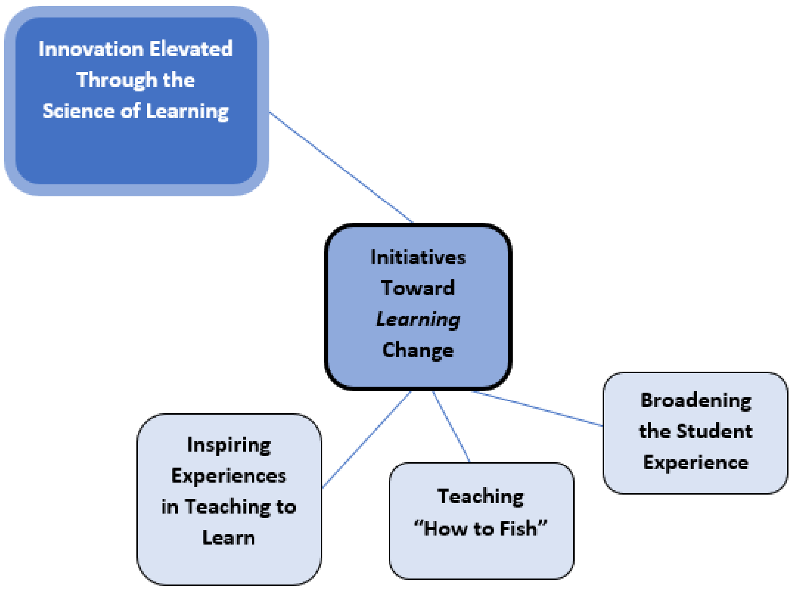
> I'm super excited about the whole brand, all the thrusts, and the team that we have. We meet every other week and there's just lots of activity and initiatives, and there's students involved, and we get their ideas, and is in fact great for your timing, and so it's a very, very engaging activity. It's helping students discover who they are and helping them reflect on what they actually know and the value that they can provide to others and other organizations, and as they build confidence and tell stories they become better communicators. (Ren, A/F)

There is no digital component to this grant work, other than for communication and a repository of information. In fact, the initiative is intended to counter a growing dominance in digital technology, as told by the administrator, “The social learning spaces is really an answer to things being very digital—and more and more digital—and us wanting to do things that are more in-person to help to balance” (Ren, A/F). Optimism is clear for this participant, as he views storytelling, do-it-yourself experimental kits, and social learning spaces as curriculum innovations.

Finding 10: Initiatives Toward "Learning Change"—Broadening the Student and Teaching to Learn (See Figure 63)

Figure 63

Finding 10: Sub-Finding Thematic Map



The participants who were identified as learning specialists—either by title or philosophy—spoke of developing the student and teaching them how to learn. Modalities of MOOCs (Massively Open Online Courses), flipped, and hybrid classrooms were attempted. Citing that "engineering is engineering"…and not about "learning how to learn," one such learning specialist elaborated:

> It's [engineering is] technical and very content focused and [often] not thinking about the bigger picture and making connections between…your physics class and your calculus class—those are separate things—not learning how to learn, if that makes sense. Even students were uncomfortable in the context of that program innovation. (Flynn, LS)

Broadening the Student Experience

During our interview, Flynn described the construct of an e-portfolio program designed to enable students to showcase what they've done—both inside and outside the classroom (and maintain digitally for future reference). This was intended to broaden the student experience. However, due to legal issues with not having a contract for the desired digital platform, as well as "philosophical differences," it was "an uphill battle." So, it gravitated to the storytelling initiative, which had no prescribed digital record-keeping.

Several faculty participants were in favor of the new, non-digital initiatives of storytelling, experiments, and social learning spaces (all under the grant), as well as problem-based learning and story-driven learning, which had been mentioned by a specific faculty member and was incorporated into the grant scope. As they are all focused on social communications and interactions, one stated,

> I think that whenever you talk about these ideas people love it. We'll have to see [because] it's a bad time to be doing social anything. It's not right now, but I think post-pandemic it's going to be even more impactful, because people are really craving those social interactions. Whereas everybody wants to go online and do more classes online or videos, I think the opposite mentality is how do we get in the room with the students and have impact, whether it's in the actual class or outside of that? (Don, F)

Don represents other similar views of in-person being superior to online instruction.

Teaching to Learn – "How to Fish"

A different insight came in the philosophy of teaching students how to learn and employing a more agile approach. An administrator/faculty member elaborated,

> The era where people come to school, you teach them 20 books or portions of 20 books--that's good enough for 40 years of their career. In the time we have been talking, more material was created than you can even comprehend. I think the strategy going forward should be a more agile way of learning. Teach the fundamentals and teach how to learn—teach them how to catch a fish. Teach how to find out what is known about the topic, find credible sources, gather context – without context you don't know what you're reading—and find a way of synthesizing information. It's fine bedrock to build upon. And then, skills on how to solve a problem, because all these problems have a unique ID. They look unique, but there is a global way of actually tackling them. Give them enough of those experiences like rinse and repeat until they get good at this. That's the philosophical thing on how to teach it. Now, do we have to be in front of each other for so many hours? Probably not. You almost have to be at the point that you're so close to them that they see you as a coach and a mentor. (Teague, A/F)

Teague speaks to a philosophy of instructor mentoring and an agile way of learning—of exposing the context of a problem and showing students how to go about seeing the context, synthesizing information, and solving the problem. He does not suggest this has to be managed face-to-face.

Inspiring Learning Experiences

Another faculty member, Oliver, employed a strategy of "teach the teacher," whereby he enlisted students during class to teach him how to do something--anything. This is how he created an atmosphere of interaction and connection, stating:

> Why do I do this? One, it's because it helps build a better rapport with the instructor. The second thing is, I tell them "there's never a time where you shouldn't be learning. We're always learning, and every one of you has something that you can teach me." And then three, "I strongly believe everyone has some interest or set of skills or knowledge that you guys care about. And I want you to recognize that hey, I care about the stuff, and, and I would be more than happy to be exposed to these things," so the students love it. It is a way of connecting with a student at a deeper level than just the content. (Oliver, F)

Douglas presented an interesting interactive concept he called the "Fast and Furious Charette." A charette is a meeting in which all stakeholders in a project attempt to resolve conflicts and map solutions; an intense period of design or planning activity. The word charrette may refer to any collaborative session in which a group of designers draft a solution to a design problem (Wikipedia, https://en.wikipedia.org/wiki/Charrette). Created after trial and error, students got really fired up, according to Douglas, "We generated a white paper with 20-plus pages of good ideas. … story-driven learning."

> In our program, we prompt throughout the semester to get them to tell stories about themselves, such as a childhood story, a peak experience, a failure, a perfect future, leadership—having been taught five tips on how to tell a powerful story. One should include a specific moment in time, share feelings, share details of the

> person who's listening so it feels like they're there with you. This is also backed up by psychological research that that's the kinds of stories that actually do tend to change beliefs. In this case, we were trying to get our students to see themselves in a better and different light, like, "you are really curious, and you are somebody who has created value already. You're going to go out and be a great engineer for these reasons…" So that's my big innovation right now.
>
> (Douglas, LS/F/A)

Faculty expressed different ways they were inspired. One mentioned his admiration for faculty who "basically make their careers on not only the teaching, but also how they learn about teaching and publish in teaching technology and other types of journals" (Declan, F).

There was praise for the teaching and learning center at the university, as several faculty members found support for how to focus on the classroom through this group. The administrators were also highlighted as having taken a school in an "interesting direction," a comment that is directed toward those who obtained the foundation grant that is promoting storytelling, experimentation, and social learning spaces.

Then there are the modes of learning that came into the interview conversations. These included MOOCs, flipped, and hybrid learning configurations. Participants expressed their experience in experimenting with each.

This university was an early adopter of MOOCs (Massively Open Online Courses]. In particular, the online Master of Computer Science has been a huge success story—one of the big success stories in the MOOC online environment, which began in 2012. However, it was conveyed that the engineering college hasn't been very engaged with MOOCs. William, an administrator/faculty member who is comfortable with digital technology uses the MOOC format for two specific reasons: to augment the classroom with a depth of information and to widen the audience of learners. Here’s how he explained:

> Reason one: to create flipped classrooms. I didn't want to just stand up and do the same lectures, forever and ever for the rest of my life, which I had been doing for 30 years, so I made sure I had really high quality recordings of my lectures. What I do now is go into a lot more advanced material and many more examples in the classroom, and I'm confident that the students have gotten all the material from my modules, as long as they watch them and study. You know a lot of faculty always fear, when they're doing typical lecture courses, “I have to cover this, and I've got to cover that,” and quite frankly, covering material does not mean that students are learning it at all…That was one reason [for doing MOOCs]: to have the material available to augment the classroom.
>
> Reason Two: I wanted, altruistically, to provide education to a wide audience of learners. I’ve had about a half million learners to date. I choose to keep my courses free. (William, A/F)

Challenges and competencies exist with MOOC creation. The biggest challenge is in the amount of time required for preparation and recording. This format also calls for the need to break material into small segments, which is difficult for the faculty member who “is used to droning on for an hour,” according to William. It helps to also have a presence in a studio and ability to speak to a camera, without the aid of students engaging. William added, “It has to be tight, compact, to the point, and that’s not in the skill set of most faculty members." There are also opportunities in an online MOOC setting to stop the video and ask questions.

Another faculty member described the same concept of a flipped classroom modality as one of "putting the purely receptive content outside of the classroom [lectures] to be done asynchronously, and while in the classroom, doing some kind of learning activity." Molly, a faculty member, stated,

> So statics is maybe the class that, prior to the pandemic, was the most traditional engineering class. That was the one where you stood up in the front of the board. You lectured on the topic. You worked some problems. They [students] did some homework. They took some tests. It looks a lot like what you think of as a college engineering class. And so when that one went virtual, I basically flipped it. I really sat down and thought, "what do I want them to walk away with?" So I condensed it down, made a ton of videos, embedded these quiz questions over them [the videos], so they never go more than three or four minutes without having to do something, i.e., interact with the video. And then they would come to class either virtually or in person, or sometimes I had some of both. (Molly, F)

As she described in detail how she ran the combination program—the difficulties of working in groups when there was a required six feet of social distancing—she outlined how she used the Canvas [new learning management system platform implemented at the start of COVID] announcement function to define the class requirements, place hyperlinks for assignments and due dates, and upload completed assignments and answers to problems they did in class. This illustrated that the students showed up for the online class. Further, this faculty member had a hard time with the word "innovative," stating,

> I don't know that any of this is particularly innovative in the sense that no one else has ever done it. It's really non-standard. Yes, we struggle with the term innovative in education because everybody's already done something. But it's definitely not a standard class. (Molly, F)

Molly admitted she will continue this process, post-pandemic, because the students liked it better.

> Students really, really liked the quizzes. Students said they really liked the videos, and they liked that we did more examples in class. So they liked the increased focus on working problems, which makes sense because it's a topic that you don't learn by listening to somebody talk about it, you learn it by struggling through thinking about the problems, so they like that. I think they'd like it if I would just get rid of the final, too. [laugh] The students have given me feedback like "this is the best class I've ever taken even counting the ones before the pandemic." They really like this structure. And they're doing well on the exams, so I do you think they're learning.
>
> I have not actually done an assessment where I compare students in a traditional classroom to students in this [flipped] classroom. I can tell you that the grades went up, but that could be a product of the fact that I added more forgiveness, like more second chances. (Molly, F)

A third mode of teaching is considered the "hybrid mode." A faculty member cited having to broadcast his lectures remotely himself. He described the setting as such:

> I had some students present in the lecture hall with me, and I lectured live in front of the students. I had slides that I annotated with an iPad, and that were visible to the students in the room. I simultaneously broadcast these through BlueJeans [video conferencing platform]. Any students that wanted to dial in remotely in real time could. They could ask questions in the chat on BlueJeans while I was lecturing, and then the lectures are also available as recordings afterward. I had a handful of students show up in person. A larger handful did remote, simultaneously. Presumably, the majority watch the lectures at some point after. They claim to in surveys, but I didn't actually collect statistics on that.
> (Beckett, F)

The challenges of operating in a hybrid mode included technological hurdles, such as making sure that audio and video had strong connections, and faculty member Beckett added, "those are actually more complicated than we'd like to think that they are. So that's slightly non-trivial." Other complications included not being able to get a sense of interaction and pace, since it is difficult to see faces online and read reactions. This faculty member felt that the "upside" was the text chat capability, as well as a "downside," saying:

> It was kind of nice that students could think through questions and then pose them in a precise way in text and then read them and then go through them. I think there's certainly some students that perhaps feel less comfortable raising their hand in a classroom setting and more comfortable putting questions in chat. So I think that was helpful. On the other hand, there's a flip side to that. There are some students that are more comfortable just interjecting in the middle of a

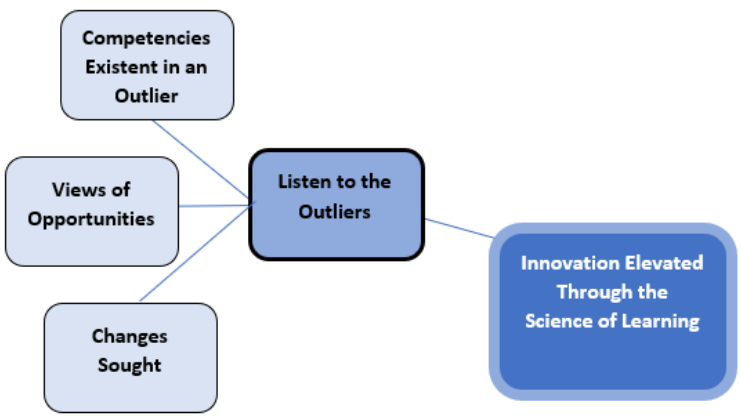
> conversation and turning it more into a discussion and less comfortable putting their thoughts in texts…All of this requires the ability for me to multi-task. (Beckett, F)

With more to add, Beckett recounted how he traditionally used the whiteboard, pre-pandemic, but developed annotated slides on his iPad during the online period of COVID. He was surprised to learn that his students liked that better. He still reminisced about the days he could move around freely in front of his whiteboard.

Finding 11: Listen to the "Outliers"—Champions of Change and Openness to Different Skills and Perspectives (See Figure 64)

Figure 64

Finding 11: Sub-Finding Thematic Map



The participants who fell within this finding were the ones who said, "thank you for listening." This category includes the faculty member who asked permission to draw on his iPad during the interview, to make his point. The forward thinking expressed by this group begged the question, does online versus in-person matter with the right teacher or the right attitude? The perspective of faculty/admin who were not born Americans take nothing for granted and appreciate education, and this surfaced in interviews, as many were outlier participants. A different set of competencies arose, as well as views of opportunities, and changes sought, from those stated within previous themes. William, administrator/faculty member, described what I mean by “outlier.”

> [Named author] was visionary—director of the [strategic initiative for the university] and a college dean. I have worked with him a lot. He thinks forward, and he’s done some great stuff. But you know, he’s an outlier. He’s not a typical faculty member in that regard. We’re fortunate to have him. (William, A/F)

Competencies Existent in an Outlier Mindset

I was able to capture what those in the minority—the outliers—considered competencies for success in teaching to learn and in navigating the technology to create an effective lecture. If the material is mathematical, which is typical for an engineering course, there are considerations, such as: how to show the simulations in a way that students can read the code and read the plots. Faculty member Beckett thought, “there is an interesting opportunity to do that.”

Regarding effective teaching in general, faculty member Molly felt there are standard competencies such as being a clear communicator, understanding what one is teaching, being compassionate and able to relate to students, having empathy, and being organized. She went on to say,

> I think some knowledge of how people learn is important, even if your field is something else, understanding how people learn--how memory works--how recall works, I think that's important. You know, understanding what makes you recall better, what makes something stick. I think those are important regardless of the classroom. (Molly, F)

About teaching digitally, Molly detailed the need to be more organized than in-person:

> I think that the organization, the amount of time I spend on logistics has gone up significantly. So I spend a lot more time making sure everything's in place for the week by Monday, and that they have this email with all those links. Most of the rest of it I learned as I went, like I didn't know going into it, how to make videos with Caltura, I didn't know how to use my iPad as a broadcasting whiteboard. There were a lot of things like that that I didn't know. And it was not hard to learn. And then I have a technology related degree, right, I'm an aerospace engineer, learning new technology is not scary so maybe to some extent, you know, there is a bias there. But everything else I needed to know I feel like I learned pretty quickly. (Molly, F)

Molly brought up the interesting irony of digital technology, since the case study had to do with engineers who deal with high technology problems and situations every single day. What this study shows is that comfort with technology is relevant. Knowing one set of technology does not imply ease in learning another technology in a different realm. Other competencies were cited, such as curiosity, openness, collaboration, knowing how things work together, i.e., the engineering ecosystem, and risk-taking.

Curiosity and a Mindset of Openness to Accept and Manage Productive Tension. Learning specialist Douglas touted “curiosity” as an important competency:

> In leading and coaching story teams, I had to “walk the talk…I had to craft my own stories.” My “about me story” has the central theme of curiosity. I’m extremely curious…always reading books and trying to learn more and become an amateur social psychologist—with an emphasis on the amateur.

> (Douglas, LS/F/A)

It's a mindset that entails a combination of competencies, inferred Jane, administrator and learning specialist:

> So I think, in a leadership role in innovation [as in a university in the lead], there needs to be a core skill that you know. So, [in the case of engineering], it's a core strong technology background. If it's an instructional design background, core strong instructional technology, instructional design background…Then, you know, being able to know the ecosystem, how things work together…Because, this space is very interdisciplinary. It's very important to collaborate, important to make connections. So understanding how those pieces work and having the people skills to make those connections with others, build alliances. (Jane, A/LS)

This administrator continued to discuss the complexity of the problems, stating that it takes a team to solve them, "It's very important to reach across the aisle, if you will, and form those relationships—those partnerships."

Jane added:

> The other thing is…[just thinking] I hear a good idea, and I immediately think of all the challenges of implementation, challenges around procurement activities, challenges around intellectual property, challenges around data security and privacy because then all of these things are real challenges when you do something very innovative… So the ability to take risks, and curiosity. Curiosity, in the academic technology space, is a very important skill. If you're not curious. You're not gonna see the problems, you're not gonna want to solve

> the problems, and you're not gonna do the work to get to solutions. That's one of the things that I base my hiring on. (Jane, A/LS)

Faculty member Don agreed, saying, "I don't think the tools are that complicated, to be honest. In fact, I think it's more of, are you curious enough to give it a shot...and in not being intimidated to try something." Further,

> I'd love to see some of our faculty who just sort of refuse to try it…I think they'd love it if you set them up with the right instrument. They could have very meaningful impact because they're wonderful lecturers, they're just not necessarily comfortable leaving the bubble of the whiteboard. (Don, F)

I asked, "How would you get them there?"

> Yeah, that's a good question. In that way the pandemic forced everybody to do it. So it was good, and I think they appreciated … we've had feedback from some of our more senior lecturers that in the beginning were like "none of this will work," but now say, "like I might actually keep doing some of this." (Don, F)

His statement reflects a change of heart. Don mentioned that he started using a lightboard, which was described as a big whiteboard (almost 95 inches) that the lecturer can mark up, and it gets recorded on video. The outcome is a "beautifully well done, production quality video." This supported his suggestion that different tools work for different people, and that people need to be shown how to use new technology. He added:

> But you let them [lecturers] go back to the environment they like, which is writing on the whiteboard and erasing the whiteboard and writing something else, but that kind of tool [the lightboard] could be a really good transition. As long as the tool makes sense, it's a positive outcome. A lot of these things you can spend a lot of

time, with very little impact. It's very frustrating when forced to do or use something. I'm kind of an early adopter. I will try it if I don't like it, I'm probably never going to try it again, but I will at least give it a shot. (Don, F)

On the competency of "openness," Douglas, learning specialist, faculty, and administrator, brought up the concept of a learning cycle inventory, which is a way of looking at learning preferences in students.

I am not trying to pigeonhole individualism, but you plot the learning experiences within four quadrants. Proud as I am of the crossover students [the contented ones]—at the end of the day, it's a traditional course with a lot of number crunching. I've discovered that some students don't like that and start to think "engineering is not for me." That's ridiculous because it is just one class and one way of thinking. The field needs people with all kinds of different skills and perspectives, so I try to make that point with this inventory. I say, "notice how you guys are in all of these different quadrants. Though this class is primarily focusing on 'this' quadrant—with about half of you there—and the other half, not." In mapping this to the design cycle and engineering, this class is about design, and we need people who can lead in each quadrant as part of a team. So we need all of you. Just because this class is focusing on this quadrant doesn't mean you should think about changing majors.

I'm always an outlier. I'm at the extreme tip of one of the quadrants—the insight building one, where pure science lives—it's like people who take different pieces of knowledge and come up with a new idea and explore it. It's a competency of mindset or proclivity. It is openness—being open to new ideas and

> exploring and trying new things out. It drives some of my colleagues nuts. I work with people who really like structure, and I appreciate structure because to actually get something done, you need that. But that's not my first tendency, not my forte. And so there is tension there, but it's productive tension.
> (Douglas, LS/F/A)

Douglas introduced a very interesting concept called "productive tension"—the relationship brought to a problem-solving situation when individuals have different perspectives and skillsets.

Opportunities Foreseen by the Outlier

The outliers voiced the following.

Broad Definition of Engineering That is More Inclusive and Empowering.

When asked how different tomorrow would be if he could make changes, Douglas, provided this response:

> I have this mantra I call engineering for all by all. In other words, we want engineers to think, as they're doing their work, about all people, not a subset of people because there's a tendency to design for the average white male. We want that to be obliviated, so we've made changes in our analytical courses where people think they're just solving equations. I want them to realize there are a range of parameter values that represent human characteristics. It's really interesting to see that the students, when we give them an open ended design problem… You can tell that they're thinking more openly about this than the students that hadn't gone through the intervention. And then the by all piece means that I want engineering to be conducted by people that represent all of

> society….[There was] a design group that was in our department three or four years ago who designed pacifier that changed to a different color if the baby had a temperature. That design group had two women on it. I highly suspect that had that been an all men group, they would not have come up with that idea. So when you have a workforce that's representative of society, all of the challenges and problems in society are more likely to be addressed. That's what I'd like to see change. (Douglas, LS/F/A)

Here is Jane's view on the same type of opportunity:

> We're gonna have to rethink. Higher education is so valuable and important for the future of our societies and our planet. We cannot let it disappear, right? We cannot just vanish or lose prestige. That's not a template to use these days. I think that what you're suffering from now is all these things that they put in place to show that we have quality, because we have what it takes to change people's future which turned into cutting people out and making this an opportunity for a small elite group of people. And that usually depends on the legacy you're coming from. As a family of college graduates, [for example] you're going to succeed in college. Otherwise everybody else is in the 75 percent of higher education not served well. The systems we have in place are serving maybe a quarter of students and that's within the system. And then there are all sorts of people that may be outside that is critical. (Jane, A/LS)

Jane, like Douglas, has highlighted the exclusivity of higher education, but feels an opportunity exists for more inclusion.

Another opportunity was expressed by faculty member Gabriel in that when he determined a good idea for a course, he would record one or two hours of lecture at a time, then put it aside. Over several months, he accumulated a strong inventory of material that he would test drive, perhaps over the summer term or with a small group of students. He was able to edit the videos, given student input. Another opportunity he saw was the ability to send these videos out for multiple language translation.

Implementing problem-based learning in engineering was once a very radical concept brought to fruition at this college by a department lead who was a learning scientist. Douglas described this chair, who also provided “problem-based learning rooms,” as making a “bold move, but so inspiring.” The atmosphere, environment, or climate suggested a mantra, which he further described:

> We are seeking to empower our students to be self-directed learners who are fearless in the face of a complex problem. Today, I suggested we expand this to include: “that students would use their skills to create a more just, equitable, and healthy society.” I have this parallel mantra: I want all people, all young people, to see engineering as a place that they could contribute to and be part of, regardless of any way we want to try to categorize people.
>
> That’s not the case right now. We accept 63 percent of women in our department, but that’s a complete radical outlier. There are still stories of instances in other departments of women being asked to be the person that keeps notes—or otherwise kind of pigeonholed in some gender-specific way. Also, people worry about diversity, when I think what comes first is inclusion—like if people see that there’s place for them and they’re valued, and their contributions

> are sought. If you do some kind of marketing thing to get more, let's say Black students in the major, and they're not welcomed, then you're making things worse, not better. So, a lot of our efforts have been trying to make the department more inclusive. We have a lot of work to do, but [are] working on that. More needs to be done. I'm trying to focus on our [college] world, but it's a proxy for the larger world of engineering workforce which is rife with non-inclusivity. (Douglas, LS/F/A)

An Opportunity to Share Successes, Learn Without Reinvention, and Design New Learning Experiences. Faculty member Gabriel cited his preference for sitting in [a faculty group] and listening to others. He said,

> I can learn a lot, and I can contribute. For example, somebody may have figured out a new tool that helps them. So at that Institute level, we are certainly doing a lot together. At the school level, we have different groups of professors, really young people who have very, very fast learning curves, and they're always talking about the newest technology. The old folks really don't want to go there. They would rather sit with a table, you know when you're bored, and focus on writing and meetings students. I am somewhere in the middle. So we have not had a lot of exchange at the faculty level. (Gabriel, F)

In line with sharing experiences, faculty member Don was complemented for having put together a technology guide for his fellow faculty during the pandemic. It outlined different technologies and how to use them. He also conducted one-on-ones with the faculty who were struggling to get set up.

Another opportunity was illumined by Douglas, who felt the pressure to always speak as an “expert.” To this point he said,

> Embedded in our culture are terms like lecturer and professor. If you think about it, that signals that a lecturer is supposed to lecture, and a professor is supposed to profess. And those days are long past…Because we have the Internet, we have all these resources. Our job is to create and design powerful learning experiences that give students autonomy. So we need to think about designing a learning experience as opposed to a lecture. We have a long way to go because many faculty and even students have these implicit beliefs that actually my role is an expert. I have to tell everybody what I know, and then they’ll learn, and that’s going to affect what they do in the classroom. And so I think things are moving in the right direction, but it’s gonna take a while. (Douglas, LS/F/A)

Lastly, opportunities can highlight new approaches to teaching that could be afforded in on online environment. Some participants stated that the impact of digital technology stimulated by COVID had “become so obvious.” Benefits included logistics and time flexibility/utilization. One faculty member and former administrator reiterated that teaching is a performing art and rallied the call for digital transformation but reinforced the need for digital production support to get there. Another in a similar position, when referencing technology change, stated, “You’ve got to hire a professional staff. This is not a faculty position anymore.”

An important contrast of view came from Douglas who had earlier raised the issue of the “fallacy of the lecture.” Strongly supporting learning, he had this to say about the opportunities that can be realized when forced to go online:

> I was better prepared because I'd always thought about this stuff [the fallacy of the lecture] and so I proactively thought about what I can do in Zoom to build connection…[Someone] once gave me the phrase "connection before content" and that's what I try to do… Even though it's a conservation biomedical engineering class, I would ask them, "What strategies do you guys use when you're stressed; what do you do to relieve pressure; or what do you do to help yourself sleep better; or, hey look, I'm really into birds… I have this camera and a bird box. Let me show you my bluebird today." I would explain things about myself and things like that…In the comfortable surroundings and the little Zoom box, which I think in many ways makes it easier to share things…A lot of times people think everything about online is worse, but I didn't think that was true, and there are some really good things that are going to come out of this that people will continue to do. (Douglas, LS/F/A)

Changes Sought by the Outlier

The following were mentioned.

Commitment to Teaching. Popularity for engineering programs is growing, and this results in larger classes. Faculty Gabriel elaborated on the ability to get to know and relate individually to a class of, say, 30 students—something impossible to do with a class of 100. So this instructor would like to see more faculty hiring, and "if not faculty, at least lecturers, professionals, whose commitment is to teaching." He added,

> But you know university culture is research, publications [garner] a higher level of recommendation, than pure teaching. But if I had power, I would probably

> create lots more lecturers who are committed to teaching, and they break their large classes into relatively smaller classes. Easier said than done. (Gabriel, F)

More Resources for Online Course Development. Faculty/administrator Lyn, in specifying that the students in general are "pretty introverted…and self-directed," seeks more resources for faculty who want to move their courses online and do them well.

More Support for the Educational Mission. Douglas would ask for "more support for different kinds of contributions—intellectual contributions," adding:

> Get more people to support the educational mission. I was fortunate to have a registrar who schedules classes, work with me to figure out a workaround for my SDL [story-driven learning] and PBL [problem-based learning], as these classes needed more duration. The waivers were about to end when someone said these are working—starting to get traction—so what do you need to make this work? Let's make this a permanent change in the system. And so I think the main things would be, make it easier for people like me—new young people who want to do things like this—to get fully converted and not have to wait two years, and maybe to have, just like the other researchers to have support, like have people go out and recruit, you know these endowed chairs come from people who are donating the money to support this, so we should have people trying to support that mission, as well as the other more basic science research. (Douglas, LS/F/A)

More Infrastructure and Support to a Nimble, New Strategy. To Douglas' point, "So higher education is forced to change," Jane, administrator and learning specialist, spoke to the drivers of change, suggesting four main ones: (1) there is a shrinking higher education market because fewer students fit the traditional college age range, (2) that there will be a decline in birth rates created by COVID that will impact university enrollment in 2037, (3) the need to reeducate and reskill calls for lifelong education, and (4) private equity money is there to step in and fulfill the educational need. Jane thinks, "It's becoming a competitive disadvantage to be embedded in a structure like today's structure, especially in a public institution of higher education, with a lot of policies that belong to a super system, and then layers and layers of requirements"…

> So we're gonna have to continuously look at the ecosystem, what's happening, and then react to it as an institution and that should happen as a strategy level: the infrastructure and support that's behind that strategy. Another aspect of this is, of course, data and research, that's going to have to be also a part of that strategy, doing things generating data, learning from it, changing the things that you do, and not do this at the margins of the institution, where online used to be 20 years ago, 25 years ago when I started this. That was just a small, individual piece. Nobody looked at it. So you can do it now without moving to the margins. It has become larger, and at places like [this university], we know that 40 percent of students are online, so it is mainstream. So mechanically, I mean, that kind of innovation needs to move to the center stage of institutions and stay there, I think, for the foreseeable future, so that they can have a handle on what's happening out there, and how they can react as institutions. (Jane, A/LS)

Jane advocates the following:

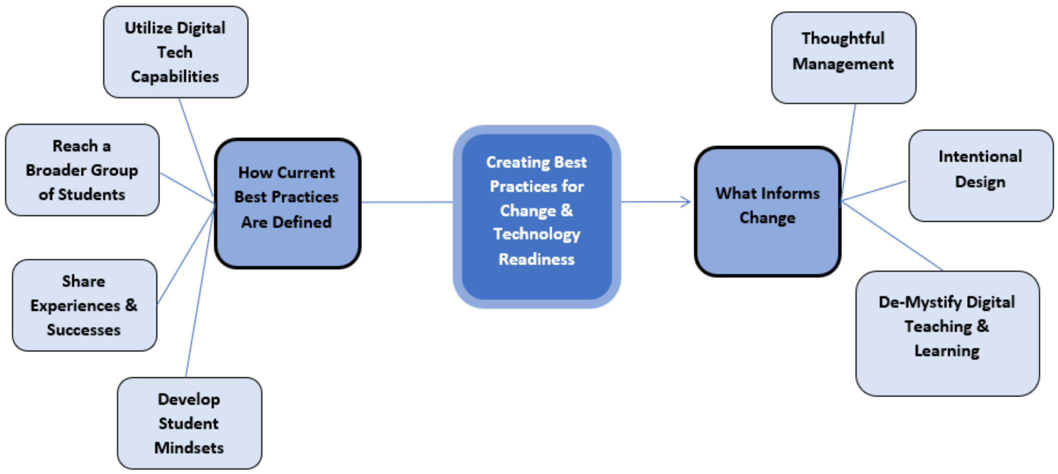
- Have a champion at the highest level in the institute to monitor innovation, understand the competitors, continuously look at the ecosystem (the planning horizon), and keep an eye on private solutions for training and education
- Develop the infrastructure and support behind a strategy
- Do things that generate data, learn from it, change the things that you do, and NOT do this at the margins of the institution, where online used to be 20-25 years ago; do it as part of the mainstream strategy
- Anticipate how to react to change—seek a nimble structure within the large higher educational system that can be poised to react and respond quickly

Theme #4: Creating Best Practices for Change and Technology Readiness

"Before the pandemic, I would have said lecturing at a whiteboard was my preferred best practice." This is a statement from Beckett, a faculty member who was highlighted in Theme 2, Finding 10: Initiatives Toward Learning Change. He had transformed his pre-pandemic whiteboard technique to annotated slides on his iPad. His students told him they liked the digital version better. Theme 4 (Figure 65) illustrates a connection between some best practices that surfaced through the interviews and whether they inform change. This theme and findings answer the research question: can current, or recent, implementation or adoption scenarios be described?

Figure 65

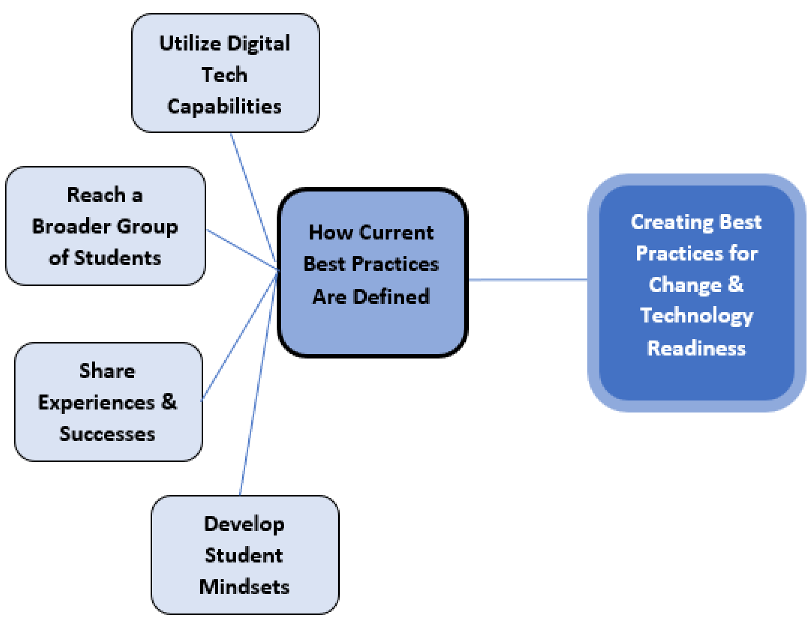
Theme Four: Creating Best Practices for Change and Technology Readiness (Complete Thematic Map)



Finding 12: How "Current Best Practices" Are Defined (See Figure 66)

Figure 66

Finding 12: Sub-Finding Thematic Map



One of the interview questions was about what the participants considered a best practice coming out of the digital, virtual mode of the COVID year (a term they used). The flow of responses, as with all the responses, covered a spectrum. Some did not include digital technology—continuing the justification for in-person instruction. Best practices have been stated under prior themes where they related to specific findings. The remaining responses thematically corresponded to four topics:

- Make the most out of digital technology capabilities
- Reach a broader group of students
- Share experiences and successes with fellow faculty
- Develop students

Make the Most Out of Digital Capabilities

The takeaway from conversations with participants about "best practices" followed these topics: be flexible with technology, break up content into small segments, interject frequent tests, employ the hybrid mode, exhibit creativity, use the digital infrastructure effectively and efficiently, and finally, make it routine—all to give innovation a chance.

Faculty member and administrator Brandon suggested, "Question why you're doing what you're doing and learn to be flexible with technology choices."

> You need to come up with a list of what's important—what is the essence, the essentials--and then you separate that from the bells and whistles…There are a lot of really good people out there, and they do a lot of different options. Find the ones that work for you—and find the ones that mesh best with one's style/approach/the way you teach. (Brandon, F/A)

Brandon also advocated breaking up content with both an asynchronous (anytime accessibility) piece and a synchronous (run in real time) piece.

> Use the synchronous piece to really do the heavy lifting, and then take the asynchronous piece and be careful with that. Be aware of their [student] attention. A lot of short things keep them focused. Also know that students are very good and very comfortable with technology—better than we are, and so you give them your [course] design with that in mind. (Brandon, F/A)

Lyn, also a faculty member and administrator, proposed interjecting frequent tests in the online format to ensure students are spending the time to watch the videos and absorb the material. A differentiation was made that older, graduate students, who know how to learn, don't need this frequent testing. However, younger students need this. Lyn added,

> In my experience, I would say that the core principle—if you're going to be doing this [hybrid mode]—definitely seems to be assessment. I found that the weaker students benefited. I think the weaker students tend to have more issues with time management and tend to put things off until the last minute. The hybrid way was a better system. If you are going to be doing this long-term, the assessment has to change, and so you have to think about whether you are tweaking the questions semester to semester to avoid cheating.
>
> Another interesting thing…the really good students' performance was not affected, but they told me I was holding their hand too much in the hybrid way. But they couldn't tune out because of the weekly tests. Couldn't cram at the last minute. (Lyn, F/A)

The employment of a hybrid mode of teaching was considered a best practice going forward. Faculty/administrator Lyn felt this type of teaching/learning is valuable for graduate school.

> I think the hybrid or even 100% online is very attractive and can be extremely beneficial. [The university] has an online computer science masters that has been extremely successful. And my school has an online masters geared toward people who work in industry [partnership with a major manufacturer]. So, basically the company pays and then the students take the classes when they can, after work, and it's been also extremely successful, both for the company and for us, quite frankly. And so I think that model is definitely here to stay. (Lyn, F/A)

She does not think this is true for undergraduates.

> I think it takes an uncommonly well prepared and motivated student to do that. Part of what we teach younger students is professionalism, to show up in class, not dressing in pj's, and to be baseline functional in the morning. Turning in assignments on time, not three weeks later, because if you do that in the workplace, you know, the consequences are much more grave. I really think it's more for people who already know how to learn and who are self-motivated and better organized than just your typical high school graduate. (Lyn, F/A)

Lyn also found that the hybrid mode enabled weaker students the option of viewing videos multiple times.

Oliver suggested the need to get creative, while he voiced,

> Technical stuff, there's only one way it can be taught—true? I feel that is such a, such a flawed, flawed statement. One of my courses is just math--basically

> numerical analysis and algorithms--and that would be the driest thing ever. I mean, there are, there's music or videos and the kids are so engaged, and they think it's like you breathe life to it. Regardless of what the material is. So, saying that there's only one way of teaching it is, I think absolutely, wrong. Well, that is lack of creativity on behalf of those who do that. (Oliver, F)

Additionally, Oliver recommended offering "extreme availability" to complement online learning and compensate for the lack of in-person discussions during COVID. He had started two programs with that in mind: "Hanging Out with an Afternoon Tea" and "West Wednesday Evening with Salient Statistics"—both virtual and handled on the BlueJeans conferencing platform. The tea was a way of opening office hours for needed individual discussions. The West enabled casual talk about statistics with a "live" professor.

Another idea within the realm of creativity came from faculty member Don who felt,

> Some things can be done well in a pre-recorded lecture type, but there's some content that perhaps is better delivered to the students in a really well done, well curated video. And that frees you to do other things with the students like problem solve, or group assignments in breakout rooms.
>
> I think some of that needs to be looked into more deeply. I think it could work and sort of improve our traditional sense and you know there's a magic to them being able to go back in a video lecture and attend just rewatch it—though watching it two or three times isn't going to make a difference if they're really struggling. It can perhaps help a little bit, so there's a balance there. But I am looking forward to when everything settles because we're still sort of going crazy

every day in trying to understand how we are going to use those videos effectively, to kind of booster the online part, that sort of in person part. I think some of that will translate. (Don, F)

"Make adequate time for planning, using solid academic technology infrastructures [that should be in place]" is a consensus reached by Jane, an administrator and learning specialist. She was referring to the learning management system, Canvas, and all its capabilities.

It's not a nice to have. It is a must have. So it's a good learning management system, [like] Canvas or Blackboard, to grow a video conferencing system and video delivery system-- all these things, along with people who can support faculty, train faculty on the use of things, the importance of faculty preparation, and then the infrastructure to make all of this happen. I think those are must haves. (Jane, A/LS)

Jane also suggested the creation of a core shell in Canvas that could alert to closings or other emergencies, "so we're not scrambling to create a shell and get people on board…fundamental best practices: to support technology, infrastructure, and preparation."

Though the aforementioned best practices show merit, all is in vain without consistency of online tool usage. For example, Beckett, the faculty member who had favored the whiteboard, said:

Beyond the digital lecturing, I had my students turn in all of their assignments digitally. I returned the grades in the digital grading system, and that made it easy for me to grade and grade consistently. And it makes it easy for students to see how I grade them, and how they compare to their peers. I have always sort of used these online grading tools, but I've used them exclusively in the past two semesters. So I think that speaking of skill that faculty could learn, I think it certainly is streamlined and made more equitable grading using these online tools. (Beckett, F)

Administrator/faculty William advanced this practice further by saying,

> In engineering, we like to give a lot of demonstrations of physical phenomenon to help students kind of relate from the things that they're learning in class, which are quite theoretical, to actual applications and demonstrations of how they might use the things we're teaching them. With a pandemic, we used a ton of digital tools. (William, A/F)

Carter, an administrator, supported the consistency of technology use, saying:

> What's hard is to get it thoroughly indoctrinated into the culture, to have tools that are easy for people to use and readily available. And so what we did on an emergency basis this past year—it would be very good to have a program where we do that routinely, rather than just flipping back to the whiteboards and markers and having the remote be the exception. (Carter, A)

Understanding the correlation between digital tools and innovations in learning, administrator and faculty member Teague, who has graduated 250 PhDs, mentioned an interesting point about innovation that permeates the discussion:

> The time of people writing things on the board and people erasing it is over. I see where things are breaking down is when it comes to innovation. You know it's like sometimes you need the whiteboard. Technically, there is technology that you

> can do this on a sketchpad and people can take over and write something, somehow, there is a little barrier in acceptance of that as being a substitute to people being together and working together. There is a general sentiment that innovation might struggle a little bit, due to this absence. (Teague, A/F)

Teague added,

> So there are certain things that technology is helping, and there's certain other things you ask why it is not helping more. It's either a psychological barrier or a sociological barrier. It's stubbornness in some cases. Eventually there may be some legitimate reasons why certain things still have to be done in person. (Teague, A/F)

Perhaps a solution to what Teague expressed about "innovation stubbornness" rests with a recommendation by faculty member, Molly:

> They talked about how to make your classroom more accessible. And I found that helpful because thinking about that online is definitely different than thinking about that in the classroom. I thought they did a really good job with their academy. We had a two week break between the time we were in person and the time we flipped to virtual. We basically spent one week learning / writing our lessons in the academy and one week delivering. And that was helpful because it did ease that transition. (Molly, F)

The center for teaching and learning provided a workshop as soon as COVID closures were announced. The workshops focused on teaching strategies, but more so in a virtual environment.

Reach a Broader Group of Students

Lyn described her thoughts about reaching a broader group of students and presenting material in a more relevant way:

> So I think if we had a better way of presenting this material that takes into consideration the fact that people [students] can come to it from very different backgrounds and very different levels of preparation. I think doing something like the Khan Academy for the core engineering classes—to do it in a fun way …but engineering, like I said, in general is not fun. So, to try and do something that's not as painful to sit through as your typical engineering classes, that is approachable and that takes into account people's varying backgrounds, I think that's a huge untapped market in this country…. picking faculty who are interested in doing this and to do this the right way, not the boring traditional way that turns off a lot of people. (Lyn, F/A)

Share Experiences and Successes with Fellow Faculty

Several facets are involved with the topic of sharing experiences. These included building a shared understanding of key terminology, digital repositories for shared content, examining why there is resistance to change, illustrating by example, and focus on the biggest challenges.

Regarding shared understandings, learning specialist Flynn adeptly said,

> Oh wait, we mean different things by X! It sounds very basic and simple, but I think that we were so eager to try to get the change going and the different types of assignments started that we didn’t stop and take that time, and it would have worked out better for us if we had. (Flynn, LS)

Individual coaching was also suggested, and Flynn added,

> We would break into pairs, stating, "What part of your course do you want to work on and then let's spend time on that." That was really helpful because I think in the fall semester when we were doing the workshops, the faculty were learning things and getting to the shared understanding but then they were still stuck on the "okay but I don't know how to translate that into action for my course." And on balancing those two things, and kind of weaving them together "so we do a little bit of workshopping a little bit of coaching, back and forth, as opposed to large blocks of each." (Flynn, LS)

Flynn went further to ascertain that "calling out assumptions about what learning looks like and what teaching looks like gets the conversation started." In speaking to the resistance she has encountered, she added:

> So then they're [faculty] more open to change because they're examining things that they've never really examined before. They're engineers, right, that's not what their expertise is. Their expertise is in the discipline itself. They're not supposed to be experts in teaching, this is just the way (and this is my pet peeve) graduate education is set out. We send very unprepared people into the college classroom and expect them to work miracles, and that just doesn't…that's just not how it works. They know their subject matter, but just because you know something really well doesn't mean that you can convey it to other people. And that's not their fault, but they haven't examined those things, and so then the resistance is stronger. (Flynn, LS)

Faculty member Don suggested a "shared sandbox" in Canvas:

> For sure there is a lot of everybody does their own thing, which again, I think is good, because if someone told me how I had to teach the class, it would not be nearly as fun or even good. But especially now and it's something we were talking about pre-pandemic, but we need good ways to share too, because there's a lot of great content that we could pull from that will make our lives easier, right. So we're definitely exploring how to do this I think we're going to do it in Canvas, it makes a lot of sense to have shared sandboxes where everybody puts content in and then you can draw from. (Don, F)

Faculty member Ann would seek to engage the community before making sweeping changes in software and applications, stating, "We need a basic understanding of how the software works and can interact with other software." This statement makes an important point about any innovation or new digital technology: look at the downstream impacts.

Illustrating by example came to light through a statement by faculty member, and former administrator, Jeff:

> We cannot force, our colleagues to follow a specific teaching approach. We have to respect that. But, at the same time, I will say it's a matter of education and a communication, because those who resist haven't had a chance to see what can be done safely. We start with a thesis one on one, and then we'll invite all of our colleagues to take a look, and say hey guys, what do you think, and maybe, maybe there's professors who will open their minds, and that they will become humble. To make changes, makes people humble. It's very important for us to establish a role model for others to look to. I will not reject my colleagues who

> tend to be resistant to our to new initiatives. I consider it our responsibility to show what can be done. So they can watch, they can touch, they can feel, they can dive into that environment. And finally, this is the way to do business. (Jeff, F)

Several responses suggested creating courses that are replicable, so that instructors do not have to create lessons from scratch. Faculty Molly relayed, “I have all of my classes set up so that if somebody teaches it after me, they can literally pick up what I've done and implement it. They don’t have to write a class from scratch.” Administrator Carter recommended looking at more challenging situations and studying them for solutions.

> One of the big challenges we've had—because we do so much engineering—are the lab courses—those have been a big challenge to do remotely and there's been some very interesting, very innovative things done, but still people are gonna be relieved when they can bring them back in person. We have also equipment for labs, but with the remote, they can't touch the equipment, which is important for engineering students. (Carter, A)

Develop Student Mindsets

The storytelling and experiments initiatives, as part of the new grant, received several accolades.

> The foundation grant is forcing us to put things into more of an active learning mode. I think that it's forcing us to include emphasis on things like critical thinking and problem solving, on giving our students confidence in their abilities to solve problems, and I think those are all really good things. And I think teaching them some of those skills that make a good entrepreneur, are going to

help them succeed regardless of whether they go to a startup or if they go to industry. Being a good problem solver, being able to recognize problems being confident in your ability to tap into something unknown, all of those things are going to serve them well. I think the grant has a lot of potential. I really do. I'm really excited to see where it goes. And I think it just depends on how well we do with implementing it. My biggest concern is getting it implemented more permanently. (Molly, F)

Molly is conveying the importance of critical thinking and problem solving to student confidence but has concerns that if it not implemented with intent, the college may not succeed in that mission.

Regarding the Storytelling initiative, learning specialist Flynn relayed:

Students need to be accountable for their work and need to address and make connections throughout their education—a vision termed Vertical Curriculum Integration. We have moved toward the art of the story, and I can describe the nature of that class, that it is old-fashioned, sit in a circle, and reflect, take time to write your stories, share with one other person, then share it with the group, and the group provides immediate feedback. Being at home, in their own spot, students were telling more vulnerable stories, and particularly one of the aims of the current foundation grant is an entrepreneurial mindset. One of those pieces of the entrepreneurial mindset is learning from failure and persisting through failure. (Flynn, LS)

Flynn sees an obvious value in the storytelling initiative as a means to foster an entrepreneurial mindset.

Hands on learning experiments via laptop enabled students to conduct experiments in their own location during the pandemic. Declan, a faculty member, noted,

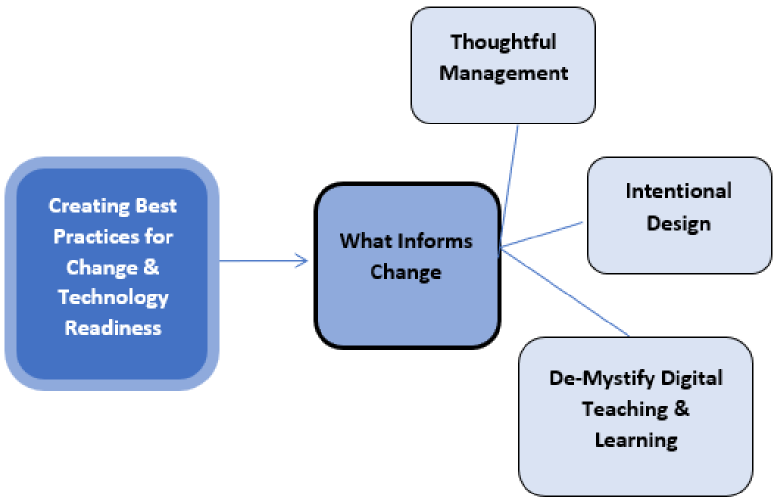
> You could perform [these experiments] literally on a desktop using very inexpensive data acquisition equipment that we've hand-built in the electronics lab in mechanical engineering…[these] are very transparent that you can see what they do, it's not a black box, the wires, the power supplies, all of it is very simple. And the idea is to try to let the students do these kinds of experiments outside of the laboratory, and so a team of two or three get an experiment to carry out, and then maybe there's some open ended-ness to it like, try to extend this with something else…It is an example of design, build, and test. (Declan, F)

It did seem possible to continue experimental work without going to a physical on-campus lab.

Finding 13: "Informing Change" Through Thoughtful Management, Intentional Design, and Running a Pilot to De-Mystify Digital Teaching and Learning—For Starters (See Figure 67)

Figure 67

Finding 13: Sub-Finding Thematic Map



This last finding begins to configure a perspective about change: how to see its value, how to address it, and ultimately how to transform ways of thinking.

Thoughtful Management

According to Faculty Declan,

> You've got to seed a lot of things and see what really catches on, and then support that the best you can. But the idea of dictating "this is how we're going to do it" just forces people into situations that they lose their interest in moving ahead. If I were in charge, I would try to not put people in boxes, or channels, and constrain their creativity. But you can't do that quickly, I mean obviously you don't have enough money to buy everybody their favorite toy. And it doesn't necessarily make anything better, and they're very disillusioned when they get it, but

> thoughtful management that tries to not put too much in any one thing… I think is what I'd be looking for. (Declan, F)

He went on to say that we still don't know a lot about teaching and learning, and "we certainly do not know how technology impacts that."

> And one of my big awakenings has been just how insidiously harmful, Facebook and social media have been to the political discourse in this country, because for the last few years I've been wondering where is this division coming from, why are we so polarized? It doesn't make sense. And I hate to pick on Facebook. They just seem to be the biggest target. And they've been exposed recently obviously for practices that that feed their bottom line but don't necessarily help society. And I think we, for all the tremendous benefit many of us thought would happen when the World Wide Web was created, boy has it gone off the rails. Now I see how that's happening. I think it's been a good indicator of the fact that we truly don't understand the technology we're working with, and it's going to take a lot more to figure it out, and I'm very interested in how we figure that out. I'm not one of those people that's going to figure it out. My passion is engineering, but I hope to benefit from what we learn. I'm willing to read the articles and try to learn and what we can, because boy I don't want to continue what we're doing right now in terms of the bigger picture. It doesn't matter which side of the divide you're on, you know—right, left, center—it's the division that's the problem. We're kind of off the topic but it gets to the point. We don't know how to use the technology that we can invent. The technology that we can invent is so addictive,

> and it so permeates our lives, but we have no idea what it's doing, like, the downstream impacts. (Declan, F)

The Need for Intentional Design and De-Mystifying Digital Teaching and Learning

Jane, the administrator/learning specialist, recounted how pre-COVID, engineering faculty were talking about a black box—a lack of transparency. She stated,

> And people didn't necessarily know how to take online courses or how to teach online courses. So they're raising their hands, or they're being pushed to raise their hands, to engage in something that they don't necessarily understand. So there's a lot of demystification that's needed to explain what it's gonna look like. We had to show examples. One of the most powerful things has been faculty members saying, "hey, this was a very hard process to go through for six to nine months, but as an outcome, I teach better, my other courses are better." Or you know, "I used what I learned in this endeavor for the residential section of the same course and my students evaluations went up." And those are the positive things coming out of it. (Jane, A/LS)

Jane elaborated on the value of designing courses with learning outcomes in mind, first—that is, with intentional design. She referred to that as a backward design mentality, which is a difficult way for many faculty to function. She described the work her group has typically done (pre-pandemic) to benefit courses:

> Backward design is an essential. We have to have the learning outcomes. And faculty members do not function like that. "This is what I want to teach" is where people start, right, content? Whereas we just flip it to like "where do we want students to go? How do they know when they get there?" …So, we think about

> the end. We think about how students got there, and then we start talking about what content, what activities, what engagements, and things like that. So, that sometimes causes tension. Because sometimes, they might think that, you know, "I know how to teach this, and this person is telling me how to teach it." Whereas, you know, we make a distinction between subject matter expertise, and learning science. And in some cases, they may exist together because let's face it, some faculty are just good at how to teach. But a lot of times, they're not, and they need some hand-holding. So we spend a lot of time just helping faculty change their approach, and that's the painful part. (Jane, A/LS)

Interestingly, Jane quoted some of the faculty as saying after going through the process,

- "This was painful. But on the other side, when I come came out of it, I realized what I've been doing was not extremely useful, or there's a more streamlined way to do it."
- "Now there was a lot of fluff that I was able to take out because when you think about the objectives and align everything that you do, you identify things that are just there because they've been there, or the textbook has it." (Jane, A/LS)

Upon going through this learning experience themselves, pre-covid, many professors gained more interest in teaching online. However, Jane sees the need to modify mindsets again by illuminating student awareness.

> What we did in the past 18 or 20 months is not necessarily online learning. It is emergency remote teaching. So any positives or negatives associated with that activity need to be taken with a grain of salt, because again, it was not what we

typically call online learning with an intentional design for online delivery. So the positive is: a lot more people are interested. A lot more people know how to use the technologies even though they had a bad experience, they know the names of the tools, how to start those tools, how to use them…I think there's a heightened awareness of possibilities, and students are demanding certain things as well. They're demanding recordings. They're demanding virtual office hours…They want that flexibility. They also know that certain things work better in person and that's not necessarily lecturing. They don't want to be in a classroom. They know that hey, "this exact same thing I could be sitting, you know, in a Starbucks and watch. I want my time to count." So that student awareness is a positive. (Jane, A/LS)

Another consideration for de-mystifying digital technology, according to Faculty Jeff, is to pilot a lesson under professional production guidance. His suggested approach:

> There is a physics 101 for all the freshmen students. Use the best available digital tools. Put your best and professor on the stage in front of a whiteboard in front of the computer screen, and provide a good production team, then we make the very best of physics 101. And then using that as a role model, then we do a paradigm shift. Then we'll share our experience with our peers, West Coast the east coast or Midwest, and we share the experience with all the professor's at the university. Hey guys, this is the right way to do business. Because of a budget limitation, we can only do one this year. But we'll continue doing that next year, we do calculus 101, we do chemistry 101, we do American History 101. And overtime, we can make a revolution. (Jeff, F)

> I think we are wasting this crisis. [This university] wants to be number one in the nation, wants to be the number one in the universe. So the question is, can we find a new space to exercise our leadership. And one suggestion for us to exercise our leadership in a new space: recorded lectures like classic movies. I'll tell you the way you design that approach doing physics 101 first and then onwards, that is an engineering approach that is very good. (Jeff, F)

Chapter 4 Summary

"Changing Some Folks' Attitudes—That's Nothing Short of Magic." Flynn made this point, which seemed appropriate to close out this chapter on results. She elaborated:

> I don't mean that they are difficult to work with. It would just be easier if I could tap a wand on the head, and they would understand and see the world in a similar way, or at least understand my perspective – not necessarily change theirs, but make a light bulb go on and they would see what I'm saying. I see value in the synergy that comes with an engineering background and then a learning scientist background—I think you get some better stuff that way—when they bring that perspective to the table that's so different. If there was a magical language we could use to communicate and understand what each other's saying instead of talking past each other when we're really probably saying very similar things… I was hired because I know higher education, and I know how students learn and grow and develop in college.
>
> You need some true organizational developers. We need a conversation, facilitated by an outside person to help us get [pause]—because we're struggling with what is the mission going to be, or what are our priority goals like and that is

> something that an organizational development consultant can come in and do and help our group get to a decision. But engineers think they can do everything, and that they don’t need outside expertise. (Flynn, LS)

What is clear from the dominant themes to the sub-theme findings, and finally to the actual example words by the participants, is that the experiences are diverse. The findings tell a story that begins with bursts of feelings about pressure, tension, and disruption of the college environment by moving courses to an online format. Shaken were the traditional approaches to teaching that depended upon a whiteboard and a lecture in a physical classroom full of students. The focal point of the interviews was the experience of having to continue to teach during a pandemic. Participants told of the rigor of the discipline and coursework in engineering, and why they believe it must be taught a certain way. They talked of an independent, entrepreneurial way of operating. There were perceptions of real or implied directives and system elements synonymous with higher education, such as tenure, models of scholarship, “publish or perish,” research funding, and graduate assistants. While one set of responses leaned into tradition, another set expressed thoughts about the science of learning and technologies for teaching. Many of the traditional mindset voiced that they were just enduring until classes could resume in person. Then there would be little need to use the digital platforms and technologies they were forced to learn. The outlying participants held views of how higher education must change. Amongst all responses best practices gave insight to how the term “innovation” is defined by the participants. Finally, thematic analysis brought me to the question of what could inform change in this environment or if it would ever permanently adopt digital technologies for teaching and learning.

Figure 68 provides an overview of the themes and sub-themes, or findings, relevant to how they answer the research questions and sub-questions. The first question pervades the entire analysis.

Figure 68

Chart of Themes, Findings, and Correspondence to Research Questions

Themes		Findings	Research Questions
Pressure, Tension, Disruption, and Conflict – Telling it Like it Is	1 2 3	Expressions of Pressure and Tension Disruption of the Norm Challenges to Professorial Identity	How is exponential digital technology growth *and* organizational change perceived and experienced for decision-makers, faculty, and learning specialists, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes?
The Center – Can it Hold? Stakeholders' Sense of Operating	4 5 6 7 8	Traditional Academic Philosophy College Environment Directives and Directions Enablers of Change Technology Readiness Assessment	What are the ideas or opinions regarding how much *change* has been or will be reauired? How are pressures for change being handled? What are the consequential *conflicts* that may impede success, how or where do they emerge, and how are they managed? **Quantitative Sub-Question** What is the *level of awareness* and *spectrum of attitudes* toward trends in digital technology and the changes that may occur to operations and/or mission—short- and long-term? **Qualitative Sub-Questions** Can current, or recent, implementation or adoption scenarios be *described*? How do stakeholders *understand, cope with, mitigate*, or *exploit* the impacts of digital technology? What *drives behavior* and illumines motivations or priorities?
Why the Science of Learning? Innovation: Learning versus Teaching	9 10 11	Commitment to Learning Initiatives Toward Learning Change Listen to the Outliers	
Can Best Practices Inform Change and Readiness for Technology Adoption?	12 13	How Current Best Practices are Defined What Informs Change?	**Qualitative Sub-Questions** Can current, or recent, implementation or adoption scenarios be *described*?

Significant for me in this exercise was the attention I had to pay to wording and attitudinal postures. Similar things were said many times, or replicated by others, but each had a nuance that placed it in a specific sub-theme finding—collecting there with others as I came upon them. I believe the analysis process that evolved is the reason there is no direct correlation between specific findings and specific research questions.

The way the themes presented themselves to me was anything but linear, and so I conclude this chapter on results realizing that my research questions were indeed answered. The final chapter of this dissertation will illustrate the contextual understanding that has been my premise for how to recognize and address conflict through a theoretical lens.

Chapter 5: Discussion, Conclusions, and Recommendations

Central to this dissertation journey was my desire to better understand the influence and impact of digital technology pervasiveness at all levels, from society, to sectors, to organizations, and to individuals—and the conflict that emerges. Having come from a business background, I know that organizations typically benchmark resources, processes, values, culture, and risk against a standard set of indicators. This dissertation signals the need for immediate analysis of digital challenges and opportunities that can prove disruptive—exposing different value propositions, metrics, and relationships—that are being, or will be, faced in every sector and organization. Many, including higher education, have resisted the portending changes.

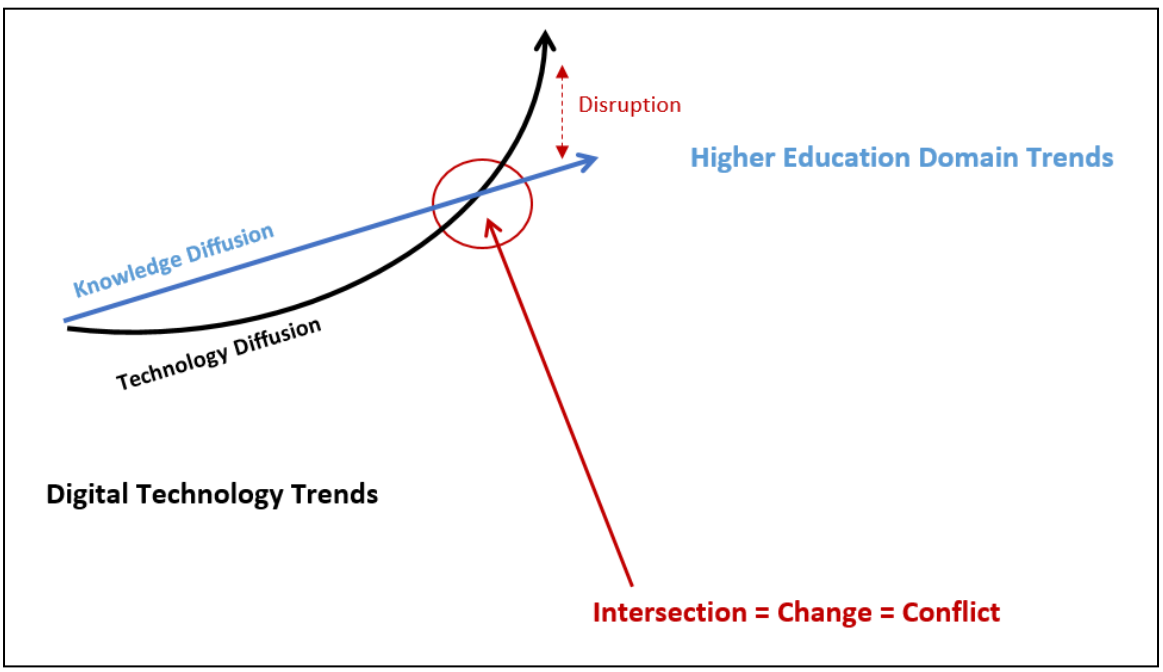
Though the exponential progression of digital technology has been under scrutiny by many, no one anticipated the beginning of the COVID pandemic in 2020, and the disruption it was to mount, including that upon this dissertation topic. With perseverance, however, I embarked on a study of a college of engineering within a large public university so that I could gain a practical perspective with a real-world entity. My premise required a contextual synthesis of the impacts of technical trends in the learning environment (specifically, instructional design, methods, and tools), organizational capacity for change, academic culture—and now, an unforeseen pandemic—that I had hoped to derive from qualitative and quantitative inquiry and discovery.

Further, my intent was to substantiate theoretical thought for organizational strategy in today's times. That is, to illumine the decisions that are made and how they are deciphered, how change is experienced, as well as how conflict is managed, by relating to wisdom found in theory.

I operate in a visual mentality, and so I have drawn several interpretations of what I attempted to do in this study. The first depiction (Figure 69) is of two independent trajectories: (1) digital technology invention and diffusion (from a historic vantage point to current day), and (2) U.S. higher education's progressive approach of knowledge diffusion. The notional point where these two trajectories intersect represented the locus of my research, as technical diffusion and knowledge diffusion cross and ignite an impetus for change in the way universities operate and deliver on their academic mission.

Figure 69

Conceptual Understanding of the Conflict Case

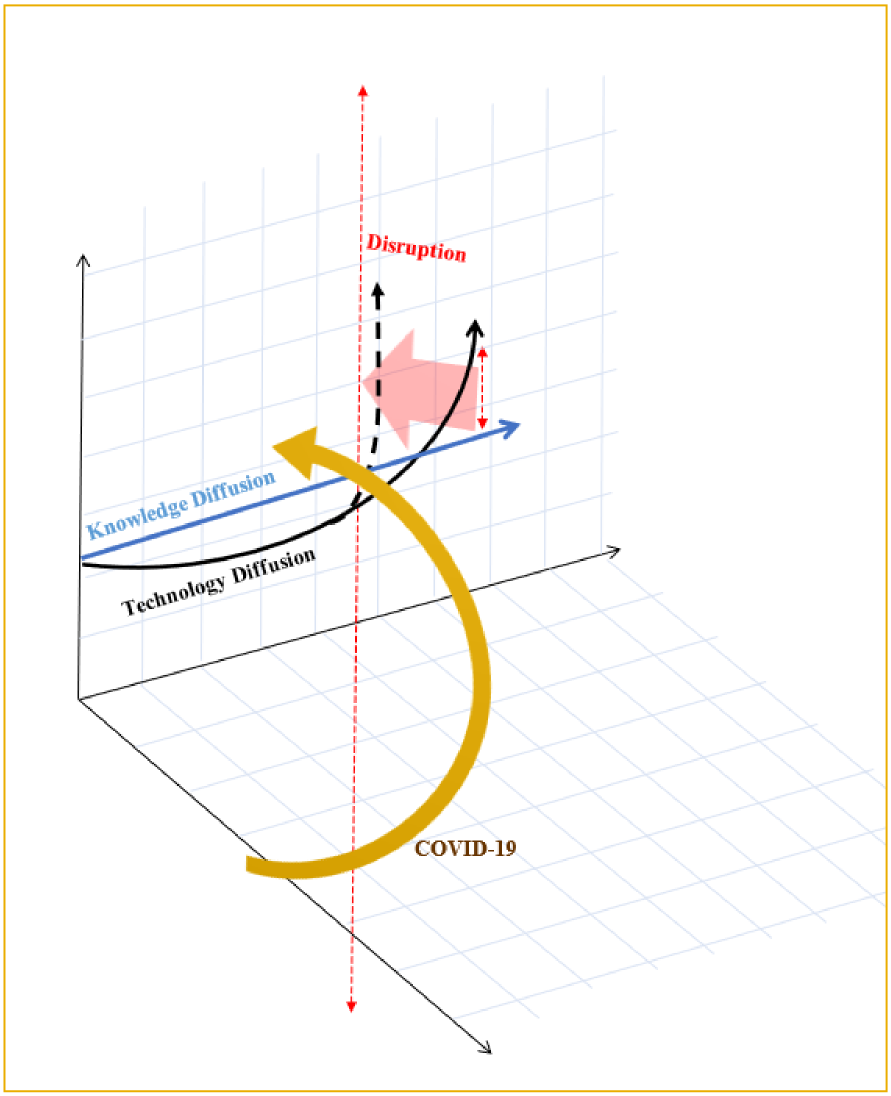


Note. Trajectory drawing adapted from Ismail, et al., 2014, p. 20.

This topic was inspired—and the literature researched—before the advent of COVID-19 in early 2020. A new visual, Figure 70, attempts to explain the now preempted (anticipated) intersection of digital technology and higher education, and it heralds an immediate conflictual thrust. In other words, the disruption I thought might come later, arrived now. Ready or not or like it or not, digital instruction—versus physical classroom instruction—had to go into immediate gear in pandemic times.

Figure 70

Conceptual Understanding of the Impact of COVID-19 on the Conflict Case

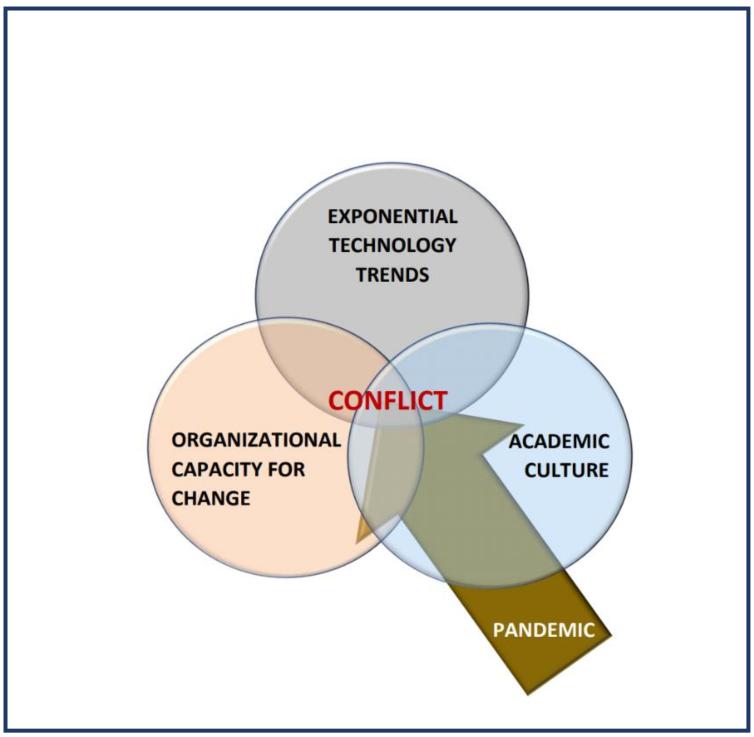


This notional graphic illustrates that the potential for disruption in Higher Ed by the onslaught of digital technology (impacting instructional design) was brought forward on my own timeline—that forcing, as I said, by COVID-19. I was sure there would be conflict and much to hear from educators, but I had wondered how much time I could borrow from them to get answers to my research questions, as they were in the thick of this sweeping change. After discernment, I determined not to see this dissertation as pre-empted, but oh so timely—even fortuitous, and so I continued to pursue the topic, now with a disruptive factor already at work.

The literature review revealed yet another consideration at the intersection of higher education, digital technology, and COVID—that of organizational capacity for sociotechnical change, defined as the interdependencies between people, technology, and the environment. Hence, a third graphic was created to include that aspect (Figure 71). My research questions inspired this depiction, as well.

Figure 71

Conceptual Framework for Study



Research Questions

1. How is exponential digital technology growth and organizational change perceived and experienced for decision-makers, faculty, and instructional designers in higher education, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes? What are the differences in responses between the three participant groups: faculty, administrators, and instructional designers?
2. What are the ideas or opinions regarding how much change has been or will be required? How are pressures for change being handled?
3. What are the consequential conflicts that may impede success, how or where do they emerge, and how are they managed?

It was with these questions, drawings, and insights from the literature review, that I designed a quantitative survey and seven qualitative interview questions to fulfill a mixed methods research approach. Through the survey I would hope to ascertain a general technical profile of the organization under study—the college of engineering—and more so, its capacity and readiness for technology adoption. Several writings about sociotechnical theory, and a published college readiness self-assessment, provided parameters I used in building the survey. It is unfortunate that the survey did not render enough response to make it feasible for my study. However, the lackluster response, itself, divulged something important about academic interest in understanding the current situation and/or addressing it.

The qualitative aspect, on the other hand, exceeded expectations in the quality, authenticity, and passion extended to me through my discussions with eighteen participants from three role groups: administrators, faculty members, and learning specialists. A final visual will shortly illustrate the connection I was able to make between digital technology impacts, organizational capacity for change, theory, and personal testimonies of practical experiences. The same intersection is represented in all my drawings—and that is the focus of this dissertation, or now more clearly the contextual synthesis I sought to achieve.

Five "Cs" at the Point of Intersection: Recognizing and Addressing Sociotechnical Change, Capacity, Challenge, and Conflict—in Context

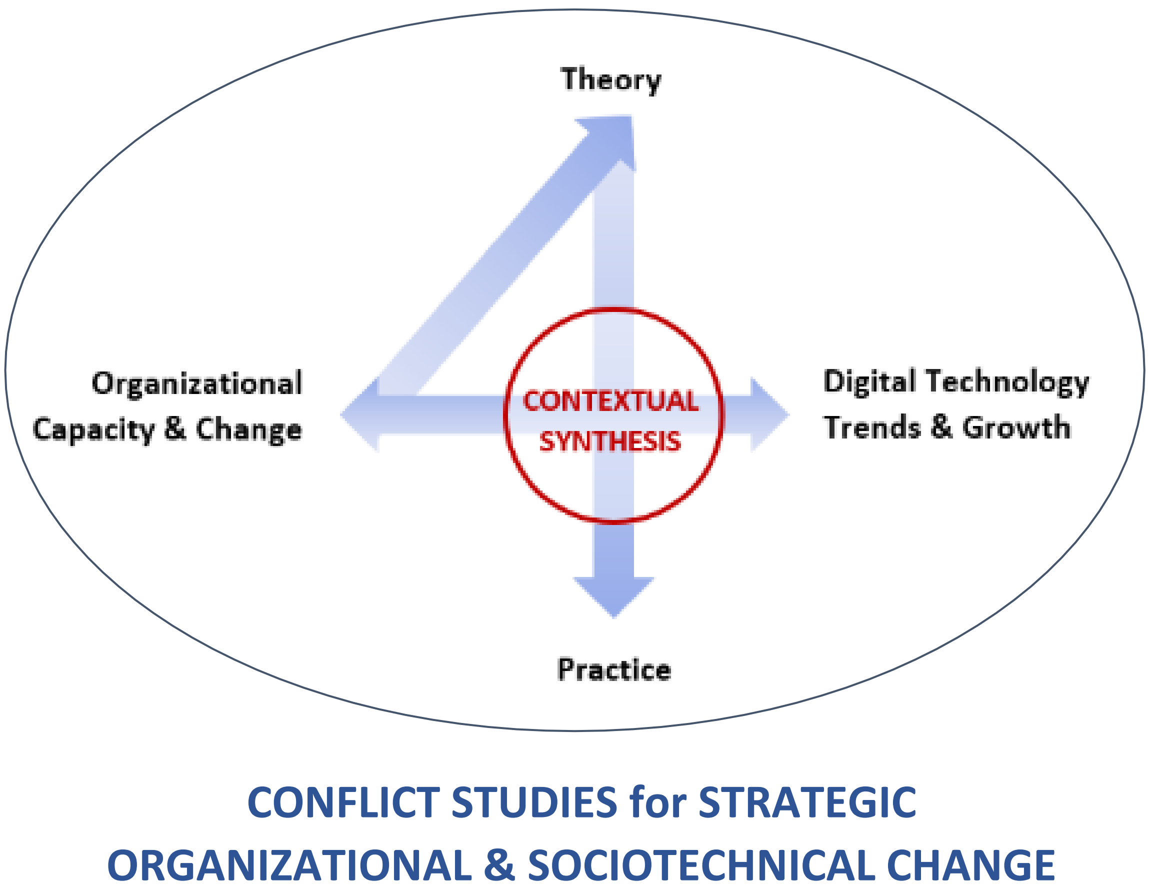
The literature review was structured thus: (a) historical patterns of technological invention or progress—and society's reaction; (b) heightened concerns for trends in higher education that impact its sectoral response to technological disruption; and (c) the relevance of conflict studies in organizational settings experiencing sociotechnical change. These themes permeated the literature review: power, polarization, identity, fear, distinctions between discontent, disruption, and meltdown, social systems, and complex adaptive systems. This undergirding, in its exploration of societal structures and responses to technological innovation and how these are manifested in attitudes and actions, illumined many causes for tensions, competing goals, and conflict.

Though the common mindset considers conflict as an issue between individuals, the broader view I wish to extend for organizational settings is that conflict is a phenomenon that takes many forms brought about by polarized interests, inadequate understanding or skills, mismatches of solutions to problems, misinformation, change, unanticipated consequences, systemic flows downstream of an event, or disruption of norms and the entire entity.

More specifically, I employed a multidisciplinary theoretical approach within my research methodology to discern mechanisms through which a college of engineering may assess, address, and adapt to disruptive technological change—gaining knowledge about the capacity to adapt and the challenges and conflict that may emerge. In my analysis of participant interview transcripts, I sought points of convergence, departure, or synergy as they led to a fuller contextual understanding or awareness of the organization and the circumstances it was weathering. Figure 72 depicts the composite framework.

Figure 72

Contextual Synthesis Achieved through Conflict Studies



Interpretation of Themes and Findings

To understand how the phenomenon of conflict operates in the higher education domain as perceived by interviewed participants, I will now map these relevant theories to the study findings:

- Technological Disruption (Christensen, 1997, 2000, 2016)
- Diffusion of Innovations (Rogers, 2003, 2004; Downes & Nunes, 2014)
- Sociotechnical Change (Dolata, 2014; Juma, 2016; Trist, 1981)
- Organizational (Group) Dynamics and Change (Lewin, 1930s; Trist, 1981)
- Complex Adaptive Systems (Olson & Eoyang, 2001)
- Practice Theory of Change (Mitchell, 2006; Shapiro, 2005, 2006; Jabri, 2006; & Ross, 2000; Watkins-Richardson & Walsh, 2016).
- Power and control (Lemert, 2013; Foucault, 1982, 1984, 1988, 2013a, 2013b)

Theories of Technological Disruption

Theme #1: Pressure, Tension, Disruption, and Challenges to Identity

Key topics:

- Disruption (Christensen & Eyring; Gans)
- Diffusion of Innovations (Rogers; Downs & Nunes)
- Social response to change
- Incremental Change
- Cultural Identity

Findings:

1. “Pressure, Tension, Disruption, and Conflict” are found in deliberate word choices and constructed topics

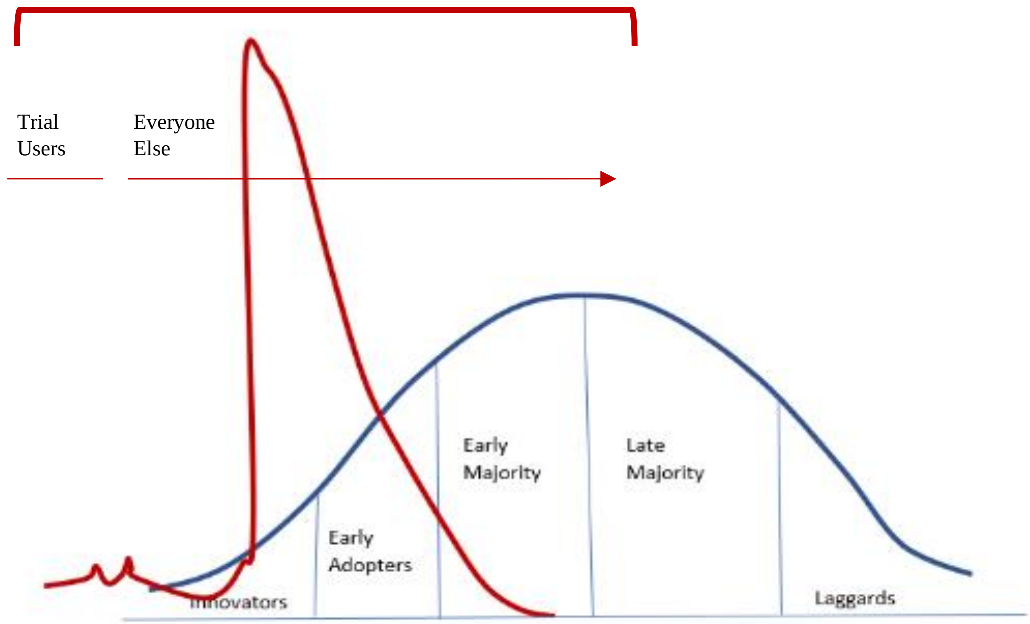
2. “Disruption of the Norm” describes the amount of work and fear of not going back to “normal.”
3. “Challenges to Professorial Identity” include the pedagogical shift toward digital technology—away from the familiar mantra of “teaching is a performing art” with a classroom (stage), a whiteboard, and the podium (props).

“Disruptive Innovation or Technology” is attributed to a business phenomenon conceived by theorist Clayton Christensen in 1997, who later addressed the same concept with co-author Henry Eyring regarding higher education. Various authors in the literature review also discussed disruption, including Joshua Gans, who is more recent. In simplistic terms, disruptive technology is a process by which a product or service takes dominance over others in the market—typically by being less expensive and more accessible—and then eventually displaces established competitors (Christensen Institute, 2021). Being associated with business models makes it difficult to understand in an academic case study, but it is applicable. Gans (2016) describes disruption in an organization as a legitimate phenomenon or a triggered event—in the case of this dissertation: exponential digital technology change combined with COVID—and the quandary stakeholders experienced as a result. The theory of disruption includes words like “complacency” and holding on to “status quo.” Christensen (1997, 2000, 2016) included in his description of disruption the term “innovator’s dilemma,” which is a paradox because “the logical, competent decisions of management that are critical to the success of their companies are also the reasons why they lose their positions of leadership [due to blind sidedness]” (p. xvii). Christensen and Eyring’s (2011) work on technology disruption in higher education illumines the aspect of institutional culture on capacity-building and adoption of new technologies. I will speak to organizational capacity in the next theme.

Closely coupled with the theory of disruption is Everett Rogers' (2003) "Theory of Diffusion of Innovations," in which a natural curve is typified from early to late adoption of innovations by individuals within organizations or groups. Rogers sought to explain how, why, and at what rate new technologies or innovations spread, stating, "Diffusion is the process by which an innovation is communicated over time among the participants in a social system" (p. 35). This curve has explained for a long time many sociological behaviors within organizations when confronted by new ideas or innovations. However, given the exponential growth of digital technology, it is rendered less useful. Downs and Nunes (2014) talk about even faster adoption that eclipses Rogers' long-held normal curve. In my literature review, I visually overlaid their Big Bang Disruption theory on that of Rogers, and it is repeated in Figure 73. It pictures the rapid adoption of technology due to the speed at which it is entering aspects of society and disrupting before few know what's happening.

Figure 73

Big Bang Market Adoption



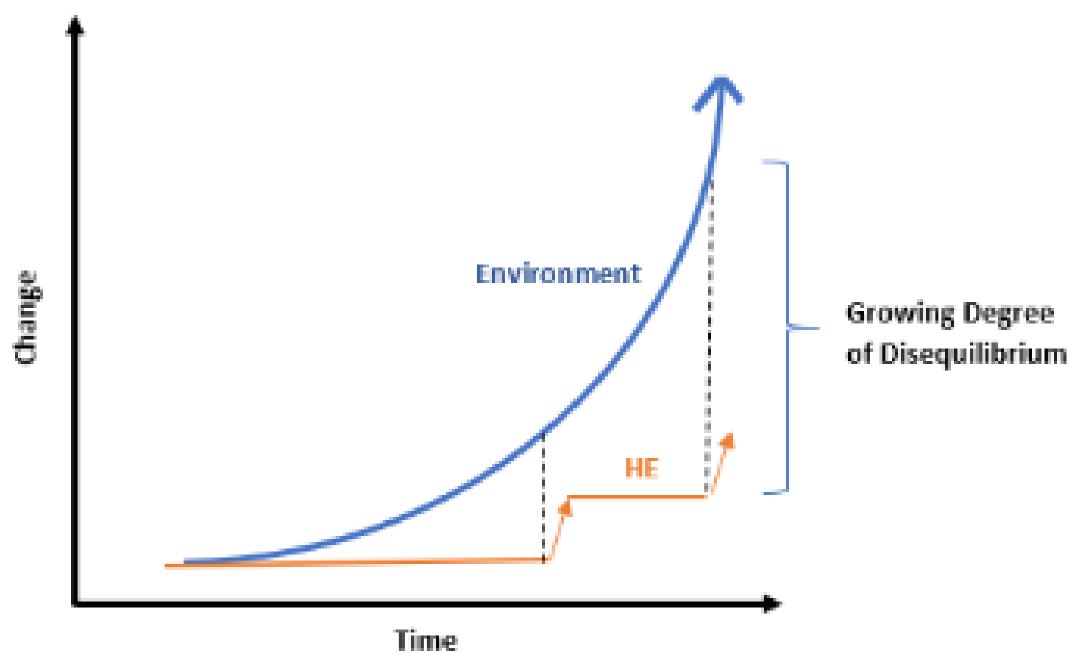
Source: Downes & Nunes, 2014, p. 35

These theories help to set the stage for the first set of qualitative findings. As noted, individuals in the college of engineering were given two weeks' notice in March 2020 to convert all in-person courses to online. The double disruption of a worldwide pandemic and the hasty acquisition of digital educational acumen was, to say the least, difficult to manage. There was no time to move methodically through Rogers' diffusion of innovations—certainly no comfort for a laggard. What these (and many other) academics faced looked more like the red line above.

Excluding the COVID issue, higher education as a domain had already been reluctant to fully embrace full-scale digital technology in the learning environment (Webb, 2016). Quite possibly, the disruption felt by my participants was aimed more toward the pandemic than toward any thought that digital technology had moved in permanently—a sign of complacency. Figure 74 illustrates the growing disequilibrium brought to light by the exponential change occurring in the environment, while higher education has historically taken linear, incremental improvements in response. There is reason to understand the desire to maintain the status quo, as will be explained later in this chapter. However, note that my interviews took place within the third term—18 months after going virtual—and the expressions of tension and pressure were still heightened, as if change had just happened. Thus the first theme to surface in my analysis was “Pressure, Tension, Disruption, and Challenges to Identity – Telling it Like it Is.”

Figure 74

The Relationship Between Environmental and Higher Educational Change



(Taylor & de Lourdes Machado, 2006, p. 153)

Finding 1: "Pressure, Tension, Disruption, and Conflict" Are Found in Deliberate Word Choices and Constructed Topics

Entities that have difficulty with technological change usually confront change with managerial, organizational, or cultural responses. When initially asking, (1) Would you please tell me about your current role as it pertains to new technology initiatives for instruction, and (2) How are things going? –quick bursts came forward, such as, "it's a horrible struggle, all this madness, the world fell apart, a nightmare, hellacious, jeopardized trust, so many things were lost, I fear for education, etc." Such choice of words reflected for me positions on self-worth, inability to anticipate change, resistance to change, as well as reflections on the culture. These were an excellent personification of the social response to technological innovation, which has historically been conflictual.

Finding 2: "Disruption of the Norm" Describes the Amount of Work and Fear of Not Going Back to "Normal"

More answers provided insight to how the participants felt about this disruption of their norm, which was coded in my thematic analysis as "increased amount of work" and "fear of not going back to normal."

The diffusion of innovations theory informs behavior toward technological innovation by mention of the social system in which we operate. For Rogers (2003), a social system "is a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal." Think: team, department, or work group with "patterned arrangements of units that enable structure, stability, and regularity to individual behavior in the system" (p. 37). Several elements reside within a social system to include communication structures; established behavioral patterns or norms; opinion leaders who influence adoption; change agents and aides who assist with influence; and consequences, or changes, which occur when an innovation is adopted or rejected (pp. 37-38). Later findings revealed an independent operating style amongst faculty that has pros and cons. Pertaining to Finding 2, the disruption of the norm impacted the college social system, and the perceptions of indecision increased anxiety and fear of not seeing the end in sight—of not knowing how long to operate in the new mode, as everyone was coping in their own, independent way.

Finding 3: "Challenges to Professorial Identity" Include the Pedagogical Shift Toward Digital Technology—Away from the Familiar Mantra of "Teaching is a Performing Art" With a Classroom (Stage), a Whiteboard, and the Podium (Props)

Cultural "identity," as acknowledged in the theory of disruption, is significant in the study of social response to technical innovation, as it highlights human worldviews, values, doctrines, and vested interests, which were communicated in several participant responses. Cultural identities also generate tension if a traditional value system is challenged by a modern one. My participants relayed feelings about losing the rigor of their lesson content in an online environment—that it was diluted. That rigor is directly tied to their sense of identity. As was stated, if one is an "instructor of record, you go into the classroom, and you teach as you see fit." Losing or compromising this status, especially after having taught the same way for 30-40 years, is understandably traumatic. Many references to teaching as a performing art, and the assumed requirement for a lecture, a whiteboard, and an audience of live students, also fulfill the professorial identity. With an independent way of operating, it was not surprising that the participants felt innovation was being forced upon them. They were confused by "the wild west of technologies and techniques" that suddenly stood before them (instead of students). Because of their pride, they did not like that confusion. Imagine teaching astrophysics yet being daunted by an iPad connecting to a live stream. So they justified their perceptions by acknowledging that they operated in "a tradition-bound university, by design," that is "a big ship—hard to turn." Expressed was the desire to get assistance through an organizational development intervention, but I was cautioned that, "engineers think they can do everything, and that they don't need outside expertise."

Some responses began to show a different side, though. Telling was the remark, "I felt like it laid bare, the complete and utter inadequacy of the lecture," for it implied that technology—because of COVID—had disrupted the transmission model in higher education in the way the theory of disruption had predicted: as a sudden alteration of the status quo or having come out of nowhere. The final references in this finding about identity are the statements made by the outlier participants—the ones who found the interview fulfilling and a form of release. These statements represented voices with a different identity that want to be heard—all similarly saying, "I never had anyone I could tell about these things" [their ideas of a better way].

Relevant quotes from the literature review add support to these three findings.

- Disruption is "what a firm faces when the choices that once drove its success now become those that destroy its future" (Gans, 2016, p. 13).
- At the individual level, Schwab (2016) identified challenges to identity: Humans, when faced with these challenges and our potential augmentation with machines, make us "question the very nature of human existence" (p. 97). Schwab foresaw increased polarization, "marked by those who embrace

change versus those who resist it"—an "ontological inequality that will separate those who adapt from those who resist—[creating] material winners and losers" (pp. 97-98).

- Brynjolfsson and McAfee (2016) believed some people will be left behind because their capacities do not match the new environment.
- Macfadyen and Dawson (2012) said, "an individual's reaction to change reflects their cognitive evaluation of the way in which a new event or context will affect their personal wellbeing" (p. 160).
- Dolata (2014): "The key to understanding a sector's adaptability to technology-induced change is to look at the external social conditions. Then, study how established actors react to new technological opportunities that seem to go against their guiding principles, organizational patterns, and routines"(p. 91).
- Christensen and Eyring (2011) taunted that "until the relatively recent emergence of the Internet and online learning, the higher education industry enjoyed an anomalously long run of disruption-free growth" (p. 18).
- Trist (1981): "Many ego defenses are projected into the existing structure and culture. They have formed their occupational identities in relation to them. They now must give up what it has taken a long time to learn and to become. Whatever its shortcomings, the status quo is familiar and has been internalized. Change involves loss. Room must be left for mourning in both its depressive and angry phases." (Trist, 1981, pp. 47-48)

- DeMillo (2011): "Universities whose faculty members write a shelf-load of best-selling textbooks still have velvet ropes controlling access to their lecture halls, because they believe that the classroom experience defines their value" (p. 177).

I would make one more point about this theme and its three findings and that is the hint it provides to a belief that the current situation is temporary. The adoption curve previously mentioned as "Big Bang Disruption" (Downes & Nunes, 2014) raises the discussion of technology transience, or the duration of time for technology usefulness as it passes from rise and rapid adoption, to falling or slowed adoption, and eventual satiation and replacement. Given the scenario, it is difficult for organizations to know what to anticipate, how to react, and how much to invest. My analysis found this to be very true in that the participants did not know how much of themselves to invest in the change to online teaching. Gans (2016) stated that mere uncertainty over whether an event is in fact disruptive gives rise to the problem. In organizations experiencing uncertainty, the workforce experiences a sense of threat that generates conflict.

Sociotechnical Theory

Theme #2: Uncertainty About Whether the Center Will Hold—Stakeholders' Sense of Operating

Key topics:

- Sociotechnical Change (Dolata, Applebaum, Juma, Lemert)
- Capacity for Change
- Technology Adoption
- Organizational Readiness

Findings:

4. “Traditional Academic Philosophy” – Revelations of WHY the mindset informs the pedagogy
5. “Environment” – Revelations on the impacts of WHAT is taught and HOW participants operate and behave
6. “Directives and Directions (Real or Implied)” – Revelations of WHO accepts the vision and sets requirements
7. “Enablers of Change” – Revelations of WHEN and WHERE something different happens
8. “Readiness Assessment” informs capacity for sociotechnical change, and therefore, technology adoption

Patterns of coding enabled my ability to form a picture of the operating environment within the college of engineering. Clusters of data began to form components. These became the sub-themes of Academic Philosophy, Environment, Directives and Directions, Enablers of Change, and Readiness for Technology Adoption. What resulted was a thematic mapping of an ecosystem, not necessarily an organizational chart—hence, my summation of the stakeholders’ sense of operating with an undercurrent of change forced upon them by the pandemic. As I stated in Chapter 4, the diversity of comments from all sides made me feel as though they were pulling me away from a center spot. I was reminded of thoughts of power, control, and center as an “old cultural order of oneness” found in the writings of Foucault (as cited in Lemert, 2013). I thought about the decentralized structure of today’s Internet, which has an implied role in this dissertation topic. I thought of the consequence of organizational dynamics, and what it feels like, personally, to lose a center of strength. A message from educator Abeles (2017) was suddenly more poignant: whether higher education has lost its center—and will find it again—as the engine for knowledge creation, diffusion, and change. I offer his telling vision once again: “Unfortunately, in its expanding efforts, it now finds itself like a runner on a mountain trail who has just realized that a sharp turn has been missed and now finds itself suspended in mid-air over the canyon” (p. 212). Hence, this theme came to be called “Uncertainty About Whether the Center Will Hold.” This theme and its findings relate to Sociotechnical Theory.

Sociotechnical Theory is “a system approach that focuses on the interdependencies between and among people, technology, and the environment (i.e., market)” (Applebaum, 1997, p. 454). The component Sociotechnical Change Theory (Dolata, 2014; Juma, 2016; Trist, 1981) is described as “the mutual influence of technology, socioeconomic structures, and institutions that inform a sector’s capacity to adapt to a new technology” (Dolata, 2014, p. 1). By this, Dolata believed technology to be a powerful phenomenon with the ability to penetrate society, restructure it, regulate it, and transform it. In doing so, technology exerted pressure for change on societies’ “actors, structures, and institutions”—impacting relationships and realigning “patterns of social organization” (pp. 2-3). Dolata’s work informs an organization’s transformative capacity, sociotechnical adoptability, and gradual transformation (p. 2).

Trist (1981) much earlier conceived the study of sociotechnical theory. He examined the relations between the levels of management and labor. Trist viewed the organization to be “equal parts a technical, as well as, a social system, that all factors should be considered” (p. 7). He and his associates examined the post-war coal mining industry in England, as an initial step toward understanding the interactions between organizational functions, workforce, and newly introduced technologies in mining.

Sociotechnical Change Theory holds that an organization must display the capacity to change and adapt (or it will not). It also risks losing its center, which has, in my sense, been illumined in the analysis of the five findings in this second theme. Questioned is whether the college of engineering exhibits the capacity to embrace sociotechnical change.

Analyzing an Organization's Capacity for Change

New technologies are disruptive in nature. When faced with the pressure of retro-fitting new technologies into an existing organizational structure—technologies that no longer match the organization's profile—substantial change is required to remain legitimate (Dolata, 2014). Often, capacity to take on something new is estimated in terms of space and capital, i.e., is there enough room, is there enough money, do we need to hire different people? The broader investigation of sociotechnical capacity requires a determination of whether exploitation of a new technology is possible and how much change will be required. Going deeper, estimating an organization's capacity for change requires a look at multiple dynamics that include the type of technology in question; how it will be used, who will use it internally and externally; industrial and corporate (or institutional) structures; research, production, distribution, as well as market demand; embeddedness within a sector and a value network; and finally, rules and regulations, norms, values, strategies for change, and all the actors involved—because sociotechnical change is much more than an incremental improvement.

Adaptability as a Research Approach

Assessment of capacity is only a first step. For an organization to adapt a new technology, it must understand how pressures for change are handled and then how the organization and its actors may perceive, adopt, and continuously innovate. Perceptions of adaptability may manifest in feelings of confidence, satisfaction, and/or support. A final stage in this process of examining the value, capacity, and change required of new technologies, is gradual transformation**,** which takes a few decades for an organization or sector to achieve because of the erratic process changes, struggles, and discontinuity cycles that occur. The understanding this topic conveys is that assessment of capacity for sociotechnical change is involved, and if not addressed well, creates conflict.

Viewed through Dolata's (2014) sociotechnical/organizational development lens, new technologies that portend high transformative capacity may pose quite different challenges to the various actors within a sector. Recognizing and measuring adaptability is made difficult through, in Dolata's words, "a diverse range of actors with a diverse range of guiding principles, routines, and patterns of organization that are embedded in a diverse range of structures and institutional milieus" (p. 91). The key to understanding a sector's adaptability to technology-induced change is to also look at the external social conditions. Then, study how established actors react to new technological opportunities that seem to go against their "guiding principles, organizational patterns, and routines" (p. 91).

Given this high-level view of capacity, change, and adoption, I will now turn to my findings within this second theme, and why, how, what, who, when and where participants expressed their experiences at the ground level. I will complete this section by circling back to theory.

Finding 4: "Traditional Academic Philosophy" – Revelations of WHY the Mindset Informs the Pedagogy

The academic participants in this study impressed upon me their stalwart approach and belief in what they were doing. This I call their mindset. Many were children and grandchildren of engineers and college-goers. Engineering and academia is their life. This mindset was the foundation for the commitment to "fulfill the mission without sacrificing the rigor." That is, a belief that their method of teaching is superior. I was struck by the remark, "Even those that are kind of misguided are so well intentioned." Added to the point of this finding is the fear of failure ingrained in this profession—collapsing bridges, for example, to the civil engineer. It is a participant group of high achieving pragmatists who don't pay much attention to someone expressing vision that doesn't have relevance (in their mind) to their day-to-day challenges. This thought was evidenced in the statement, "He's very visionary, but I didn't pay much attention because it was stuff at a much higher level than I was interested in." A revelation occurred, however, when I was told that there were two faculty groups: those who have an interest in improving teaching and engagement, and those who just want to teach the content. This leads to my next finding.

Finding 5: "Environment" – Revelations on the Impacts of WHAT is Taught and HOW Participants Operate and Behave

I was explicitly told that "engineering is not fun." The style of teaching has not changed for generations, as mentioned in Finding 4. The rigor of the engineering discipline is mirrored in the rigor of the classwork. The program of study is not very forgiving, nor friendly toward those students who may not fit the traditional mold. If one does not score well, one moves on to another career study. The most tragic result of the stressful program is student suicide, which was mentioned several times. I call that the ultimate conflict, and something to be addressed.

Other factors about the environment came to be coded as “sense of operating.” These included numerous descriptors of how it feels to teach in the college of engineering. Pride was attributed to the entrepreneurial, independent, autonomous spirit “inherent” in the faculty role. To earn the badge of “instructor of record,” as stated in Finding 3, was very prestigious and denoted a course that can’t easily be duplicated. Missing was agreement on the collaborative nature of the environment. As in several instances where it was clear I was hearing from one of those “interested in improving teaching,” silos and separatism was described as, “It depends on the school you’re in…My school is a little silo away from aerospace, away from civil, away from mechanical, and computer science. And my God, you leave the College of Engineering, and you’ve gone off a cliff!” The sentiment that “collaboration is not rewarded” was disputed by the traditional participants who spoke of a “very positive, supportive culture.” When I asked one of these how change is handled, the response was that to try something new, one must win over a select set of faculty members and utilize their influence. Before leaving this finding, I must add my perception that students appear valued in this environment because there were many statements about mentoring and spirited relationships.

Finding 6: "Directives and Directions (Real or Implied)" – Revelations of WHO Accepts the Vision and Sets Requirements

This finding surfaced by hearing of several instances of discontent from the participants. I traced these back to forcing actions that were either implied or real—cultivating in a dichotomy of directive versus direction. The former was experienced by the receiver as having little choice of compliance—that of feeling imposed upon, and therefore a requirement not too welcomed in an entrepreneurial environment. Direction, on the other hand, is something that guides action and hopefully gives more agency to compliance. For example, COVID was a directive to go fully online, forcing a new instructional style and inspiring a lot of opposition and stress. Some raised the issue of lack of transparency and equity because the directive was handled unevenly—allowing certain faculty to "opt-out" of selected requirements, while others had to conform.

The directive to go virtual was also associated with an increased workload and finite time. Already, finite time was felt as class sizes grew in the college of engineering. A normal class size was 90-100 students. So, finding time to make individual student contact was difficult in that scenario. Further, Clark Kerr, who architected the California higher education system, coined the term "multiversity," which implied the extended set of burdens placed upon faculty beyond teaching, such as publishing original research, writing grant proposals, serving on committees, managing programs, attending conferences, and hosting visitors to campus [pre-pandemic] (p. 177). It was acknowledged that the directive to "do more," by creating courses in a digital pedagogy and finding new ways for engaging students and fellow faculty, impacted relationships and resources.

As if the situation just described is not weighty enough, elements of the system of higher education added an ever-present layer of directives—many of which are inescapable if one desires to retain a career in academia. These include system elements such as the tenure track, the “publish or perish” mantra, continuous search for research money in grants, levels of bureaucracy, and adhering to a model of scholarship that prescribes one, or a combination, of approaches that include teaching, discovery, application, and/or integration—and that are incorporated into promotion opportunities. It was stated in my interviews that innovative teaching at a research institution, such as this case study, is not rewarded, nor is collaboration, both of which fit within two quadrants of the scholarship model.

Given several available documents and online references, I was privy to strategic planning at the university, college, and group levels. The guidance offered was encouraging. Key words are given below. As strategic plans go, this should have inspired direction, and therefore agency to proceed in this operating environment. Overvaluing strategic plans, however, can be tricky. Often, they are developed at the top, and not from the grassroots workers. When this happens, there is less buy-in or agency.

- University strategic plan: students are top priority; champion innovation, inclusion, diversity, access, excellence, impact, collaboration, ethics, freedom of inquiry and expression, leadership by example.
- College strategic plan: adapt and accelerate community, learning, and discovery; inspire transformative learning experiences
- Group view: provide all students with transformative learning experiences; create programs at the intersection of arts and technology; incorporate

learning experiences; develop and expand student programs in social innovation and entrepreneurship.

Participant interviews spoke less of any strategic vision and reflected the broader state university system when it came to understanding direction. As I said in Chapter 4, this appears reasonable, given the emergency mode of operation, but it is not sustainable for the college and university. “Students are top priority,” as portrayed in the strategic plans was not fulfilled by responses in the interviews concerning the college’s student- versus faculty-focus. This will be explored shortly, in this section’s Finding 8.

What also intrigued me was the need by some for direction, as evidenced by this statement: “At some point you have to pull the trigger. I think when change comes about what would be better or helpful is if someone kind of simplifies the change and tells us exactly.” Another participant added, “There’s a looming sentiment that if things continue to get worse, no one knows what to do. It has not been addressed explicitly.” I was able to translate this need to leadership support as an expression of direction. Support was requested in various forms to include more training on the new digital technology requirements, more support for innovative teaching, more money and resources, greater flexibility and less bureaucracy, and incentives.

Finding 7: “Enablers of Change” – Revelations of WHEN and WHERE Something Different Happens

The topic of change became a central theme in my analysis. Asked in the interviews was the question of competencies required for successful implementation of innovation and/or digital technology. Some responses cited that change happens with an open mind and willingness to listen to others and other ideas—resulting in new skill-building. Learning how to employ digital online instructional technologies was considered a competency—eliciting delight in creating first-class videos. Having a willingness to change was another competency, as was developing the ability to build relationships, and maintaining an attitude of always wanting to do better. These were all self-evolved insights. Others spoke of how the pandemic forced the broad change to implementation of digital technology in the learning environment that was needed. The analogy of a cliff came up yet again. This time it was said that "faculty were thrown off the cliff," referring to the sudden change from classroom to online. It was also said, "Changes were made, that will have taken decades to happen, out of necessity." Favorable reviews of change were also met with a reluctance to invest too much effort in a teaching mode not meant to last that long. One faculty member described this approach as a "passive-aggressive-reactive mode."

Finding 8: "Readiness Assessment" Informs Capacity for Sociotechnical Change, and Therefore, Technology Adoption

Whether in favor of change or not, the real questions lie in the ability to change and knowing how much change will be required. Simultaneous to the qualitative interviews, I conducted an online quantitative survey. The intent of the survey was to assess organizational readiness for successful digital technology adoption in the learning environment. Adapted with permission from the Community College Research Center's Readiness for Technology Adoption (RTA) framework (Karp & Fletcher, 2014), the results were intended to help round out the organization's profile and to provide insight to whether digital technology can be readily adopted, not just implemented, per sociotechnical change theory. My tool attempted to assess across two system levels in my case study: the institution or college level and the group or project level. These levels were, in turn, studied along two parameters: technology and culture. The findings would reveal readiness at three altitudes:

- poised for action, i.e., highly ready for digital technology adoption
- moderately ready, or
- minimally ready

According to the literature that accompanied the assessment tool, exhibits of moderate or low, versus high readiness are meant to inform where additional planning would be beneficial. Therefore, the tool was not intended to be a condemnation of effort, but helpful in moving through technology change.

Previous research and validation fieldwork suggested that "successful adoption requires more than technological and project management capacity…and therefore, the RTA framework focuses on the cultural context of a college as well as its infrastructure and management" (p. 2). The original instrument held three premises—within which I note the parts of my survey that relate below.

Adoption-ready colleges attend to the cultural characteristics that influence their ability to support the hard work of reform.

- Clarity of mission
- Communication
- Decision-making process
- Openness to change

Getting a technology to a point where it can be reliably used by college personnel is a critical first step toward adoption.

- Technology in the Learning Environment
- Online Learning
- Classroom Technologies
- Institutional Priorities for Technology Change

In addition to technological resources, a college must have the logistical and structural resources to ensure that the project can be completed.

- IT System Stability
- Past Experience with Digital Implementation
- Administrative and Technical Resources
- Training
- Ongoing support
- Incentives
- Motivations

Though I did not get the survey completions I needed for this study, I chose to use what I had as an exercise in what could be a complementary analysis of quantitative and qualitative data. I arrived at an assessment by understanding the use of the original tool and deeming scores in the lower third percentile to suggest minimal readiness; scores hovering around the 50 percent level suggested moderate readiness; and scores that exceeded 50 percent suggested a high readiness level. It was interesting to see now little agreement there was and how often responses had a three-way tie across a spectrum. Again, the data drawn from the survey responses is not significant enough to derive conclusions; however, given that some of the interviews provided information complementary and corroborative to the survey and could be used as an overlay on the thirty-eight responses, my notional readiness assessment by quadrant has been included in the framework in Figure 75.

Figure 75

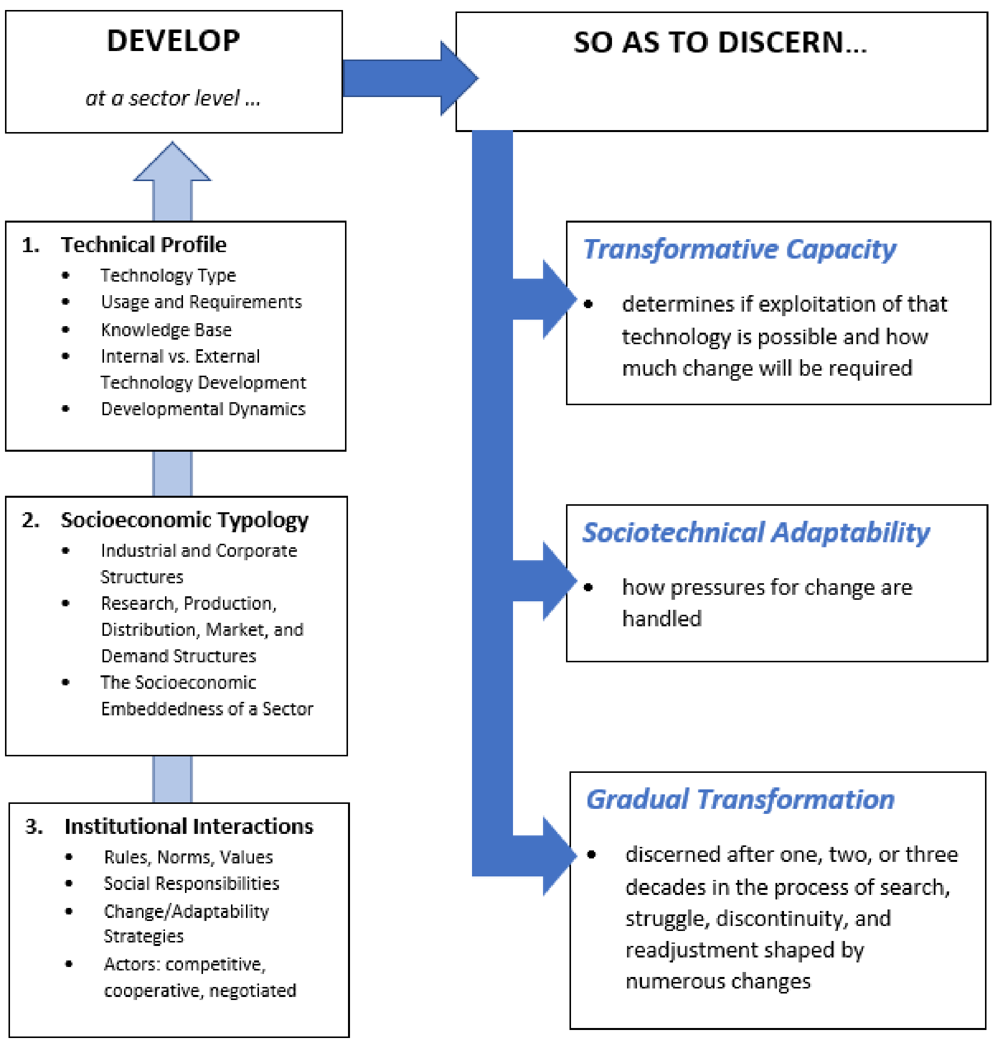
Survey Framework: Readiness for Technology Adoption with Notional Assessment

SURVEY FRAMEWORK: READINESS FOR TECHNOLOGY ADOPTION		
	Technology	**Culture**
Institution/College Level	**I.** **Technological Readiness** • Technology in the Learning Environment • Online Learning • Classroom Technologies • Institutional Priorities for Technology Change **MINIMAL/MODERATE READINESS**	**II.** **Organizational Readiness** • Clarity of mission • Communication • Decision-making process • Openness to change **MODERATE READINESS**
Group/Project Level	**III.** **Group Readiness** • IT System Stability • Past Experience with Digital Implementation • Administrative and Technical Resources **MINIMAL READINESS**	**IV.** **Motivational Readiness** • Training • Ongoing support • Incentives • Motivations **MINIMAL READINESS**

In returning to the theory of sociotechnical change, I had felt my quantitative strand of methodology would assist in building an organizational technical profile based on Dolata's (2014) heuristic model. Therefore, in developing my survey questions, I blended parameters that I drew from three additional sources: Christensen and Eyring's (2011) work on technology disruption in higher education, which illumines the aspect of institutional culture on capacity-building and adoption, Rogers' (2003) Theory of Diffusion of Innovations, in which a natural curve in the adoption process is described, and the Community College Research Center's *Readiness for Technology Adoption (RTA) Framework* (Karp & Fletcher, 2014). The characteristics of Dolata's (2014) heuristic framework are described in Figure 76.

Figure 76

Visual Stages of Dolata's Theory of Sociotechnical Change Analysis



Note. The "transformative capacity of new technologies" is an assessment of how much organizational, structural, and institutional change may be required, as new technologies (with new properties) seek to be integrated into existing "socioeconomic constellations."

"Sociotechnical adaptability" is an indicator for how pressures for change are handled. Technology-induced change depends upon the "capability of the institutions and actors involved to perceive, adopt, and further develop new technologies that are path-deviant [from the status quo]."

"Gradual transformation" might, after one, two, or even three decades appear as a radical sociotechnical shift, but it is the "outcome of a longer, non-linear, and often erratic process…that focuses on the peculiarities, dynamics, and variants of such enduring periods of transformation. Substantial changes to their underlying technologies inevitably have consequences for their organizational, structural, and institutional constitution."

(Dolata, 2014, pp. 3-5)

The understanding I garnered through my participant responses (and the survey exercise) is that the capacity for the college to exploit new digital technologies—and understand the resulting change, as well as, adapt technologies by effectively handling pressures for change—are low. Why I came to that conclusion is because of several factors.

What Gets in the Way of Capacity-Building and Adoption? – Barriers to Innovative Change

Unevenly Shared Vision. Faculty member Oliver made a significant statement when he told me, "There are many questions in the survey that I felt were tailored to someone with more of an administrative role, which I don't have, so there were some questions where I didn't have much to say." Questions about the clarity of the college or university mission should have resonated with those who get their direction from the mission. All questions in the survey that dealt with the cultural aspects of the institution—Mission, Communication, Decision-making process, and Openness to change—should have held meaning and scored high, as that would be an indicator (one of four, according to my survey framework) of capacity to exploit digital technology and to be aware of how much change would be required.

Additionally, participant responses did not signal a precise view of whether the college culture was student-focused or faculty-focused. There is meaning in having a singular focus and the unit moving in the same direction. It usually becomes clear that an institution places value on one of these over the other. The strategic documents imparted what was meant to be valued. That included students as a priority, inclusion, diversity, innovation, collaboration, freedom of inquiry, and transformative learning experiences—to name a few. I realized a polarization amongst the participants that informed an uneven share in the mission because of tensions around competing interests. This same polarization was described in the literature review between faculty who want high-touch (personal interaction) versus those who want capacity education (broader reach).

Not Acknowledging Trends. Reponses from some of the participants alluded to an online faculty contingent that was on the periphery, and therefore, not in the mainstream mode of education. When asked on the survey, what technology tools were used either in the physical classroom prior to the pandemic, or now online, the majority responses were: multimedia, Wi-Fi, Web conferencing, and LMS (learning management system).

The literature review included listings of new technologies for classroom instruction, described as those integrating teaching technologies and methodologies. Here are three classifications of the technology, referred to as Ed Tech:

1. educational hardware (smartphones; interactive whiteboards, tables, and displays; projectors; printers; audio systems; collaboration solutions; dashboards; and gamification tools);
2. educational systems (Learning Management Systems (LMS); Learning Content Management Systems (LCMS); Learning Content Development Systems (LCDS); Student Response Systems (SRS); Assessment systems; Document management systems); and
3. enabling technologies (Educational gaming; Educational analytics; Educational Enterprise Resource Planning (ERP); Educational security; Educational dashboard) (Education Technology, 2019, para. 5).

The Society for College and University Planning published an article in their house journal in 2015 portending a "sea change in the evolution of the campus into a technology-rich virtual learning environment… a growing library of online educational content and a pedagogical move toward student-centered, project-based, experiential learning" (Park, 2015, p. 12). Jargons surface more easily in academia today, such as zettabyte computing systems, digitization, algorithm-driven, predictive analytics, artificial intelligence, and adaptive learning systems. Competency-based learning is gaining support by accreditation agencies, whereby "students learn at their own pace and not within a predetermined block of time and course of study, i.e., death of the credit hour" (p. 12).

Coming in from the fringe (as Webb, 2017, would say) is the disruptive technology of online learning as first employed by for-profit organizations, which is causing a rethinking of the traditional higher education model. Notably, the technology has now been used for a decade, but still does not get adequate attention. It offers value to price-sensitive students and is said to lower operating costs for state legislatures that face fiscal challenges to support state institutions (Christensen & Eyring, 2011). Online instruction technology has improved as the speed of the Internet and related communications has increased. Economic downturns have forced cost-cutting at traditional universities, giving a new financial edge to the for-profit educators.

Moreover, digital natives have reached college age. They were raised with computers, texting, gaming, Google, and Facebook. Online enrollments are outgrowing traditional campus enrollments. A turn toward a more student-centric educational environment, brought about through "technological and social change threatens to undermine the traditional university's dominance" (Christensen & Eyring, 2011, p. 325).

The Coupling of Cultural Identity and System Elements. A third item that I saw as getting in the way of capacity-building and adoption is cultural identity. The sociocultural intersection with technology unites this study's attention to professorial identity and the response to sudden change, as it highlights human worldviews, values, and doctrines (Aoun, 2017). There was disruption of the norm as lived and perceived by these academics. Moreover, Schwab (2016) maintained that it is the systemic nature [of digital technology] that can incite a "popular backlash against fundamental changes that are underway" (p. 9), or what can be considered a tipping point when "increased polarization is marked by those who embrace change versus those who resist it" (p. 98).

Authors Brownell and Tanner (2012) were professors of biology from two different universities, Stanford and San Francisco State, respectively. Their paper identified "barriers to faculty pedagogical change" as lack of "training, time, incentives, and tensions with professional identity" (p. 339). Using the term "evidence-based teaching," they spoke of the irony that biology or science teachers should be resistant to new calls for transformational education. The authors acknowledged the barriers of time, training, and incentives, but said there are "unacknowledged and unexamined barriers…the tensions between a scientist's professional identity and the call for faculty pedagogical change are rarely, if ever, raised as a key impediment to widespread biology education reform" (p. 339). It is significant how Brownell and Tanner framed this issue: "The development of a professional identity is not unlike the development of a personal identity but is situated in the context of a discipline and thus framed by the 'rules of membership' of that discipline" (p. 341).

Finally, the college of engineering's structure and processes—academic system elements—seem to reflect the university DNA suggested by Christensen and Eyring (2011) that began a century and a half ago with Harvard, Yale, Johns Hopkins, Cornell, and Massachusetts Institute of Technology (MIT). It is a model that has exclusionary potential by making it a challenging pathway toward a degree and at the same time, not necessarily toward the workplace, and a preferred pedagogy of face-to-face instructor/student interaction.

Systems and Organizational Change

Theme #2: Uncertainty About Whether the Center Will Hold—Stakeholders' Sense of Operating

Theme #3: Innovation Elevated Through the Science of Learning

Key topics:

- Complex Adaptive Systems (Olson & Eoyang, 2001; Rogers, et al., 2005; Perrow, 1999)
- The Center – Will it Hold? Organizational Structure (Lemert, 2013; Foucault, 1982, 1984, 1988, 2013a, 2013b)
- Organizational Innovativeness (Rogers, 2003)
- Organizational Dynamics, Behavior, and Change (Lewin, Trist)

Findings:

9. Diverse Levels of "Commitment to Learning" – Mechanisms for (a) building quality of instruction or (b) endurance and optimism amid lagging quality
10. Initiatives Toward "Learning Change"– Broadening the student and teaching to learn
11. Listen to the "Outliers" – Champions of change and openness to different skills and perspectives

As I arrived at the most dominant themes from the dataset, I determined a transition occurring between themes 2 and 3. Theme 2 characterized the environment and through Finding 7, informed areas of potential change in the environment. Theme 3, however, focused more heavily upon that change and the polarization of views. At the crux was the concept of the science of learning, which challenged the traditional mindset. Most striking for me was that this theme came from the participants, even as I had bound the scope of my dissertation topic by not addressing the expansive arena of learning outcomes, or the science of learning. Learning theories cover a broad spectrum: behaviorism, cognitivism, motivation, social learning, and online collaborative learning. Before commenting on the findings in Theme 3, I will address the theories that involve systems and organizational change, as these help to understand the change and polarization themes that surfaced in this analysis.

Complex Adaptive Systems

CAS is an extension of systems theory—which, as a simplified definition, is a relational group of tangibles as well as intangibles that have identifiable parts that affect each other to produce something, an effect, which is different from the effect of each part on its own. Further, the effect, or the behavior, persists over time and in multiple circumstances. Flow of information holds systems together (Meadows, 2008). According to Olson and Eoyang (2001), CAS addresses the concept of change, and as an alternative to traditional models of change, "provides a comprehensive and integrated explanation of how complex organizational systems adapt to uncertain environments" (p. xxxii). The basic building blocks of the CAS are agents that are considered semi-autonomous units that work together to find "fitness by evolving over time" (p. xxxii). CAS suggests that the most powerful processes of change occur at the micro level, "where relationships, interactions, small experiments, and simple rules shape emerging patterns" (p. xxxiii). Enabled is emergent self-organization so that when the resulting system can create emergent behavior capable of response to the environment, it is adaptive. Rogers et al. (2005) created a co-theoretical model, combining CAS and the diffusion of innovations model (DIM). They exploited what is referred to as the "strength of weak ties" among social network members as a way to approach the management of innovation in an organization (pp. 2-3).

Regarding systems, the university in this case study is part of a state higher educational system. Perrow (1999) determined characteristics that contributed to the functionality, or connection between different parts, of a system, from loose to tight coupling and linear to complex interactions. Figure 77 illustrates these dimensions and provides example systems in each quadrant of combinations or level of complexity. (Note, I circled the location he prescribed for universities.) Higher education, in general, exhibits a loose-coupling amongst complex interactions. In a loosely coupled system, change is easier to make via intervention, but pared with complex—as opposed to linear—system interactions, it may be difficult to engender systematic change. Responses from participants support the description of the university as loosely coupled, as they told of faculty independence and "no boss." Another term would be "decentralized management." A disadvantage of loose coupling is inconsistency. A potential advantage is flexibility. A loosely coupled system is less affected by a breakdown in another part of the system (Weick, 1976).

Figure 77

Interaction/Coupling Chart

(Perrow, 1999, p. 97)

"The Centre – will it hold?" The title of a chapter in a book by McAfee et al. (2017) reads: "The Dream of Decentralizing All the Things" (p. 278). This resonated with me, as I have been fascinated by conflict theories regarding losing the center. Jacques Derrida and Michel Foucault are often mentioned in the context of poststructuralism because of the nature of their writings and alignment of thought. The writers both believed modern culture had its limits. Lemert (2013) recounted how Derrida and Foucault predicated the end of modernity, or the "old cultural order" of oneness, on such topics as “decentering, discourse, and differences” (p. 284). The concept of center (or no center) is reflected most effectively in the structure of the Internet. The unease with losing the center is at the heart of how some people think about digital technology and its prevalence in our lives.

Regarding this topic, witness an interesting—and often quoted poem by William Butler Yeats’s called *The Second Coming.* Lemert (2013) would have the reader consider simultaneously the fractious 1960s’America—and ironically (now) the Internet—as he quoted this poem:

> Turning and turning in the widening gyre
> The falcon cannot hear the falconer;
> Things fall apart; the centre cannot hold;
> Mere anarchy is loosed upon the world,
> The blood-dimmed tide is loosed, and everywhere
> The ceremony of innocence is drowned;
> The best lack all conviction, while the worst
> Are full of passionate intensity. (Yeats, as cited in Lemert, 2013, p. 277)

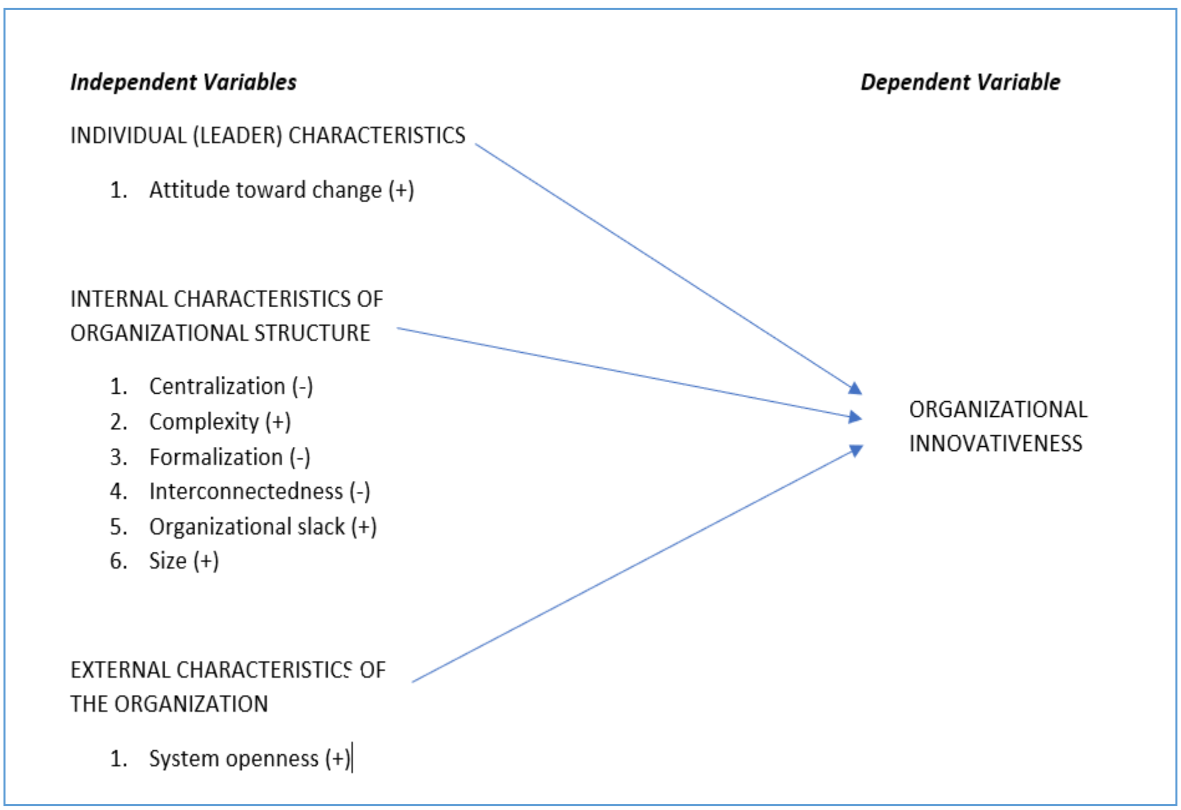
This is a disturbing poem, yet I believe it illustrates (vividly) the relationship between positions holding fast to a center—an order—and those calling for change. This topic raised a question for me about the constructions of centralization versus decentralization—is one better than the other? The next sub-theory explains.

Organizational Innovativeness

Figure 78 illustrates the independent variables that Rogers (2003) determined to have impact on the dependent variable: organizational innovativeness. What is visible in this quantitative example is that Rogers identified centralization, formalization, and interconnectedness as having a negative effect on an organization's ability to innovate; whereas, good attitudes toward change, complexity, system slack, and size have a positive impact. System openness, something external to the inner workings of the organization, was viewed as a positive influence on the organization's innovativeness. How well this supports CAS and Perrow's (1999) findings. The study of systems, structure, change, and innovativeness would not be complete without addressing theories on organizational dynamics.

Figure 78

Independent Variables Related to Organizational Innovativeness



(Rogers, 2003, p. 411)

Field Theory and Group Dynamics – Change and Conflict

Kurt Lewin had a commitment to resolving social conflict that is useful, still, today. He made a valid contribution to the understanding of group behavior, the individuals within the group, and the roles played in organizations.

Main elements of Lewin's *Robust Approach to Planned Change* (viewed as a unified whole; a single, well-integrated system) were: "field theory, group dynamics, action research, and his 3-step model" (Burnes, 2004, p. 977). Lewin has been called "the intellectual father of contemporary theories of applied behavioral science" because of his post WWII views aimed at resolving social conflict that "launched a whole generation of research in group dynamics and the implementation of change programs" (p. 978). He was also "instrumental in establishing the Tavistock Institute" in the UK (p. 980). Lewin believed that "the key to resolving social conflict was to facilitate learning and so enable individuals to understand and restructure their perceptions of the world around them" (p. 981). He propelled the perspective that "the group to which an individual belongs is the ground for his perceptions, his feelings, and his actions" (p. 981).

Others, such as Coghlan and Brannick (2003), call Lewin the father of social psychology or social science. Though he never wrote a book, Lewin's influence permeates contemporary management. He worked to improve organizations from within. Coglan and Brannick said, "Overall, his contribution to management was his way of thinking. Lewin's major contributions are to methodology in social science research and his concerns with linking theory and practice" (p. 32).

Lewin broke from the research employed in the physical sciences when he sought to change human systems, for to him (according to Coghlan and Brannick, 2003) "human systems could only be understood and changed if one involved the members of the system in the inquiry process itself" (p.32). Argyris (1993) identified four "core themes" in Lewin's work:

1. Integrated theory and practice to study problems critical to society;
2. Framed the whole, then differentiated the parts;
3. Produced constructs to both generalize and to understand the individual situation as a researcher/interventionist;
4. Placed social science at the service of democracy by empowering the dispossessed. (Argyris, as cited in Coglan & Brannick, 2003, p. 33)

"Field Theory" was the name Lewin attributed to his study of group behavior in the context of the setting. He determined that individual behavior was a "function of the group environment or field"—or driving forces (Lewin, 1947, as cited by Burnes, 2004, p. 981). Lewin believed the forces within the field created a continuous state of adaptation and that "change and constancy are relative concepts; group life is never without change, merely differences in the amount and type of change exist" (Lewin, as cited by Burnes, 2004, p. 981). Lewin sought to help people "identify the power of these forces so they could not only understand responses to them, but also learn how to diminish or strengthen them to bring about change" (Burnes, 2004, p. 982). Behavioral change could be a slow process, but under critical circumstances the forces in the field could react radically. Under these conditions, Lewin felt "new behaviors or patterns of activity emerge, and a new equilibrium for the group is achieved" (p. 982).

For a period, modern researchers considered Lewin's work to have become less relevant. However, Burnes (2004) cited work by Argyris (1990) and Hirschhorn (1988) that based an understanding of “resistance to change” upon Field Theory. Complexity Theory, as well, has a parallel to Field Theory—that is, self-organization and unpredictable, non-linear systems are the nature of change. Burnes stated, “Field Theory is now probably the least understood element of Lewin’s work, yet, because of its potential to map the forces impinging on an individual, group, or organization, it underpinned the other elements of his work” (p. 982).

Lewin’s interest in the importance of the group led him to formulate “Group Dynamics Theory.” It is believed Lewin had an interest in two questions: “What is it about the nature and characteristics of a particular group which causes it to respond (behave) as it does to the forces which impinge on it, and how can these forces be changed in order to elicit a more desirable form of behaviour?” (Lewin, 1939, as cited in Burnes, 2004, p. 982). Individuals are constrained by group behavior to conform. (In fact, rather than trying to achieve a specific objective, the group is realized by “individuals learning about themselves and being prepared, if necessary, to change their behavior for the sake of the group as a whole”) (Eastman, 2012, p. 139). Therefore, according to Lewin’s assessment, the “focus of change must be at the group level and should concentrate on factors such as group norms, roles, interactions, and socialization processes to create ‘disequilibrium’ and change” (p. 983). Note how this mirrors CAS.

Levinger (1957) extended Lewin’s theories to “situations of conflict within and between social entities, because the conception that behavior is determined by forces or fields of forces lends itself readily to an analysis of conflict situations” (p. 331).

The following three findings serve to illustrate the organizational dynamics participants in the college of engineering experienced. Evident is a cultural polarization around the manner of teaching, the commitment to learning, and digital technology in the learning environment.

Finding 9: Diverse Levels of "Commitment to Learning" – Mechanisms for (a) Building Quality of Instruction or (b) Endurance and Optimism Amid Lagging Quality

During the interview with faculty member Oliver, I witnessed his use of the iPad integrated with the video conference call. Not only did he illustrate his vision for his course, but he exuded passion as he spoke about it. He related technical to aesthetic aspects of aerospace engineering, and he mentioned that he asked his students to hold him accountable for what they learn. I contrasted his teaching style to another who admitted he reads his PowerPoint slides to his students. As a student myself, I was concerned about the differences in the quality of instruction between these two examples. When I asked an administrator whether he thought this mattered to students, he said yes, and that there was concern over online delivery quality during the pandemic. Oliver's comfort came from developing his proficiency with the technology. He also displayed a relationship with his content and a commitment to learning. Others lacked that commitment by not willingly taking on the challenge of producing under new circumstances. Oliver further described "the elephant in the room" as being the lack of interest in, or support to, teaching effectiveness. He believed, "The big picture of teaching is where I adopt technologies—whatever can help me."

Alternatives to a commitment to learning were expressed by what I coded "endurance" and "optimism." Endurance denoted a behavior of getting through this period until in-person classes would resume. Responses that came from the naysayers for digital learning sounded like “online is mostly a way to generate more money” and not a consideration for “high quality institutions [like this one]” and “I think we’re going to go back to the way things were before.” Optimism was similarly voiced as “in general, we’re doing quite well [with the online method],” which seemed contrary to other statements. There was noticeable excitement about the new grant in development. However, the components were not digital, but relied on in-person interactions. In fact, the initiative is intended to counter the growing dominance in digital technology and is viewed as innovative.

Finding 10: Initiatives Toward “Learning Change” – Broadening the Student and Teaching to Learn

The innovativeness of the grant was described as “broadening the student experience.” A faculty member said, “Whereas everybody wants to go online and do more classes, I think the opposite mentality is how do we get in the room with the students?” The initiative has been designed to foster more self-awareness, develop more relationships, provide transformative learning experiences, and expand student minds. Participant responses also depicted an agile approach to teaching so that students learn. For example, administrator and faculty member Teague stated, “I think the strategy going forward should be a more agile way of learning. Teach the fundamentals and teach how to learn—teach how to catch a fish.” He advocated mentoring skills and exposing the context of a problem, showing students how to go about seeing the context, synthesizing information, and solving the problem. He does not suggest this has to be managed face-to-face.

Once again, as I sorted through data—even as I found conflicting views of the learning environment—I gathered a few inspiring experiences that formed early impressions of best practices about learning. These included "teach the teacher," which Oliver felt connected with a student at a deeper level than just the content. Faculty Douglas created the "fast and furious charette," a salute to story-driven learning and its capacity to help students see themselves in a better and different light. Responses incorporated new teaching modes for the participants that grew from the new online requirement. These included MOOCs (Massively Open Online Courses), flipped, and hybrid course configurations. Challenges and competencies vary with each. Of note, several faculty members expressed they will continue these modes of teaching after in-person classes resume because the students responded positively.

Finding 11: Listen to the "Outliers"– Champions of Change and Openness to Different Skills and Perspectives

Some participants self-described as outliers. These were the learning specialists and a few others who exhibited some of the same philosophies and forward thinking. They are the ones who thanked me for listening, as they are in a minority in this environment. A different set of competencies arose, as well as views of opportunities, and changes sought, from those stated within previous themes. Faculty member Molly felt there are standard competencies such as being a clear communicator, understanding what one is teaching, being compassionate and able to relate to students, having empathy, and being organized. She mentioned that she continuously reads about better methods for learning. Stated competencies consisted of curiosity; mindset of openness "to manage productive tension," but also to understand how different skills are brought to a problem;

ability to cross into other disciplines for collaboration; and to take risks and "give [something] a shot." I was now in the realm of the visionary who held a broader definition of engineering that is more inclusive and empowering for students. The outliers were very forthcoming during interviews, illustrating opportunities and providing insight that was hard to condense, as they illumined a goal to empower students so they "would use their skills to create a more just, equitable, and healthy society." Raised was the point that engineering is still a male-dominated field, and diverse students are not effectively welcomed. Learning specialist, faculty member, and administrator, Douglas decried, "the larger world of engineering workforce is rife with non-inclusivity."

Outliers see opportunity in sharing successes, learning without reinvention, making more personal connections with students through digital media and on "non-engineering" topics, and designing new learning experiences (as opposed to a lecture) that give students autonomy. The belief that professors are experts, which reflects my discussion on identity, was denounced as no longer helpful to how people learn. Lastly, opportunities can highlight new approaches to teaching that could be afforded in on online environment. Some participants stated that the impact of digital technology stimulated by COVID had "become so obvious" [in a good way.]

When asked the question, "if you had the power to make changes, how different would tomorrow look?" the outlier sought a "commitment to pure teaching." In addition, this group asked for support for the educational mission, enabling release from some system limitations. Outliers also desire more resources to extend online course development, but more so, an infrastructure to support a "nimble new strategy." Jane, administrator and learning specialist, spoke to the drivers of change, suggesting four main ones: (1) there is a shrinking higher education market because fewer students fit the traditional college age range, (2) that there will be a decline in birth rates created by COVID that will impact university enrollment in 2037, (3) the need to reeducate and reskill calls for lifelong education, and (4) private equity money is there to step in and fulfill the educational need. Further, she stated, “It’s becoming a competitive disadvantage to be embedded in a structure like today’s structure, especially in a public institution of higher education, with a lot of policies that belong to a super system, and then layers and layers of requirements.” Jane described a new ecosystem that should be addressed at a strategic level—not on the margins of the institution, “where online used to be 20-25 years ago.” Jane added, “That kind of innovation needs to move to the center stage of institutions and stay there, for the foreseeable future, so that they can have a handle on what’s happening out there, and how they can react as institutions.” Jane advocates the following:

- Have a champion at the highest level in the institute to monitor innovation, understand the competitors, continuously look at the ecosystem (the planning horizon), and keep an eye on private solutions for training and education
- Develop the infrastructure and support behind a strategy
- Do things that generate data, learn from it, change the things that you do, and NOT do this at the margins of the institution, where online used to be 20-25 years ago; do it as part of the mainstream strategy
- Anticipate how to react to change—seek a nimble structure within the large higher educational system that can be poised to react and respond quickly

What is being voiced by outliers replicates the literature review on so many levels. The pandemic is less the problem than is the traditionalist mindset. I am brought once again to the intersection of technology diffusion and knowledge diffusion—the need to recognize the conflict that lies there.

Practice Theory of Change

Theme #4: Creating Best Practices for Change and Technology Readiness

Key topics:

- Implications for Practice Theory of Change as an Assessment Process
- Contextual Synthesis
- Implications for Complex Adaptive Systems Theory

Findings:

12. How "Current Best Practices" are defined.
13. "Informing change" through thoughtful management, intentional design, and de-mystifying digital teaching and learning—for starters.

Given the analysis I have conducted, a last theme and set of findings shall be the switch that flips toward a way forward. I asked participants what they considered to be best practices, with the thought that there may be some very useful ideas to highlight and share. After review of theory just presented in this chapter, these practices would not be expected to create technology adoption or transformation in this complex system. The analysis has revealed that the disruption caused by the pandemic triggered challenges and/or conflict, and what this next section discusses is a process for effecting "intentional change" in the situation, as opposed to being held hostage to disruptive change.

Finding 12: How "Current Best Practices" are Defined

One of the interview questions was about what the participants considered a best practice coming out of the digital, virtual mode of the COVID year (a term they used). The flow of responses, as with all the responses, covered a spectrum. Some did not include digital technology—continuing the justification for in-person instruction. Four sub-themes emerged in this finding:

- Make the most out of digital technology capabilities
- Reach a broader group of students
- Share experiences and successes with fellow faculty
- Develop students

To make the most out of digital technology capabilities, the participants relayed the following: be flexible with technology, break up content into small segments, interject frequent tests, employ the hybrid mode, exhibit creativity, use the digital infrastructure effectively and efficiently, and finally, make it routine—all to give innovation a chance.

Faculty and administrator Lyn spoke to reaching a broader group of students—ones from different backgrounds different levels of preparation—to be inclusive. She suggested a strategy akin to the Khan Academy.

Sharing experiences and successes meant communicating key terminology and experiments, housing digital repositories of content, illustrating by example, and coaching. It was felt that examining resistance to change—calling out assumptions—would be help build shared understandings among the different role groups. The community seeks to be engaged in decision making about sweeping changes.

Finally, developing student mindsets through employment of active learning and critical problem-solving would give students confidence and skills to become entrepreneurial. The story-telling initiative stands high on the list for cultivating this spirit.

Finding 13: "Informing Change" Through Thoughtful Management, Intentional Design, and De-Mystifying Digital Teaching and Learning—For Starters

This last finding begins to configure a perspective about change: how to see its value, how to address it, and how to transform ways of thinking. Three sub-themes informed change: thoughtful management, intentional design, and de-mystifying digital teaching and learning. Thoughtful management touched on strategy again and the need to understand how technology impacts teaching and learning. Raised was how social media is creating polarization and whose practices "don't necessarily help society." The external influence on this case study is another connection to CAS and organizational dynamics. As faculty Declan said, "We don't know how to use the technology that we can invent. The technology that we can invent is so addictive, and it so permeates our lives, but we have no idea what it's doing, like, the downstream impacts."

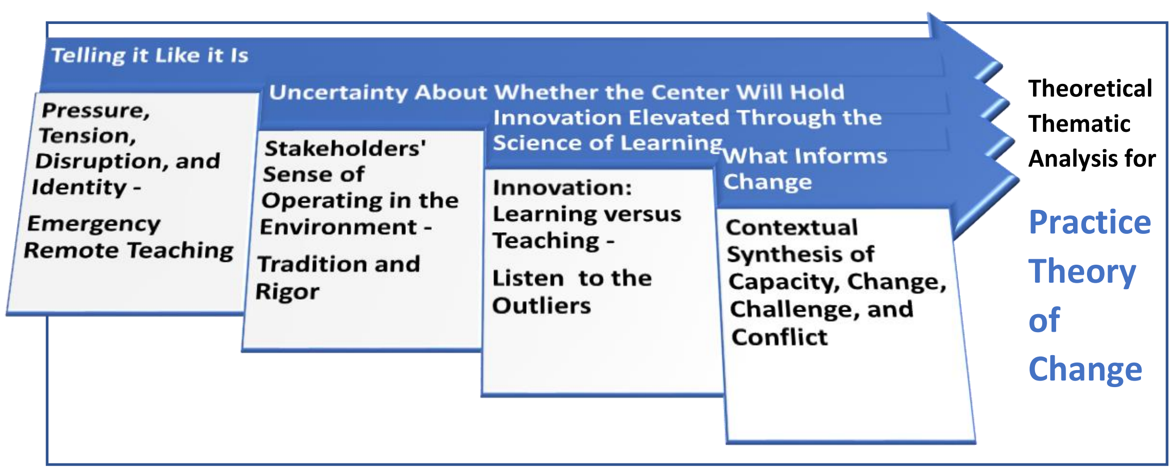
A backward design mentality, as introduced by administrator and learning specialist Jane, leads to designing learning outcomes with intention, first, followed by course design—a difficult process for some faculty, she said. She also made an important distinction between the concepts of "online learning" and "emergency remote teaching." The latter being what occurred during COVID. Again, Jane stated, "So any positives or negatives associated with that activity [the emergency response] need to be taken with a grain of salt, because again, it was not what we typically call online learning with an intentional design for online delivery." Lastly, she pointed out the need to pay attention to student demand for online programs.

A suggestion on how to de-mystify digital technology was valid and followed an engineering mindset of doing a pilot, then gradually doing more courses based on the outcomes of the pilot. The description Jeff, a faculty member and former administrator, provided is a linear approach that takes time to realize success.

In the final analysis, this dissertation has arrived at the place where the work must occur. That is, informing change with "intention"—given a "contextual understanding" that has evolved from this qualitative study. See Figure 79.

Figure 79

A Model for Theoretical Analysis and a Practice Theory of Change in Organizations



Study Implications for Practice Theory of Change as an Assessment Process

Program evaluation techniques and theories of change (combined as Practice Theory of Change—PToC) are important tools for synthesizing elements of a problem or program, then considering strategies and action toward evolving a "theory of change" with positive "intended effects" (Shapiro, 2005). Returning to the premise of this dissertation, I pursued a contextual understanding or awareness of conflict in times of sociotechnical change in a college of engineering case study. I sought to grasp the combined impacts of technical trends, organizational capacity for change, and academic culture. Shapiro's (2005) framework included the following components:

1. problem framing
2. intervention framing and goals
3. methods
4. how change happens
5. intended effects.

As stated, this is an evaluation tool for intervention, which I would reposition, for now, as an assessment process—a way to evaluate potential influencers, change agents, and worthy concepts going forward. A visual depiction of the general thought process is illustrated in Figure 80, which represents a synthesis of inquiry drawn from several sources for the purpose of assessing PToC (specifically: Shapiro, 2005, 2006; Mitchell, 2006; Jabri, 2006; Ross, 2000; & Watkins-Richardson & Walsh, 2016). When a colleague and I conceived it during a period of coursework, I had hoped it might become a useful tool for future case evaluations. I suggest it as a method for gaining an understanding of how conflict resolution need not be an afterthought but anticipated and strategically addressed by employing precepts of "Practice Theory of Change."

Figure 80

Practice Theory of Change

Note. Questions Informed by a Blending of Theory: Shapiro (2005, 2006); Mitchell (2006); Jabri (2006); and Ross (2000); Watkins-Richardson & Walsh (2016) [unpublished presentation]

Shapiro (2005) believed that intervention programs should have a hopeful vision for change (p. 5). He felt that organizations operate at their peak when individuals who are transformed take the lead in needed “structural change,” or reciprocally, that “changing policies and practices should lead to the transformation of individuals” within that organization—illustrating that intervention strategies can have different starting points for change (p. 10). This revelation reflects the literature on organizational behavior and CAS.

I feel that the take-away from a PToC exercise is that leadership can explore barriers to change and learn from new understandings how to assess, address, and adapt to change—in this case, sociotechnical change. Shapiro (2005) believed that “stronger links should be fostered between theory and practice by surfacing the underlying theories of individual, relational, and social change that shape practice” (p. 11), which is what I am proposing.

Implications for Technological Disruption and Sociotechnical Theories

Below, I define each of the five steps of PToC and place them where they make the most sense within the two main groups of theories. Note that the framework for PToC appears linear, but it is reiterative when exercised. What I have described below is generic but would be adapted and altered in the process of assessment.

PToC Step 1: Problem Framing and Theoretical Roots. A deliberate attempt to consider defining, or naming, the problem must be realized by asking relevant parties to articulate the nature of the resistance and to review the set of actions, patterns, attitudes, or behaviors leading up to the current moment, i.e., where change happened to inspire challenge or conflict. Doing so will provide easier assessment of the degree to which values and worldviews converge or diverge between and among parties.

It is important to focus on the issues of capacity and readiness to adopt technology that are relevant to theories of disruption and sociotechnical change, and I point back to these important touch points:

- Adoption-ready colleges attend to the cultural characteristics that influence their ability to support intentional change.
- Getting a technology to a point where it can be reliably used by college personnel is a critical first step toward adoption.
- In addition to technological resources, a college must have the logistical and structural resources to ensure that the project can be completed.

This means that in framing the problems to be addressed, a consideration of these topics are considered key:

- Clarity of mission, strategy, and institutional priorities for technology change
- Communication, decision-making process, and thoughtful management
- Rules, norms, and values
- Social responsibilities
- Openness to change
- Infrastructure for intentional design
- Administrative and technical resources
- Training and coaching for digital literacy
- Ongoing support, incentives, and motivations

Implications for Systems and Organizational Change Theories

PToC Step 2: Goals / Intended Effects / the Resulting Grounded Theory. After framing the problem, the practitioner should consider the intended effect component of the PToC model (the last box). Nothing is more powerful than envisioning an intervention goal, then setting out the strategies, principles, and specific methods for achieving it, i.e., the “backward mapping” (Shapiro, 2005, p. 3) suggested. Change is the key concept, because the intended effect is dependent upon incurring the precise psychological or physical change. When discerning this component, it would be advisable to also envision the broader context and long-term implications of various outcomes. It is very possible that the practitioner may identify needed data that is not available at this point in the process, which means the intervention strategy must be built upon less than full information and move forward with caution. When this component of the PToC is revisited after the fact, it is critical that the processes leading to the intended change are verified, so that the PToC can be reconstructed and used again—thus creating new grounded theory.

PToC Step 3: Intervention Framing and Goals / Theories of How Change May Happen. Based upon how the practitioner has framed the problem and intended effects, the job of framing the intervention occurs. At this point I would draw upon Ross (2000), for his consideration of theories that could shed light upon the orientation, nature, or channel for intervention (or assessment), be it through “community relations, principled negotiation, human needs, psychoanalytically informed identity, multi-cultural miscommunications,” or more elevated toward conflict transformation and the tools *that* would require (p. 1004). This suggests a toolkit relevant to the intervention frame, and of course, oriented on how change is anticipated to occur within the context of the issue or problem. The most foundational activity within intervention framing is that of formulating an understanding of participant positions, interests, needs, and worldviews.

PToC Step 4: Methods or Specific Strategies and Action Plan of Intervention. This component of the Shapiro (2005) model suggests an action plan detailing processes aimed at achieving the intended effects. This would be the time to consider assumptions and/or hidden assumptions or power issues. Randolph (2016) contributed that a safe environment be created that allows parties to freely express their worldviews and to be heard. By listening without judgement, defenses and guards may be dropped, and parties permitted to reveal their values and their value systems with transparency. They would expose their own ambiguities and vulnerabilities (p. 97). Without this, conflicts intensify. He hammered the point of the far-reaching consequences of not being heard. And he proclaimed emotions as the "royal road" to the worldview of the party (p. 130), by revealing the values and value system, and how those are being degraded in the conflict.

The review of literature has evidenced that linear approaches to organizational change will not serve higher education at today's technical intersection. All systems involved are complex—the structure of the institution and the distributed network of technology. CAS considers a bottom up, self-organizing approach to encouraging and managing change. It employs the concept of the strength of weak ties. The metaphor of an orchestra performance encapsulates the thought of how complex, yet explainable, adaptive systems can be. The musicians and individuals in the audience function as "autonomous system agents." The "container" is the auditorium, the various roles of those involved in making the event happen, basic rules, and the length of the performance. The contribution that each instrument—its lines of music, changing harmonies, and melodies—represent “significant differences.” The process that occurs between the audience and the musicians is a “transforming exchange” (Olson & Eoyang, 2001, p. xxxv). Viewing the research questions through a complex adaptive systems lens enabled a broader view of what may be occurring in the context of my study. Adding in aspects of complexity theory to a PToC assessment tool, would speak to a holistic view. Olson and Eoyang compared traditional models of change to the complex adaptive model in Table 12.

Table 12

Traditional and CAS Models of Organization Change

Traditional Model of Organization Change	Complex Adaptive Model of Organization Change
Few variables determine outcomes.	Innumerable variables determine outcomes.
The whole is equal to the sum of the parts (reductionist).	The whole is different from the sum of the parts (holistic).
Direction is determined by design and the power of a few leaders.	Direction is determined by emergence and the participation of many people.
Individual or system behavior is knowable, predictable, and controllable.	Individual or system behavior is unknowable, unpredictable, and uncontrollable.
Causality is linear: every effect can be traced to a specific cause.	Causality is mutual: every cause is also an effect, and every effect is also a cause.
Relationships are directive.	Relationships are empowering.
All systems are essentially the same.	Each system is unique.
Efficiency and reliability are measures of value.	Responsiveness to the environment is the measure of value.
Decisions are based on facts and data.	Decisions are based on tensions and patterns.
Leaders are experts and authorities.	Leaders are facilitators and supporters.

(Olson and Eoyang, 2001, pp. 1-2)

Organizational reinvention begins as parts of the system (the agents) interact over multiple cycles, causing patterns to "emerge from the system as a whole" (Lewin, 1931, 1935; Trist, 1981). When old patterns give way to new ones, the organization adjusts. Olson and Eoyang (2001) cited this as the "parts affecting the whole" (p. 10). However, the whole affects the parts, as well, because every time new patterns emerge, the agents may still be influenced by old patterns. Patterns of "corporate culture, group norms, and documented procedures" are examples (p. 10). The authors acknowledged that certain structures offer needed stability. However, "too much dependence on old patterns of behavior locks individuals and groups into habits that may not be adaptive in new circumstances" (p. 10). The implication that individuals are shaped by their organizations, and vice versa, as made by the authors, represents an interesting intersection of individual identity and group identity. It is where conscious and unconscious choices in behavior have been made that shape the group dynamics and create what is called "group-as-a-whole" (Bion as cited in Katz, 2015). Group-as-a-whole is a complex theory and an entity that emerges with unique energies, dynamic forces, and a collective identity. The group becomes the focal point, and the individual becomes the background (Katz, p. 53). The circular phenomenon that results is that of the individual creating the group-as-a-whole, which then "recreates" the individual (p. 13).

PToC Step 5: When the Switch Flips, and Change Occurs. The most intriguing facet of the PToC is the identification of change—specifically: when it occurs; the speed and intensity; what is changed; whether short- or long-term impact, mitigation or transformation; and how it is qualified or justified to the intervention frame and the intended effects. This phenomenon called change is worth a lifetime of study in the conflict field. We must continually strive to recognize it and, upon gaining a fruitful understanding of change and how it impacts the intended effect, document the lessons learned by the experience.

Limitations of the Study

The findings from this study are limited to the sample participants from the college of engineering. Though I attempted to understand differences in responses between three role groups: faculty members, administrators, and curriculum designers or learning specialists, I realized early that the roles of faculty and administrator are often combined in this environment, as individuals performed multiple roles. There was a separation of the learning specialists, which came through in the analysis. This composition of overlap in roles may not exist at other universities, and differences may be more pronounced.

Implications for This Study and Recommendations

Theories of organizational conflict and change provided the impetus for this study of digital technology and higher education, given a case study of a U.S. college of engineering at a large public university. The theories I studied were bookends of a process. In the beginning, they held potential, I thought, for delving into the topic, but this was only a hunch. Never did I realize their full potential, however, until my analysis phase. Coupling these clusters of theory with actual participant responses was a learning experience—giving me a deeper appreciation at the end than I had ever conceived. The theory clusters included:

- **Theories of Technological Disruption**
  - Diffusion of Innovations; Social Response to Change; Cultural Identity

- **Sociotechnical Theory**
  - Capacity for Change and Adaptability; Organizational Readiness
- **Complex Adaptive Systems and Organizational Change**
  - Power and Control; Organizational/Group Dynamics; Innovativeness
- **Practice Theory of Change**
  - Employing Contextual Synthesis

I would recommend the organization consider a Practice Theory of Change assessment process, guided by a conflict practitioner who will meet individuals and their organization where they are, (a mental conception). In the short term, faculty, administrators, and learning specialists may benefit from an examination of the outcomes from this work—to include a review of communication, decisions, management styles, and behaviors. I urge a focus on where the forms of conflict arise.

Conclusion and Future Directions

Change, Capacity, Challenge, Conflict and Context

In times of exponential change and the need to align with the environment, Taylor & de Lourdes Machado (2006) contend that a higher education institution will get farther out of equilibrium (as it attempts to maintain status quo). It may go into crisis management mode, and abate the issues temporarily, but a disconnect will widen until the "possibility of an equilibrium-disrupting situation becomes a reality." Attempting to evaluate the full context of the challenges and emerging tensions or conflicts, has been the focus of this study, and illumines the need to listen at every level: societal, sectoral, institutional, group, and individual—within each of these "Cs:"

Change

The point of intersection, as described, represents change that is inspired by such institutional higher education ingredients as culture, philosophy, norms, strategy, and relevant stakeholder positions; and the impact of exponential digital technology growth and its unknown consequences. Disruptive change enables an expansive breeding ground for conflict, yet theories of intentional change, when employed, can result in opportunity.

Capacity

I hope it has been made clearer that capacity is as much a mental as physical state of being. Assessment of capacity has tenacles into the organization's culture, governance, finances, structure, processes, and people. It must consider relationships between individuals, work groups, departments, schools, the institute-at-large, the domain of higher education, and the broader social and economic environment. There must be a strong technical infrastructure and strategy. Barriers must be considered. Integration of digital technology with all other systems, its availability, useability, and transience must be evaluated. Most importantly, the organizational dynamics, and how change is handled must be strategically gaged.

Challenges

To provide focus, I narrowed the digital technology area of concern to higher educational instructional design and implementation. Many synonymous terms surfaced in the literature review, but the most common instructional design output seemed to be "digital learning." The compelling question lies in the optimal course modality options faced by faculty, instructional designers, and leadership in the higher education community (see Figure 81).

Challenges include the following. Educators lack awareness of proven benefits to students amid a growing supply of digital learning technology products and processes. They are having to alter methodologies to include a blended delivery of content. They also lack the time it takes to undergo professional development to learn new skills and to develop digital courses. Faculty are often not involved in the decisions of strategy for their institution, school, or department, so they may not be supporters or champions of "the vision." They are not given all the necessary tools or motivations. There are hurdles at the student level, as well. Not all access is equitable, nor ownership and use of devices across demographics. Digital literacy is an acquired skill that can impact success (Intentional Futures, 2017, p. 7).

Figure 81

The Challenge of Design Modalities

Modality		Sample Practices	Example Case Studies
FACE-TO-FACE	**Face-to-face** In person instruction with no digital learning components. The syllabus and final grade may be provided to students through a learning management system (LMS). These "traditional" courses are often lecture-based, where instructors present to students in a classroom.	• Lectures • Synchronous assessments • Coursework done outside of class	
	Tech-enabled face-to-face Instruction that is supported by technology but does not replace class time (e.g., use of online texts or videos). Tech-enabled face-to-face courses supplement "traditional" lecture courses with digital content that can be accessed outside tof the classroom.	• Digital version of textbook • Discussion boards via LMS • Content-relevant videos	

MIXED	**Blended** Courses that combine in-class and online learning where less than 25% of the traditional face-to-face time is replaced with digital content. Instructors may assign additional coursework to be completed outside of the classroom.	• Adaptive courseware • Online simulations • Discussion boards	• Northern Arizona University
	Hybrid Courses that combine in-class and online learning where 25%-75% of traditional face-to-face time is replaced by digital instruction. While similar to blended courses, the replacement of in-class instruction allows for the incorporation of more active learning in class.	• Courseware used for coursework and assessment • Online discussion boards • Teaching assistants or tutors used in class • Classes meet in person once or twice a week	
	Flipped Courses where students receive all instruction content via online materials (often through courseware) outside of class and instructors use class time for active learning, application, and individual student support.	• Team projects and problem sets in class • One-on-one instructional support • Instructor acts as a facilitator instead of lecturer	• Austin Community College • Virginia State University • University of Mississippi • Cedar Valley College

FULLY ONLINE	**Fully online flex** All instruction and coursework is conducted online, but students are given the option to receive in-person support. These courses are often taken by students who live in the area and want faculty support but need the increased flexibility of online learning.	• Support centers for online students • Personalized support • Office hours	
	Fully online These courses do not have required face-to-face meetings. The course and all learning activities exist in a fully digital space. Fully online courses are typically chosen for distance students or those who need increased flexibility.	• Faculty members as coaches • All material delivered and coursework assessed in courseware • Online discussions and forums	• The American Women's College • College for America • Rowan-Cabarrus Community College • St. Petersburg College • Colorado Technical University • Seattle University

Source: Intentional Futures, 2017, p. 8

Let's NOT Discuss Conflict

Conflict in an organizational (or institutional) setting is like the elephant in the room. As Juma (2016) aptly stated, most circumstances of failed attempts at strategic vision and new directions are labeled "adoption failures…[and] the popular dismissal of resistance to innovation as futile acts of neo-Luddites" (p. 291). This mentality fails to consider that theories of conflict analysis and resolution might provide a great deal of insight to sociotechnical problems of resistance and bring more to bear on the core issues.

Moreover, Choppin and Borys (2017) deepened the understanding of the competing perspectives of stakeholder groups. The four perspectives were "(1) designer perspective; (2) policy perspective; (3) private sector perspective (e.g., publishers and philanthropists); and (4) user (teachers and schools) perspective" (pp. 666-670). Their analysis of these viewpoints illustrated both the promise and the limitations of digital programs—but more importantly, it highlighted the strong positions stakeholders maintain, which lead to obvious tension, conflict, and potentially, failure (p. 663). It was also valuable to learn from these researchers that faculty engage in personal conflict, given multiple obligations that may be competing, and with which faculty must constantly find a balance (p. 664).

Context

This study has attempted to provide a full picture (albeit a wide net) surrounding the topic of unprecedented exponential digital technology growth, with an emphasis on how higher education institutions are approaching the technical challenges. The literature review addressed societal responses to technological innovation and how these are manifested in attitudes and actions. The intersection (focus point for the research questions) represented the point at which the two trajectories of technology diffusion and higher education knowledge diffusion have met, i.e., current day. The topic of disruption was introduced as a scenario, should higher education lose its grasp on mission. Though disruption represents an extreme example of conflict that could emerge, this study has illumined many causes for tensions, competing goals, polarization, and conflict. The goal of this completed study has been to gain new observations and resolutions through a contextual synthesis of trends in exponential technology, organizational capacity and change, focus on academic processes and structures, and to show the relevance of conflict studies in organizational settings experiencing sociotechnical change.

I was motivated to complete this study by the late Calestous Juma (2016), whose writings challenged me through his hope that "Given the significance of the tensions between innovation and incumbency, the time has come to develop this field as a distinctive area of scholarly endeavor" (p. 291).

Future Directions

It is believed this dissertation will be a first step toward developing an assessment process that leverages theoretical underpinnings and the approach prescribed through a multidisciplinary conflict studies lens—making a viable contribution to the study of sociotechnical change in organizations and institutions.

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Appendix A: Research Questions and Objectives in a Mixed Methodology

Research Questions

1. How is exponential digital technology growth *and* organizational change perceived and experienced for decision-makers, faculty, and instructional designers in higher education, due to varying social conditions (such as the COVID-19 global pandemic), academic structures, and processes? What are the differences in responses between the three participant groups: faculty, administrators, and instructional designers?

2. What are the ideas or opinions regarding how much *change* has been or will be required? How are pressures for change being handled?

3. What are the consequential *conflicts* that may impede success, how or where do they emerge, and how are they managed?

Qualitative Sub-Questions

- Can current, or recent, implementation or adoption scenarios be *described*?
- How do stakeholders *understand*, *cope with, mitigate*, or *exploit* the impacts of digital technology?
- What *drives behavior* and illumines motivations or priorities?
- How do tensions or conflicts emerge; how are they managed?

Quantitative Sub-Questions

- What is the *level of awareness* and *spectrum of attitudes* of faculty, decision-makers, and designers in higher education toward potential trends in digital technology and the changes that may occur to their operations and/or mission—short- and long-term?
- What are the *mechanisms* (means, methods, processes, structures, etc.) by which digital technology impacts individual stakeholders in higher education institutions?
- What *characteristics* or *factors* contribute to perceived changes due to implementation of digital technology?
- Does the *theory of sociotechnical change* provide a good starting point for the assessment of digital technology capacity, adaptability, and impacts on higher education?

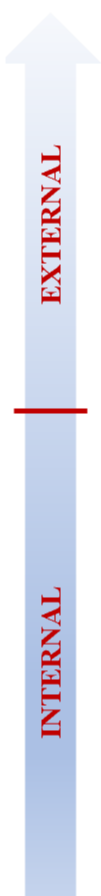
Dependent Variable

- *Adaptability to technology-induced change* for instructional design i.e., the structural and institutional conditions for adaptability

Independent Variables

- Dynamics, variations, patterns, confrontations, barriers, power influences (socially and technologically based), i.e., *mechanisms that facilitate or block adaptation* and potentially, transform the organization

The following table attempts to show the cross-analysis of the Assess-Address-Adapt model through a system approach, i.e., exploring from the individual through to the societal level how respondents perceive the organization is assessing its capacity for new technology, addressing the implementation (to include awareness and attitudes), and whether there is a perception of success, i.e., adaptation.



Levels in the H.E. System	**Capacity Assessment Tools** [Build a Profile]	**Addressing Actions & Attitudes Tools**	**Adaptation Tools**
Societal Level		**Use of existing national survey results and Literature Review, as well as QUALITATIVE INTERVIEWS**	
Sector Level	**QUALITATIVE INTERVIEWS** **INSTITUTIONAL DOCUMENTATION**		
Institution Level (Perceptions of Technology)	**READINESS: Institutional/University & College/School** 9, 10, 11, 12, 16*	**LEARNING ENVIRONMENT** 10, 12, 13, 14, 15	**QUALITATIVE INTERVIEWS**
Group/Project Level (Implementation Process)	**READINESS: Group/Project** 18, 19, 20, 21, 22, 23, 24, 25	**QUALITATIVE INTERVIEWS**	**LEARNING ENVIRONMENT** 15 **QUALITATIVE INTERVIEWS**
Individual Level	**QUALITATIVE INTERVIEWS**	**QUALITATIVE INTERVIEWS**	**QUALITATIVE INTERVIEWS**

* *numbers coincide with survey questions (Appendix B)*

Across three participant layers:

- Faculty Member
- Instruction / Curriculum Designer / Learning Specialist or Scientist
- Administration or Program/Project Manager

Appendix B: Quantitative Survey and Survey Questions

Sections

1. **About You** (Baseline Demographics)

2. **Institutional Readiness** (capacity or readiness, and inclination toward, or away from, technology, change, and/or conflict) at the Institutional/College level)

3. **Institutional Readiness at the** Group/Project level

Total Number of Questions Asked of Each Participant: 26

SURVEY FRAMEWORK: READINESS FOR TECHNOLOGY ADOPTION		
	Technology	**Culture**
Institution/College Level	**Technological Readiness** • Technology in the Learning Environment • Online Learning • Classroom Technologies • Institutional Priorities for Technology Change	**Organizational Readiness** • Clarity of mission • Communication • Decision-making process • Openness to change
Group/Project Level	**Group Readiness** • IT System Stability • Past Experience with Digital Implementation • Administrative and Technical Resources	**Motivational Readiness** • Training • Ongoing support • Incentives • Motivations

Overview of Survey Categories

A general review of the questionnaire provides the following categories:

Readiness Assessment: General Perceptions of Technology in the Learning Environment at the College/University Level

- Agreement on college mission
- Rating the importance of various aspects of college communication
- Agreement about college decision-making processes
- Agreement about openness to change
- Agreement regarding benefits/weaknesses of digital instructional technology and online learning
- Use or Non-use of Specific Classroom Technologies
- Rating the importance various institutional priorities for technical change

Readiness Assessment: General Perceptions of Technology in the Learning Environment at the Project (Individual)/Group/Department Level

- Agreement regarding the current IT system stability relative to the project
- Agreement regarding past experience with digital project implementation
- Agreement regarding administrative and technical resources provided
- Agreement regarding training support
- Agreement regarding ongoing support
- Agreement regarding incentives
- Overall rating of technology experience for instruction
- Selection of three factors (from list) that would *motivate* participant to integrate more or better technology into the teaching practice or curriculum

Two optional open-ended comments (one halfway, the other at the end) regarding the use of digital technology in higher education

Survey Questions

[Landing Page, after individual has clicked on the SurveyMonkey link in the email]

Digital Technology in the Learning Space

We are interested in understanding the *role of digital technology* in the teaching and learning environment of the university. Your input is very much desired. The following survey, which is in two sections, seeks your perceptions and/or perspectives via a series of multiple choice and rating questions. All responses will be confidential and anonymous. The time estimated to complete it is 30-40 minutes.

We are seeking input from three academic categories only: faculty member, instruction or curriculum design, and administrator or program/project management. Please proceed to a letter for anonymous surveys if you identify yourself in at least one of those categories. [options to exit or click next]

[Participant Letter for Anonymous Surveys] – [click next]

[Survey tool]

Questions 1 and 2 related to identifying as one of the observed academic groups, and then agreeing with the participant letter, which preceded the actual survey. Thus, the survey itself began with question 3.

SECTION 1: ABOUT YOU

3. How would you MOST identify yourself in your current position?

- Faculty Member
- Instruction / Curriculum Design
- Administration or Program/Project Management

4. How many years (overall) experience do you have in each of the following positions

- Estimated years in a full- or part-time faculty position:
- Estimated years in an instructional design position:
- Estimated years in an administrative or management position:

Pull down menu options for each bullet:

- None
- 1- 5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years

5. In which category below would you classify MOST of your current effort?
- **Undergraduate program**
- **Graduate program**

6. What is your gender?
- Female
- Male
- Transgender
- Non-binary/non-conforming
- A gender not listed
- Prefer to self-describe ______________
- Prefer not to respond

7. What is your age?
- Under 20
- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70 and older

8. Which of the following statements BEST describes you?
- I am an innovator of new technologies.
- I am an early adopter of new technologies.
- I typically wait to adopt new technologies after seeing how they are working.
- I am disinclined to use new technologies.
- I don't have any opinion on technology use in the university.

SECTION 2: PERCEPTIONS ON TECHNOLOGY IN THE LEARNING ENVIRONMENT

Thinking about *your own specific organization—that is, your SCHOOL or COLLEGE within the larger university*—please respond to the following. (Shortly you will be asked specifically about your own team and projects).

9. Please indicate your level of agreement about the clarity of *your college* mission, via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
Our college's mission is concrete enough to guide our decision-making, and it provides an image of the types of outcomes we want to see at our college.

Individuals throughout our college are able to articulate our mission in the same way.

Individuals throughout our college buy into our mission and use it to guide their professional practice.

Our mission changed with the advent of COVID-19.

Our mission did not change, but our pedagogical approach did with the advent of COVID-19.

10. Please indicate your level of agreement about *communication,* via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
We have established regular mechanisms for communicating with individuals throughout the college—at all levels, not just the senior-level administrators.

Individuals throughout the college feel informed, respected, and trusted.

The requirements and benefits of a new initiative are made known.

The students or community are regularly asked about their needs.

11. Please indicate your level of agreement about the *decision-making process,* via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
When implementing new projects, our college involves a wide range of individuals from multiple levels in the planning and implementation processes.

We have clear lines of decision-making authority in order to maintain the forward motion of a project.

We are following an institutional strategic plan.

We assess how much change will be required.

We assess the amount of needed resources (internal and external).

We assess the processes that are currently in place.

We assess the alignment of institutional values.

We are aware of the benefits and risks of radical versus incremental change.

12. Please indicate your level of agreement about *openness to change,* via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
Most individuals at our college seek new ways of doing their work in order to improve student outcomes.

In general, individuals at our college feel that digital technology is useful in their work.

Our college is tradition-bound, but our reform leaders have developed a plan to encourage individuals to learn about the benefits of the intended change.

There is a resistance to change.

There are no strategies for dealing with change and uncertainty and/or adaptability to change.

We are often pressured to change.

13. To what extent do you agree with the following statements about *technology in the learning environment* or *instructional technology*? (Scale: Strongly disagree to Strongly agree, and Don't know)

Digital resources provide a more personalized learning experience than traditional methods.

Our efforts to introduce digital instructional technologies is impacted by the number of students who have the right digital devices and access.

Our lack of funding impacts our ability to employ digital instructional technologies.

We lack instructional designers to partner with faculty in producing digital changes to the curriculum.

Working with digital instructional designers improved the quality of my course.

In my experience, digital instructional designers need more understanding of the educational discipline.

We lack IT staff to partner with faculty in producing digital changes.

I worry that certain technologies will someday no longer be supported and therefore, obsolete.

There is too much private-sector influence on our use of instructional technology.

The cost of digital tech outweighs the benefits to students.

Faculty lose too much control in the learning environment with increased technology.

14. To what extent do you agree with the following statements about *online learning,* in particular? (Scale: Strongly disagree to Strongly agree, and Don't know)

Online learning helps students learn more effectively.

Online learning leads to pedagogical innovation.

Online learning makes higher education available to more students.

Online learning makes higher education more affordable for students.

Online learning reduces the numbers of faculty and teaching positions in higher education.

15. Which of these *classroom technologies* have you used at your institution? (Select all that apply)

Classrooms with multimedia and audio visual (AV) equipment

Wi-Fi access/wireless system

Web conferencing systems for remote speakers or remote students

Audience response systems (e.g., clickers)

Interactive display (e.g., SMART podiums)

Remote monitoring for technical support

Extended reality (XR) technology

Artificial Intelligence (AI) in the classroom (e.g., voice-activated assistants)

Technologies and/or spaces that aid students with disabilities

Learning Management Systems (e.g., Blackboard, Moodle, Sakai, D2L Brightspace, Canvas)

IT security against network attacks, secure data bases, identity management, etc.

E-books or e-textbooks

Simulations or educational games

Software to create videos or multimedia resources as a learning tool in class or for assignments

Publisher electronic resources (e.g., quizzes, assignments, tutorials, homework, practice problems)

Online proctoring/monitoring applications

Open Source / OER curricular resources

Adaptive learning tools

Other (list)

16. As you think about *institutional priorities for technology change*, how do you rate the importance of the following issues? (Scale: Not at all important to Very important, and Don’t know)

Assisting faculty in their incorporation of technology into the curriculum

Supporting online course instruction

Upgrading the Learning Management System (LMS)

Upgrading the campus IT resources

Creating physical collaborative spaces (e.g., computer labs, learning commons, testing centers, research labs, active learning classrooms, etc.)

Enhancing classroom-based technology resources (e.g., computers, projection systems, lecture-capture systems, SMART boards, etc.)

17. Please provide any additional comments, issues, or perceptions you would like to share regarding the institutional use of digital technology for teaching and learning.

SECTION 3: PERCEPTIONS ABOUT THE IMPLEMENTATION PROCESS

Thinking about *your own specific GROUP, TEAM, or DEPARTMENT, relative to an Instructional Technology PROJECT or REFORM (past, current, or proposed),* please respond to the following.

18. Please indicate your level of agreement about the IT system *stability* at your institution, relevant to the process of a current or recent technology initiative, via the following statements. (Scale: Strongly disagree to Strongly agree, and Don't know)
Our institution or college has not introduced any major systems changes in the past year.

Our institution has undergone some reorganization in the past three years.

End-users are confident in their ability to use current systems and could engage in learning something new.

The current or recent technology initiatives are deemed incremental – minor changes have been, or will be, incurred.

The current or recent technology initiatives are deemed radical – major changes have been, or will be, incurred.

19. Please indicate your level of agreement about *past experience with digital implementation,* via the following statements. (Scale: Strongly disagree to Strongly agree, and Don't know)
Our previous digital implementation experiences were successful, as evidenced by our clear implementation plans, timely rollouts, and the adoption of new technologies by end-users.

We have a clear understanding of what went wrong during previous technology implementations and have a detailed plan for addressing similar challenges going forward.

20. Please indicate your level of agreement about *administrative and technical resources,* via the following statements. . (Scale: Strongly disagree to Strongly agree, and Don't know)
We have clearly defined departmental responsibilities for implementing the project, including project leads, departmental division of labor, and timelines.

The departments responsible for implementation have the staff capacity—in terms of skill and time—to execute their responsibilities.

We are able to identify challenges we may encounter during the implementation process and have a plan for addressing those challenges.

We have clear adoption and usage goals for the project.

We have an executive sponsor for the project who will be actively involved throughout the implementation process.

The requirements (resources needed) and benefits are known.

We are aware of process modifications and/or new procedures to put into place.

We know and understand the new technology that characterizes the project.

We are aware of the capital requirements.

We are aware of the knowledge-based requirements.

We are implementing the project with existing internal resources and staff.

We are implementing the project through external resources and development.

21. Please indicate your level of agreement about *training,* via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
We have a specific timeline for training that provides end-users with ample time to learn about the system prior to its scheduled launch.

We are cognizant of the need to foster new digital literacies.

Professional development will be provided around the integrated use of technology for teaching, whether face-to-face or online (e.g., technology training opportunities, incentives, and professional advancement)

22. Please indicate your level of agreement about *ongoing support,* via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
Ongoing support activities will be embedded into staff roles, and staff will have ample time to provide ongoing support to end-users.

We have developed policies that protect our faculty's intellectual property rights for digital work.

The time demands of new instructional design and implementation is acknowledged.

23. Please indicate your level of agreement about *incentives,* via the following statements. **(Scale: Strongly disagree to Strongly agree, and Don't know)**
Staff are incentivized for participating in the initial rollout and for incorporating the new technology into their daily work routines.

We have budgeted for incentives.

24. Rate your overall experience with CURRENT instructional technologies at your institution: (5 STARS)
Very dissatisfied
Dissatisfied
Neutral
Satisfied
Very satisfied

25. Select up to three factors that would motivate you to integrate more or better technology into the teaching practices or curriculum:
More/better technology-oriented professional development opportunities

A monetary or other value-oriented incentive

Tenure decisions and other professional advancement considerations

Release time to design/redesign my courses

Direct assistance from an instructional design expert to design/redesign my courses

Direct assistance from IT staff to support the technology I choose to implement

Assigning me a classroom that matches my educational technology needs

Working in a faculty cohort or community that is adopting the same types of practices

A better understanding of the types of technologies that are relevant to teaching and learning

A better understanding of how to use student-owned technology during class for teaching and learning

Confidence that the technology will work the way I plan

Increased STUDENT expectations of technology integration

Increased INSTITUTIONAL expectations of technology integration

Clear indication/evidence that students would benefit

None – I prefer not to integrate technology

Other; please specify: ____

26. Please provide any additional comments you would like to make regarding the use of digital technology and/or the impacts of the COVID-19 pandemic on your professional efforts: ____________________________________

Appendix C: Qualitative Semi-Structured Questions and Prompts for Interviews

– Faculty, Administrators, Instructional Designers

Interview Questions:

1. **Would you please tell me about your current role at the university—especially as it pertains to new technology initiatives for instruction or curriculum?** *Prompts:*

    a. Are you a member of the faculty? An instructional designer? A digital technologist or specialist? A student? An administrator?
    b. In your particular role, how would you describe your current activity?
    c. Are there qualities that you possess that have helped? Hindered?
    d. With what other roles do you interface? Have those relationships been good?

2. **How are things going, in your view?** [SWOT analysis] *Prompts:*

    a. How has the introduction or planning process gone so far? Was there a clear rationale provided to you for the change? Is everyone on the same page? [Covid?]
    b. Can you describe the process for implementation? What has worked well?
    c. What do you hope to achieve? Opportunities? How will these make a positive impact?
    d. What has been particularly challenging? Weaknesses, threats?
    e. What problems or changes do you foresee? (drivers and inhibitors or barriers)
    f. Are there issues unique to your field? What are they? Can they be mitigated or overcome? Do you sense these changes will be transformational, long-lasting?
    g. What are considered the drivers and inhibitors of implementation?
    h. What is the nature of the relationships between the parties of implementation?
    i. What mechanisms are in place for coordination and control?
    j. What are the characteristics and features of successful and unsuccessful implementations?
    k. What is the nature of relationships with suppliers and customers, clients, or students relative to a recent tech change or implementation? Are you getting all the support you need?
    l. What is the manner of information interchange and technology deployment? Who made the decisions? How were they communicated?
    m. What metrics are used to determine performance or success?
    n. How does the organization manage risk?
    o. Would you deem this new project an incremental or radical change in your operation?

3. **What would you consider to be a "best practice" coming out of your current initiative?**

    a. What did the team assess, i.e., inputs, criteria, or rationale?

b. What options came out on top?
c. Who owns the initiative(s)?

4. **What attributes or competencies (knowledge, attitudes, skills, and habits) do you feel are important to have or acquire for the new initiative(s) or for those responsible for advancing and sustaining them in education?** *Prompts:*

   a. What are your personal experiences with, or attitudes about, digital technology? How would you rate your digital literacy? How do these answers relate to what you are experiencing within the organization and/or the new initiative(s)?
   b. How does an individual's perceived value to the organization affect adaptation?
   c. What is the perception of the future of the organization?
   d. How is change typically handled in the institution?

5. **How would you describe your university and/or school culture?** *Prompts:*

   a. Student-centered? Faculty-centered?
   b. Collaborative? Polarized?
   c. On the cutting-edge? Traditional?
   d. Administration – faculty relationships?
   e. Was this new initiative part of a strategic vision or plan? Who participated?
   f. How is pressure for change handled?
      - How are pressures perceived, engaged, and coped with?
      - What strategies are emerging?
      - What conflicts are emerging?
   g. What mechanisms are in place for coordination and control?
      - Is there any sense of things being "out of control"?
      - Is there a sense of fear? Of what?
      - Is there a sense of loss? Of what?
      - Is there a sense of excitement and challenge? How? Why? About what?
      - For any of the above, how have you or your department been impacted? (characteristics, factors, relationships, coping mechanisms, outcomes)
   h. Can you describe instances of stress, tension, conflict relative to this initiative?

6. What is ONE thing that your institution can do with technology to better facilitate or support your faculty's teaching role?

7. Relevant to what we have been discussing, how different would tomorrow look, if you had the power to make changes?

Appendix D: Synthesis of Key Quantitative Survey Results with Qualitative Interviews and Documents

<table>
<tr><th>Component</th><th>Most Relevant Survey Excerpts</th><th>Notional Assessment</th><th>Comments Relative to Interviews & Document Analysis</th></tr>
<tr><td>Clarity of mission</td><td>Our college’s mission is concrete enough to guide our decision-making. (44% agree)

Individuals use the mission to guide practice. (53% agree)

Our pedagogical approach changed with COVID-19. (59% strongly agree)</td><td>Moderate Readiness for Technology Adoption</td><td rowspan="3">[Documents]
University strategic plan’s key words: students are top priority; champion innovation, inclusion, diversity, access, excellence, impact, collaboration, ethics, freedom of inquiry and expression, leadership by example.

College strategic plan’s key words: adapt and accelerate community, learning, and discovery; inspire transformative learning experiences

[Interviews]
Little mention of strategic vision or mission--mostly reflecting upon the broader state university system and levels of bureaucracy

Student-focus and faculty-focus were both mentioned

Communication tends to occur within departments; limited cross-communication or collaboration

Some individuals feel excluded from communication channels.

Decision-making was described as having lack of transparency and</td></tr>
<tr><td>Communication</td><td>We have established mechanisms for communication throughout the college. (47% agree)

Individuals feel informed, respected, and trusted. (41% agree)

The requirements and benefits of a new initiative are known.(41% agree)

Students are regularly asked about their needs. (53% agree)

Access for all students. (47% agree)</td><td>Moderate Readiness for Technology Adoption</td></tr>
<tr><td>Decision-making process</td><td>When implementing new projects, our college involves a wide range of individuals from multiple levels in the planning and implementation processes. (47% agree)

We have clear lines of decision-making authority in order to maintain the forward motion of a project. (38% agree)

We are following an institutional strategic plan. (50% agree)

We assess how much change will be required. (38% agree)

We assess the amount of needed resources (internal and external). (47% agree)</td><td>Minimal Readiness for Technology Adoption</td></tr>
</table>

	We assess the processes that are currently in place. (38% neutral; 38% agree) We assess the alignment of institutional values. (34% agree) We are aware of the benefits and risks of radical versus incremental change. (34% agree)		equity; other statements gave leadership high marks There is no clear plan for helping individuals learn about the benefits of intended change
Openness to change	In general, individuals at our college feel that digital technology is useful in their work. (56% agree; 22% strongly agree) Our college is tradition-bound, but our reform leaders have developed a plan to encourage individuals to learn about the benefits of the intended change. (50% agree) There is a resistance to change (22% disagree; 28% neutral; 38% agree; 6% strongly agree) We are often pressured to change. (31% disagree; 25% neutral; 28% agree; 6% strongly agree)	**Moderate Readiness for Technology Adoption**	Most projects are driven and led by a small number of individuals Workload increases and finite time were described Change is slow; most individuals are skeptical of educational technology; traditional mindset; entrepreneurial mindset Some academic structures seem to impede change; reviews about change and how it should come about are mixed
Technology in the Learning Environment	Working with digital instructional designers improved the quality of my course. (34% don't know) Our efforts to introduce digital instructional technologies is impacted by the number of students who have the right digital devices and access. (41% agree) We lack instructional designers to partner with faculty (34% agree) Digital instructional designers need more understanding of the educational discipline. (34% agree)	**Minimal-Moderate Readiness for Technology Adoption**	Called "learning specialists" or "learning scientists" in this case, though helpful, were not used consistently during the pandemic Comments were made about learning specialists not understanding the discipline of engineering enough to be useful in course design; this was countered by the learning specialists.

<table>
<tr><td></td><td>We lack IT staff to partner with faculty. (28% disagree; 22% neutral; 25% agree)

I worry that certain technologies will someday no longer be supported. (41% agree)

The cost of digital tech outweighs the benefits to students (50% disagree)

Faculty loose too much control in the learning environment with increased technology. (56% disagree)</td><td></td><td rowspan="4">Opposition to fully online; more acceptance of hybrid or flipped class instruction mode

Perceived lack of student spontaneity and interaction in online teaching mode

Perception that current pandemic use of online is temporary; in-person classes will resume; some faculty will continue to conduct in hybrid mode

Some faculty feel they lose trust and control of attention and interactions online.

Indecisive about whether students do better or worse online; [documentation] students seem to prefer synchronous classes for problem-solving and asynchronous videos for lectures

There is agreement that online mode reaches a greater number of students.

Faculty would like more assistance with technology incorporation in teaching

Upgrading IT campus resources does not seem to be a need

Creating more physical collaborative spaces aligns with faculty who prefer in-person instruction</td></tr>
<tr><td>Online Learning</td><td>Online learning helps students learn more effectively. (38% disagree)

Online learning makes higher education available to more students. (66% agree)

Online learning leads to pedagogical innovation. (50% agree)

Online learning reduces the numbers of faculty and teaching positions. (41% disagree)</td><td>Moderate Readiness for Technology Adoption</td></tr>
<tr><td>Classroom Technologies (those used)</td><td>• Classroom with multimedia
• Wi-Fi
• Web conferencing
• LMS</td><td>Minimal Readiness for Technology Adoption</td></tr>
<tr><td>Institutional Priorities for Technology Change</td><td>Assisting faculty in their incorporation of technology into the curriculum (56% very important)

Supporting online course instruction (56% very important)

Upgrading the Learning Management System (LMS) (31% somewhat important)

Upgrading the campus IT resources (50% somewhat important)

Creating physical collaborative spaces (53% somewhat important)

Enhancing classroom-based technology resources (47% very important)</td><td>Moderate Readiness for Technology Adoption</td></tr>
<tr><td>IT System Stability</td><td>Our institution or college has not introduced any major systems changes in the past year.</td><td>Minimal Readiness for</td><td>Disruption of the norm repeatedly mentioned</td></tr>
</table>

	(60% disagree) Our institution has undergone some reorganization in the past three years. (60% agree) End-users are confident in their ability to use current systems and could engage in learning something new. (30% disagree; 33% agree) The current or recent technology initiatives are deemed incremental – minor changes have been, or will be, incurred. (27% disagree; 30% neutral; 27% agree) The current or recent technology initiatives are deemed radical – major changes have been, or will be, incurred. (30% neutral; 36% agree)	**Technology Adoption**	New university president created a new strategic plan Difficulty in switching from in-person to online seemed related to the learning curve required of digital instructional technologies and platforms Incremental versus radical change exhibited differing views largely based upon audience: faculty/admin versus learning specialists
Past Experience with Digital Implementation	Our previous digital implementation experiences were successful, as evidenced by our clear implementation plans, timely rollouts, and the adoption of new technologies by end-users. (20% disagree; 27% neutral; 27% agree; 13% don't know) We have a clear understanding of what went wrong during previous technology implementations and have a detailed plan for addressing similar challenges going forward. (23% disagree; 23% neutral; 23% agree; 23% don't know)	**Minimal Readiness for Technology Adoption**	Small amount of previous experiences were described Due to forced changed resulting from pandemic, implementation going forward has not been fully described
Administrative and Technical Resources	We have clearly defined departmental responsibilities for implementing the project, including project leads, departmental division of labor, and timelines. (33% disagree; 37% agree) The departments responsible for implementation have the staff capacity—in terms of skill and time—to execute their responsibilities. (43% disagree) We are able to identify challenges we may encounter during the implementation process and have a	**Minimal Readiness for Technology Adoption**	Project-level descriptions of a new grant and its components have been clearly described, as well as having an executive champion [documentation]. However, these employ a minimal amount of digital technology.

	plan for addressing those challenges. (20% disagree; 20% neutral; 30% agree; 20% don't know) We have an executive sponsor for the project who will be actively involved throughout the implementation process. (27% agree; 33% don't know) The requirements (resources needed) and benefits are known. (37% agree; 20% don't know) We are aware of process modifications and/or new procedures to put into place. (33% agree; 27% don't know) We know and understand the new technology that characterizes the project. (43% agree; 23% don't know) We are aware of the capital requirements. (37% agree; 20% don't know) We are aware of the knowledge-based requirements. (30% neutral; 30% agree; 23% don't know) We are implementing the project with existing internal resources and staff. (47% agree; 23% don't know) We are implementing the project through external resources and development. (37% disagree; 37% don't know)		Group/project level interview responses largely addressed current initiatives to teach online. Responses suggest individual approaches to challenges and initiatives. The disruption that was experienced by individuals did not enable examination of many of the points in this part of the survey. Staff capacity and resource requirements were not a planned consideration as the pandemic forced the change in instructional mode to online.
Training	We have a specific timeline for training that provides end-users with ample time to learn about the system prior to its scheduled launch. (33% agree) We are cognizant of the need to foster new digital literacies. (56% agree) Professional development will be provided around the integrated use of technology for teaching, whether face-to-face or online (e.g., technology training opportunities,	**Minimal Readiness for Technology Adoption**	Training was offered and appreciated, but individuals required more.

	incentives, and professional advancement) (40% agree; 30% don’t know)		
Ongoing support	Ongoing support activities will be embedded into staff roles, and staff will have ample time to provide ongoing support to end-users. (23% disagree; 17% neutral; 27% agree; 30% don’t know) We have developed policies that protect our faculty’s intellectual property rights for digital work. (13% strongly disagree; 17% neutral; 27% agree; 37% don’t know) The time demands of new instructional design and implementation is acknowledged. (20% disagree; 27% neutral; 33% agree)	**Minimal Readiness for Technology Adoption**	Support sought for the following: • Teaching value • Digital tech training • Flexibility • Incentives aligned with values • Workload/release time • Shared resources and experiences
Incentives	Staff are incentivized for participating in the initial rollout and for incorporating the new technology into their daily work routines. (40% disagree;20% neutral; 13% agree; 17% don’t know) We have budgeted for incentives. (33% disagree; 30% don’t know)	**Minimal Readiness for Technology Adoption**	
Motivations (three factors that would motivate you to integrate more or better technology into the teaching practice)	Clear indication that students would benefit (50%) Release time to design/redesign my courses (43%) Confidence that the technology will work the way I plan (33%) Working in a faculty cohort or community that is adopting the same types of practices (30%) A better understanding of how to use student-owned tech during class for teaching and learning (0%) Increased INSTITUTIONAL expectations of technology integration (0%)		

Appendix E: Inventions and Their Social Implications

(Carlson, 2005, 2013)

Estimated Start or Period	Invention	Technology Breakthrough	Social Implications
Stone Age (2 million to 10,000 BCE)	Oldowan stone tools	Sharpening the edge of stone provided ability to cut or chop	Time of physical stability, implying little innovation
8,000 BCE	Potters' wheel	Stored energy via momentum of a turning wheel; one of the first machines	Required ingenuity, illustrating the nature of technological creativity
8,000 BCE	Ships (Galleys)	From dug out trees to the creation of a keel for steadiness	Allowed trade and ideas to spread
5000 BCE	Beer, Wine, Distilled Spirits	Manipulation of chemical and biological processes to achieve an outcome	Shaped social order and convey cultural meanings; technology is not just about the inorganic, but also the organic
800 BCE	Metals	Combining heat, chemistry, and hammering to convert an ore into a pure metal	Certain natural metals at the disposal of a civilization began to give it leverage
1900 to 1800 BCE	Currency and the Alphabet	Along with ships, these created mechanisms for trade or exchange	Coins revolutionized the infrastructure of the ancient world, creating an intermediary good for trade; the common set of symbols representing sounds moved ideas from one person to another
600 BCE	Crossbow	Trigger mechanism for releasing the bowstring	Technology manifested power; simultaneously developed in the East and West
300 BCE to 476 CE	Roman Arches, Aqueducts, the Colosseum	The arch presented a design invention that could withstand weight; central element: the keystone. Aqueducts moved water from its source to the cities	Invention shaped by political change, leadership, power; Roman inventions reflected the idea of commonwealth, public works, and spectacle
300 BCE	Waterwheels & Mechanical Clocks	Waterwheels: first major energy source beyond human muscle and animals; clocks defined time	Set stage for early modern world; required sophisticated thinking and creativity; significantly changed how people lived and thought about the world

600 CE	Pagodas & Cathedrals	Inventive technology	Tools to express spiritual meaning, though they also stood for economics and politics
200 BCE	Paper & Printing	Moved from China to Europe on the Silk Road trade route	A response to the needs and imperatives of the environment and society; people began to read
900 CE	Gunpowder, Cannons, Guns	Combustion	Altered history differently for East vs. West. China used gunpowder and rockets to maintain homogeneity in their culture (to keep out invaders); Europeans used it to separate into different nations.
16^{th} century	Telescopes & Microscopes	Optical instrument invention changed how people understood the natural world	Enabled observations that created new fields of study: astronomy, biology, physics, and chemistry; helped establish the scientific method
15^{th} century	Caravel & Celestial Navigation	Integrated three innovations: better ships, systematic information about prevailing winds and currents, and new navigation techniques (systematic applied knowledge)	*First creation and use of technology* to deliberately shape the destiny of a nation (Portugal). Marks the beginning of the modern world; hallmark of the modern world: belief that we can change our destiny; also fueled the acquisition of wealth and the furtherance of technology
18^{th}-19^{th} centuries	Coal & Iron	Created more output through economies of scale (activities, machines, and buildings could be bigger), economies of speed (processes could be done faster), economies of coordination (more output resulted by planning how the work was done/division of labor), and economies of location	Several technological breakthroughs that inspired the first industrial revolution; caused rising income per capita and rising income by gains in productivity (output); also created new consumer demands
Mid-17^{th} to 18^{th} centuries	Steam Engines & Pin Making	Contributed to the first industrial revolution through productivity: economies of speed and economies of coordination; integration of social and technical innovations caused dramatic gains in output.	Technology helped to distribute economic power in society; labor in factories was reorganized (Adam Smith). Smith thought division of labor would eliminate classes, creating a working class into a single middle class.
480 BCE	Canals &	Third component needed for the Industrial revolution to succeed: transportation;	Reduced costs of shipping goods, time, and enlarged markets; fueled steel industry, Wall Street,

Mid-18th century	Railroads	creation of locks and dams; creation of signal systems and triggered standardization (via tracks)	corporations, and national governments
19th-20th century	Food Preservation	Learned how to kill bacteria and contain food in process called canning; metal containers; also learned how to condense milk and corned beef; refrigeration and freezing	Preservation moved from the home to the factory as workers left rural areas; made possible the ability to produce quantities of food in one area for consumption in another
16th century	Water & Sewer Systems	Sanitation; toilets; plumbing	1867, the second Reform Act granted urban working men the vote; same time, the Sanitary Act and Public Health Act. Much social and political change.
19th century	Batteries & Electric Generators	Converting one form of energy into another	Improvements in the mechanisms significantly increased the output of electric generators, made electricity cheaper to generate, and thus paved the way for the application of electricity to a variety of new uses
19th century	Cameras, Telephones, Phonographs	Creation of analog communications, in which information is stored or transported from one place to another by the creation of a representation that serves as an analog of the message. Invention became a team sport and a race among genius'.	Played a huge role in making information and knowledge widely available to millions of people; created the expectation that information can and should be shaped by individuals. Photos showed society in three-dimension. Telephones were first installed in businesses—later to homes for social purposes.
19th century	Electric Light & Power	Two inventors/two phases of development: incandescent lighting/direct current and motors/alternating current; connected markets and technology; right combination of old thinking and practical problem-solving	Power became cheaper and more available; reshaped American culture by powering the tools, appliances, and communication devices we use daily
Late 19th century	Department Stores & Retailing	Invention of new ways to shop: department stores, mail-order catalog companies, and retail chain stores	Changed social structure from going to central markets for each type of product; in the new vein, entrepreneurs could focus on the sale of a small quantity of goods; networks of retail stores developed and remained the dominant arrangement by which

			Americans shop and purchase manufactured goods.
Late 19th century	Motion Pictures	Urban populations demanded new forms of entertainment; new machines responded	Growth of urban populations
Late 19th century	Surgery & Operating Room	Technological innovations that made medicine and surgery safer and confronted the risks of pain, bleeding, and infection (anesthesia, ligature, and antiseptic)	Reshaped daily life, medicine, and surgery
14th century	Steel, Glass, Plastics	Qualities of material were improved, such as hardness, ductility, and tensile strength.	Materials that helped define the 21st century; transformed everyday life and people's expectations of what the world should look like. Glass became a commodity, not just a luxury material.
Early 20th century, 1908	Model T	Revolutionized production by developing the moving assembly line; by 1927 several competitors entered and produced faster cars with electric starters, closed bodies, and multiple colors	First car that average Americans could afford; demonstrated the ingenuity of Americans in terms of both production and engineering; thoroughly changed American life and captured the imagination of people.
Early 20th century 1903	Aviation	Technology influenced by military needs; developed craft control and stability; jet engine; bombers	Civilian applications created spillover effects of military investment; circumstances (political and military) were prime for this invention
Early 20th century	Radio & TV	Broadcasting technology was an integration of technology, distribution, and content	New mediums of entertainment and information transfer
1938	Nuclear Power	Nuclear fission and nuclear fusion; pressurized water reactor	First considered a better way to produce electricity; it also presented military and environmental risks
Late 19th century	Household Appliances	Invention of the vacuum cleaner (and portability), washing machine, clothes dryer	Became central artifacts of consumer society and were the convergence of other inventions; came about with the spread of electric power and capacity to mass-produce complex products; distributed through department and retail stores; allowed for a new level of personal comfort; middle-class Americans came to see these products as proof of the

			quality of the American way of life; served as social and cultural markers, signaling who belongs to middle class in America and confirming the virtue of the capitalist system. As the industrial revolution occurred, these items became acceptable in the home—viewed as female space. Prior, machines were controlled mostly by men. Bringing these items in house created more work for women.
Early 20th century	Electronics & Chip	Invented the vacuum tube, transistor, integrated circuit (chip) – each a dramatic step forward, *building on the ideas and practices of the previous device*	Created ability to generate and detect radio waves, amplify weak signals, and operate as switches
Late 20th century	Satellite & Cell Phones	Combined with digital information, making it possible by the late 1990s to communicate with nearly every part of the planet; moved from 1G to 4G protocols for transmission	
Mid- 20th century	Personal Computing	Each step built on preexisting technology, which was repackaged or reconfigured or redirected to a new purpose; programming; hardware and software; applications and games	
Mid 20th century	Genetic Engineering	Creation of polymerase chain reaction (PCR); computer scientists and biologists working together	Applied in agriculture, medicine, and criminal forensics; created field of biotechnology; cloning; aids for studying disease and developing new drugs and therapies; improves understanding of human health
Late 20th century	The Internet	Digital information and packet switching (first developed by Tesla in 1902); world wide web; search engines	New ways of getting information and advertising

Appendix F: Evolution of Harvard's DNA from 1636 to 1953 – a Timeline of Changes in Competencies (Christensen & Eyring, 2011)

Harvard's DNA	Traits	Implications
1636-1707 (p. 35)	Small, face-to-face classes	▪ High faculty-student intimacy ▪ Low instructional efficiency
	Classical, religious instruction	▪ High moral content in the curriculum ▪ Narrow curriculum with low practicality for non-pastors
	Nonspecialized faculty	▪ Dogmatic instruction ▪ High faculty empathy for learners ▪ Low faculty expertise
1708-1868 (p. 44)	Secularization	▪ Freedom from dogma in academic inquiry ▪ Increased practicality in the curriculum ▪ Tendency toward skepticism
	Subject matter specialization	▪ Greater subject matter expertise and depth ▪ Better scholarship ▪ Enhanced faculty credentials ▪ Diminished faculty focus on students ▪ Increased emphasis on curricular content and lecturing ▪ Increased instructional cost
	Departmentalization	▪ Broader study options ▪ Enhanced disciplinary collaboration ▪ Increased narrowing of scholarship and fragmentation of the curriculum ▪ Increased fragmentation of the faculty
	Long summer recess	▪ Greater faculty research opportunities ▪ Lower utilization of physical facilities
	Professional schools	▪ Increased contribution to economic and social welfare ▪ Specialized alternatives to liberal education
	Private fundraising	▪ Greater discretion in spending ▪ Diminished dependence on student tuition and state support ▪ Donor limitations and incidental expenses
1869-1909 (pp. 69-70)	Comprehensive, elective curriculum	▪ Broader study options ▪ Opportunity for greater depth of study and self-pacing ▪ Opportunity to bring more advanced scholarship into the classroom ▪ Competitive incentive for teachers

		▪ Potential loss of curricular breadth and subject matter depth ▪ Tendency toward fragmentation of the curriculum ▪ Proliferation of courses and a decrease in students-per-class in advanced courses
	Graduate schools atop the college	▪ Low-cost supply of graduate instructors and research assistants ▪ Elimination of pressure on the college to provide professional preparation; greater freedom to emphasize liberal education ▪ Further narrowing of the college curriculum
	Increased organizational complexity and cost	
	Faculty self-governance	▪ Greater curricular depth and rigor ▪ Increased excellence in scholarship ▪ Potentially decreased faculty attention to undergraduate instruction and increased instructional cost
	Tenure and other faculty benefits	▪ Increased faculty stability ▪ Increased institutional cost
	Student freedoms	▪ Increased social activity ▪ Decreased academic and social discipline ▪ More off-campus living ▪ Social cliques
	Intercollegiate athletics	▪ Alumni engagement ▪ Student distraction ▪ Increased institutional cost
	College entrance standards	▪ Tighter high school performance standards ▪ Greater awareness among high school students of college opportunities ▪ Reduced need for new student remediation ▪ Dual burden of college prep and career prep on high schools.
1909-1933 (pp. 90-96)	Residential house system	▪ More unified collegiate community ▪ Social and academic support for students ▪ Significant expense ▪ Limitation of student social freedoms
	Curricular distribution (liberal, general education, or GE) and concentration (majors)	▪ A scholarly solution or knowledge discovery shop on one hand (concentration), and a value-adding process on the other (distribution) o Balance of subject matter depth and breadth ▪ Increased demand for less popular subjects ▪ Tendency toward delegation of instruction in distribution courses (as professors believed their value lay in their research endeavors and not in the opportunity cost of instruction;

		undergraduate tuition is often subsidized by tuition; scholarly/concentration area of Harvard began to grow)
	Grading curve and academic honors	▪ Increased incentive to excel academically (awards of *cum laude, magna cum laude*, and *summa cum laude*) o Even today, the difficulty of measuring in absolute terms what a student has learned makes relative ranking and the awarding of academic honors an attractive, practical alternative. ▪ Potentially decreased intrinsic motivation to learn ▪ Student pressure on faculty for generous grading o Reinforced the autonomy and academic freedom of the professoriate
1933-1953 (pp. 114-133)	Up-or-out tenure for faculty	▪ Increased scholarly excellence of faculty (peer review, merit-based competition in tenure) ▪ Decreased attention to teaching and toward the scholarship track ▪ Decreased collegiality and commitment to the institution
	Faculty salary and workload distinctions	▪ Increased incentive to win tenure ▪ Flexibility in recruiting scholarly stars and approximating market rates outside of higher education ▪ Increased salary costs ▪ Envy and division ▪ Organized into departments naturally create courses reflective of their high degree of specialization
	SAT-based admissions selectivity through entrance examination and national merit scholarships	▪ Merit-based fairness in student selection – rather than privilege and personal connections – oddly, it created a new form of privilege and a fierce drive to secure it ▪ Greater opportunities for poor students with need-based tuition aid ▪ Increased cost ▪ Gave an advantage for Harvard and other elites to get brightest students
	Externally funded research	▪ Attraction of world-class researchers ▪ New opportunities for social contribution ▪ New costs of grant writing and regulatory compliance ▪ Distraction from teaching ▪ Accentuation of haves/have-not's disciplinary divide
	The Redbook/General Education (a 267-page volume	▪ Enhanced course quality – became the new general education (GE) program

	called General Education in a Free Society, or the "Redbook"	▪ Broader range of required studies – humanities, social sciences, and natural sciences o Increased emphasis on values o Liberal education prescriptions for high school students (good for future college students, but at odd with technical training needs of others)
	The Ivy Agreement (7 sister institutions: Brown, Columbia, Cornell, Dartmouth, Penn, Princeton, and Yale, i.e., the Ivy League)	▪ Reduced financial expense ▪ Elimination of admissions exceptions for athletes ▪ Increased zeal for intramurals ▪ Decreased affinity and support from some alumni ▪ Loss of athletics' contribution to the university's public profile

Source: Christensen & Eyring, 2011