"BILT for Success": An Alternative Education Strategy to Reskill the Business and Technology Professionals for a Sustainable Future

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Abstract

Today's organizations are operating in a volatile, uncertain and complex digital environment. The outbreak of COVID-19 pandemic has exacerbated this situation. There is an urgent need for organizations to acquire a new generation of business and technology professionals that not only possess in-depth and current disciplinary specialization knowledge, but also are able to communicate and collaborate using skills across the organization in fields including business, innovation, leadership, and technology (BILT). It is recognized that the traditional pathway of getting a "full-fledged" master's degree within 18-24 months may not address the challenge in a timely manner. As educators working in the technology and business sectors of higher education, we aim to explore an alternative strategy to prepare the BILT workforce ready for the "new" economy. This article reviews several alternative education models that have been taken by different stakeholders to prepare the workforce to meet employers' quickly changing expectations. An "H-shaped" BILT model is illustrated as a modular curriculum structure to enhance and complement disciplinary specializations with a focus on combined skills across multiple domains. We present a case study with details on developing and implementing the BILT model at our school as an alternative pathway with greater degrees of flexibility and agility. Finally, we discuss the potential of generalizing this alternative education model in other settings and delineate several future research directions.

Keywords: alternative education strategy, reskill, stackable credentialing, modular curriculum, digital transformation, COVID-19

1. INTRODUCTION

We are all living in a rapidly changing world with constantly emerging technical, political, and economic challenges on a global scale (Van der Steege, 2017). Today's businesses and governments must operate in this volatile, uncertain and complex digital environment which is posing numerous "wicked problems" (Kraaijenbrink, 2019). Further, the outbreak of COVID-19 pandemic has exacerbated the situation. While the use of digital technologies in business has been gaining traction since commercial use of the Internet began, digital transformation is expected to dominate as organizations (government and business) try to recover from the disruptions caused by the COVID-19 pandemic. Business disruption along with fast digital adoption by remote workers has made intricacy and uncertainty the "new" normal

(Wiles, 2020). It has also increased cybersecurity concerns with a large surge in fraud and phishing attacks (Radoini, 2020). The organizations facing such challenges need to rethink their business models and make effective, as well as economical, use of technology, to retain and enhance their competitive advantage. As a result, there is an urgent need for organizations to acquire a new generation of business and technology professionals that not only possess in depth and current disciplinary specialization knowledge, but also are able to communicate and collaborate using skills across the organization in fields including business, innovation, leadership, and technology (BILT).

The ensuing question challenging industry and academia is how to prepare our workforce, both existing and future, to enable our organizations to overcome today's challenges and adapt to disruption in an agile and cost-effective manner. A recent Gartner survey revealed that 80% of the workforce, 92% of managers and 77% of senior leaders already felt poorly prepared for the future (Wiles, 2020). Another strikingly notable result from the survey is that almost 50% of employees taking the survey said they frequently had to complete responsibilities outside of their perceived role. As the COVID-19 drives unprecedented business transformation, the need for critical skills has never been greater and the existing workforce will be less "fit for purpose" (Wiles, 2020). However, most higher education programs still focus on training professionals in silos of functional disciplines (Demirkan & Spohrer, 2018). To address the challenge, we need to create some innovative approaches to bridge gaps and disconnections between those silos by moving business professionals towards technology and technology professionals to business. A BILT workforce can maximize communication, ensure implementation of the right technology, and lead organizations effectively, all essential to business survival and government operational effectiveness in times of declining budgets.

It is recognized that the traditional pathway of getting a "full-fledged" master's degree within 18-24 months may not address the challenge in a timely manner (Arbeit, Bentz, Cataldi, & Sanders, 2019; Brown & Kurzweil, 2017; EdCast Team, 2018). Therefore, the need for some alternative education modules is pressing. As educators working in the technology and business sectors of higher education, we aim to explore an alternative strategy to prepare the BILT workforce ready for the "new" economy. No business analyst or economist, in government or industry, can truly predict how and when the U.S. economy will recover from the pandemic. However, we know that implementing new technologies will be pivotal in the recovery process and that there will be a workforce gap in these important technologies (Horn, 2020). Information Technology (IT) professionals need to learn new methodologies, tools, and techniques, inside and outside their traditional knowledge areas, to power the future and ensure sustainability (Lanzolla et al., 2018; Marion, Fixson, & Brown, 2020). Business leaders must learn the power of these new technologies and the processes necessary for effective implementation in the organization's business practices.

This article first examines the "new" economy that today's organizations face, focusing on the impact of digital transformation and technological disruption. The next section reviews several alternative education models that have been taken by different stakeholders to prepare the workforce to meet employers' quickly changing expectations. The general requirements for traditional, mainstream master's degrees and graduate certificates at a business school are also discussed. We then present a case study on developing and implementing a modular curriculum structure at our school as an alternative pathway with greater degree of flexibility and agility. Finally, we discuss the potential of generalizing this alternative education model in other settings and delineate several future research directions.

2. THE CURRENT BUSINESS AND TECHNOLOGY ENVIRONMENT

Digital technologies are rapidly evolving and have dramatically affected society in the last few decades (Colbert, Yee, & George, 2016; Walter, 2016). Digital approaches, including efficiency technologies (e.g., "cloud technologies"), connectivity technologies (e.g., 5G technologies and IoT), and automation technologies (e.g., big data and DevOps) are driving forces that can transform industries and institutions profoundly (Lanzolla et al., 2018). Organizations are facing with massive changes introduced by artificial intelligence (AI), robotic process automation (RPA), telepresence systems, mobile computing, and cyber threats, all of which challenge existing capabilities and skills (Baralou & Tsoukas, 2015; Dougherty & Dunne, 2012). Several major factors shaping the current business and technology environment are discussed below.

A recent survey of more than 800 CEOs, senior executives, and directors showed that digital transformation risk was one of their top concerns for 2019 (Sun, 2018). Another report revealed that 70% of all data transformation initiatives did not reach their goals (ZoBell, 2018). A further analysis of the success cases led to the findings that digital transformation worked for those organizations that focused on changing the mindset of their employees, leveraging the insider knowledge of the organizations, and adjusting the organizational culture and processes strategically (Tabrizi , Lam, Girard, & Irvin, 2019). Strong business and technical leadership were a must and innovative approaches (thinking outside the box) was imperative. As digital transformation is a multi-faceted phenomenon, how the combined effect of digital technologies transforms organizations and impacts business success still remains unclear (Lanzolla et al., 2018).

Disruptive technologies such as AI and robotics have long been predicted to change the skills needed to perform today's jobs and reshape the workforce landscape (Brynjolfsson & McAfee, 2014). We are now seeing this happen. Intelligent software and smart robots are increasingly used to make complex decisions and take over previously human tasks (Schwarzmüller, Brosi, Duman, & Welpe, 2018). Gartner TalentNeuron data showed that AI was expected to be pervasive in new software products and services by 2020 (today) and become a positive net job motivator (Wiles, 2018). We were observing some shifts in workforces and workforce planning based on the impact of AI before the COVID-19 pandemic. These shifts will continuously evolve along with the increasing adoption of AI across different functions in organizations as automation initiatives gain momentum with mounting financial pressures. AI has, however, increased demand for the skills it cannot replace such as creativity (Frenkel, Korczynski, Donoghue, & Shire, 1995) and social interactions (Frey & Osborne, 2017). Therefore, the critical skills that can sustain our digital future are not siloed technical skills, but a broader perspective with a balance of technical skills, innovative thinking, communication skills, and business acumen, including leadership.

As technology has become commonplace in everyone's life, so has the number of cyberattacks increased and incidents of cybercrime have sky-rocketed during the Covid-19 pandemic (Bolster, 2020). The outbreak of COVID-19 resulted in dramatic changes to the business operations of organizations across the globe. This placed additional stress on the digital infrastructure caused by the large number of people working from home as well as cybercriminals taking advantage of the "fear" of the population.

Consequently, another major factor impacting the business and technology environment is cybersecurity capacity. One of the latest studies revealed that around 94% of security and IT professionals globally are concerned about their organization's cybersecurity after the outbreak of the COVID-19 pandemic (Tripwire, 2020). The study further showed that organizations are struggling to mitigate the risks of increased pandemic-related attacks, with 58% of security issues revolving around remote workers. Cybersecurity controls and policies in organizations are put under stress due to the disruption. The ongoing situation has significantly impacted employees across all the functions who need to deal with emerging cybersecurity challenges, which requires robust security measures in remote work environments, quick response capability to contain potential cyber risks, and business culture and strategy aligned with cybersecurity policies and measures.

New technologies adopted by organizations must co-evolve with the skills that those organizations need. Before organizations can rethink their strategies in sustaining growth, promoting innovations, and competing for talent, they must identify the core skills they need to innovate and survive. It has been found that the competencies companies need most are business-oriented rather than technical, even for brick-and-mortar companies that are trying to become more digital (Marion & Fixson, 2018). New technologies must be implemented strategically to align with business goals and an entrepreneurial spirit must be encouraged both inside and outside organizations. To drive innovation internally, an organization cannot only rely on hiring all-new workers because of the enormous expenses and deficit of qualified recruits (Marion et al., 2020). A more practical and sustainable approach lies in reskilling existing employees and other members of their communities. We need a cadre of talent who can lead innovations during the digital age, and they need to possess business acumen, an entrepreneurial spirit, leadership skills and technology (BILT) competence. This article, therefore, aims to demonstrate an alternative pathway the authors have created at their school to reskill technology and business

professionals to fill the ever-changing and challenging job market.

3. ALTERNATIVE EDUCATION AND TRAINING APPROACHES

A PwC CEO survey reported that 77% of surveyed chief executives think that a scarcity of people with key skills is the biggest threat to their business (PWC, 2017). However, 61% of CEOs revealed that they had not yet taken any additional steps at that time to attract and retain talent. A recent survey by Harvard Business Publishing Corporate Learning presented a similar concern from the employees' angle, in which nearly half of employees were disappointed in their employer's learning and development programs (Westfall, 2019). Employers believe that the need for qualified talent is so urgent that the traditional education system cannot keep abreast with the demand. We, as educators, need to rethink our curricular model and renovate the pathway to supply the needed workforce to support the new business models. This section provides an overview of several emerging, as well as well-established, alternative education and training models for adult learning and reskilling.

There is a well-researched and documented need for higher education to provide multiple pathways and techniques that have arisen including bootcamps, competency-based education, and stackable certificates (Brown & Kurzweil, 2017; Sandeen, 2013). These techniques are being used to help students learn academic content from where they are, regardless of time, place, or pace of learning. They provide flexibility in what is learned, many focusing on career prospects, how it is learned, and provide students with personalized learning opportunities.

Bootcamps/coding academies have been offered as an alternative training module in response to employers' quickly changing skill and credential requirements. Based on a study on 1,010 technology-related programs offered in the United States, Canada, and online, there is more diversity in terms of bootcamp providers, the mode of delivery (online vs. in person), intensity (part time/full time), cost, and program types than would be expected from public discourse (Arbeit et al., 2019). Based on the data they collected, they presented a classification structure for bootcamps as five distinct program types including: comprehensive career preparation program, standalone course, university-affiliated program, fellowship program, and postsecondary education replacement program. Despite the high expectation of bootcamps being used to reskill employees, this research showed that it does not align as well with the labor market demand as would be expected based on media coverage. These academies are generally lacking in accreditation standards resulting in very uneven quality levels.

Competency-based education (CBE) is another alternative model that has recently garnered recognition for its potential to offer flexible and affordable post-secondary educational options (Rivers et al., 2019). In the broadest sense, competency-based programs offer an alternative pathway to a degree by awarding academic credit when students demonstrate competency in designated learning outcomes rather than when they pass courses that meet requirements for instructional time (Brown & Kurzweil, 2017). CBE can take either a credentialing approach that awards students' academic credit based on assessment of their prior learning or an instructional approach in which students are taught material on a more flexible schedule than that of traditional academic programs. Generally, students are graded on a pass/fail basis and can repeat multiple times, making it difficult for employers to identify the high performers.

There has been a perceived gap between the skills demanded by the labor market and skills the workforce acquired from college degrees (Abel & Deitz, 2014; Cappelli, 2015; Horn, 2020). One proposed approach to address the issue is to develop "stackable" credentials. Stackable credentials are defined as "part of a sequence of credentials that can be accumulated over time and move an individual along a career pathway or up a career ladder" (Austin, Mellow, Rosin, & Seltzer, 2012). A series of stackable credentials can serve as part of a sequence of credentials that lead efficiently to a longer-term degree (Bailey & Belfield, 2017). More importantly, stackable credentials allow experienced workers to upgrade their skills without limiting long-term opportunities, and they are the most beneficial when the cumulative effect of all credentials is greater than the effect of each one separately and by itself (Accenture, 2016).

The challenges of time, distance, and costs associated with traditional degree completion make online delivery of instruction more a flexible pathway that is more accessible and potentially affordable (Rivers et al., 2019).

Online learning emerged over two decades ago as a technology category introducing disruptions to the traditional, classroom-bounding model. It is growing rapidly in postsecondary education. Today, roughly a third of students in the United States take at least one online course as part of their accredited higher-ed experience, and over 15% study exclusively online (Lederman, 2018). Many of those students are adult learners who are employed while taking online courses on platforms such as Coursera, Udemy, and edX. One interesting by-product of the online learning model is the creation of numerous organizations and offerings that support companies' talent development efforts (Horn, 2020). For example, organizations such as Pluralsight, LinkedIn Learning, Learn@Forbes, and Udacity focus on helping employers re-skill the workforce in cutting-edge fields.

4. THE BILT MODEL AS AN ALTERNATIVE PATHWAY

While many of these educational or training approaches enhance individual skills, they are very personalized and are primarily designed to provide fundamental skills such as learning to code in Python. They do not generally include developing soft skills such as oral communication, writing, and teamwork, all very important in today's workplace.

The question we posed is how can we apply these techniques to graduate education across the needed disciplines of business, innovation, leadership, and technology (BILT), given our technology programs are in a School of Business and Technology. We previously had developed and successfully implemented dual degree programs with some of the business programs, for example, a dual MBA/Information Technology program. But these are too long (2 -3 years) in many cases to meet the need for this "new" economy.

The BILT model we propose is driven by the fact that the skills, rather than roles, are becoming more and more relevant and useful to fuel competitive advantage in an organization, especially when tasks and responsibilities change quickly (Wiles, 2020). However, it is not practical to eradicate the existing workforce bounded by two distinctive silos of roles: technical professionals and business professionals. On the one hand, many people in the workforce have the technology framework and experiences. For example, they may have been coding in COBOL or they may have been maintaining servers and networks for years. Such members of the workforce just need to be upskilled in the emerging technology of today and the business and security issues with their implementation. On the other hand, many people in the workforce have the business framework and experiences such as providing financial management support for their company or minimizing inventory to maximize sales and reduce overhead costs. Such business professionals just need to be upskilled in the application of emerging technology to their business. To achieve a sustainable workforce development goal, the BILT model is designed to provide an alternative "fast-track" enhancing and complementing disciplinary specializations with a focus on combined skills across multiple domains.

We researched the problem and identified three important factors impacting our consideration on skills and knowledge that need to be covered in the BILT model. First, everyone in management of an organization needs to understand the cyber risk associated with existing and emerging technology and the need for revised cybersecurity controls to protect that investment. Second, innovation is an important critical success factor in the new economy. There has been a shortage of graduates who are prepared to use entrepreneurial skills to help employers grow and meet the challenges of an ever-changing world. Students often feel left out from entrepreneurship programs because they want to use their entrepreneurial spirit and skills in existing organizations, rather than start their own. Intrapreneurship, defined as the application of entrepreneurial behavior to growth challenges in existing organizations, drives the growth of many successful area businesses in media, hospitality, government contracting, healthcare and IT (Seshadi & Tripathy, 2006). Third, new technologies, such as AI, are resulting in organizational disruption and so changing management and other leadership principles (Behreandt, 2019).

In summary, the BILT model can be depicted as an "H-shaped" curriculum model, with the technical and business domain knowledge as two vertical lines, bridged by a horizontal line of skills in different domains including business, innovation, leadership, and technology. The illustration of the model is shown in Figure 1.

Figure 1. The BILT Model (see appendix)

5. CASE STUDY: IMPLEMENTATION OF THE BILT MODEL

Stackable Credentialing

We ascertained that our current approach of masters' degree with specialties worked well for new entrants in the field, but not for existing workers looking for a quick sprint of additional knowledge and skills for the "new" economy workplace. We examined our existing master's level curriculum in IT and cybersecurity and recognized that our existing 12-credit specialties covered most of the content needed for some of these quick sprints. We decided, therefore, to separate them out into new certificates including:

- Cybersecurity
- Data Science
- Digital Health
- Digital Transformation

For the business and leadership aspects, we also looked at the masters' programs in the MBA, in the management and leadership program, and in the human resources program and identified courses that would give quick sprints, resulting in three new business certificates:

- Leadership
- Project Management
- Talent Management

Our last remaining gap was in the innovation area. The university had launched a new intrapreneurship initiative in September 2019 to address one of the most significant talent gaps in our region: - graduates who are prepared to use their entrepreneurial skills to help their employers develop new products and services to meet the challenges of today's digital world. Amazon, with its move of HQ2 to Arlington, had made it clear through public statements and its own publicized activities that it puts a premium on a workforce that has the ability to apply technology and business principles in a holistic manner, and integrate these skills to create innovation and deal with a rapidly changing work environment.

We had no specific curriculum in intrapreneurship, although innovation was covered in the MBA and in the masters in management and leadership. Based on this existing content, we developed five specific intrapreneurship courses. Three are required courses: "Entrepreneurship Thinking", "Intrapreneurship", and "Strategic Growth for Entrepreneurs and Intrapreneurs". The fourth allows students to select either the startup route with a course entitled "Emerging Business Formation and Financing" or focus on intrapreneurship within an organization focusing on leadership or management ("Dynamic and Adaptive Leadership").

Each of the certificates was created and approved through several layers of the university's curriculum approval process. Students can enroll in the certificates individually and get the master's level certificate in 2 semesters. Due to many recent revisions in the university's curriculum process to maintain the university's agility in today's environment, the certificate program was created and approved in less than one year and will begin in Fall 2020.

We also left it open that we will be adding additional certificates to the program over time, for example, graduate certificates in artificial intelligence and business foundations are in the works.

Diploma Plus

Most organizations will require many of their business and technology workers to have more than one new knowledge and skills: for example, digital transformation, cybersecurity, and project management to effectively implement new technology within an organization.

To incentivize this multi-skill acquisition, the program allows the technology students to take 3 of the certificates in a five-year span (at least 2 of which must be technical) to earn a MS in Emerging Technology. In addition, for business students we will implement a MS in Technology Management for those who take 3 certificates, at least 2 of which are in the business area.

Similarly, we will allow working adults in the MS in Information Technology and MS in Cybersecurity programs to earn certificates based on their chosen specialty, or to add a

second certificate to their current master's programs.

The conceptual framework of stackable credentialing and diploma plus is shown in Figure 2.

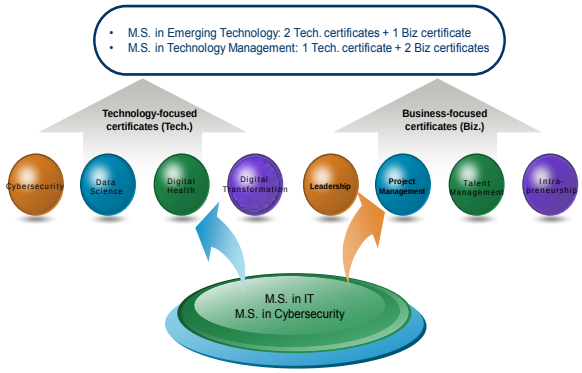

Figure 2. The Conceptual Framework of Stackable Credentialing (see appendix)

Hybrid Learning

The university has been moving to hybrid (sometimes referred to as blended learning) for the past few years, combining the advantages of remote access for some, or parts of some, courses without losing the enhanced learning experience of face-to-face classes. As for all other educational institutions, Covid-19 has accelerated our move to online education for all classes as universities shuttered their doors in the middle of the Spring 2020 semester. We have, however, continued to focus on our "high-touch" approach, albeit through remote tools such as Zoom.

The certificates will be offered in this hybrid format to maximize the learning and increase the flexibility for working adults. Our focus is not just becoming familiar with the new subject matter but also developing the 21st century skills, which are increasingly important in this fast-moving digital world. Communication skills, team work, critical thinking, and respect for diversity are important parts of our approach, and largely reinforced in the face-to-face or live remote class components.

6. FUTURE OF THE IT WORKFORCE

There is no doubt that IT budgets will be tight in the next few years as economies struggle to recover from the effects of the pandemic. Businesses will focus on digital transformation to improve their productivity and leadership will expect a higher return on investment (ROI) than in the past. Forbes reported that 70% of existing digital transformation initiatives were not expected to meet their stated goals resulting in over $900 billon of wasted investment (ZoBell, 2018). By integrating skills across the enterprise in business, innovation, leadership and technology (BILT) and stressing communication and teamwork, our reskilled workforce should be poised to meet these higher expectations.

While our focus has been on business reinvention in the new economy, our approach also applies to our system of government, federal, state and local, which faces many of the same workforce issues. In May 2020, the Federal CIO Council updated its thoughts on the future of the federal IT workforce (CIO Council, 2020). They recognized there are a number of federal employees who are ready to retire and who do not want to retrain for the constantly evolving IT environment. Many of these are the managers in the IT organizations and will need to be replaced by new IT talent that understands new technology and its implementation. However, they also recognize that attracting and hiring such talent may not be easy and that they will need to offer the existing IT workforce reskilling opportunities to enable them to understand and manage the new innovations and changes that must happen in the workplace.

7. CONCLUSIONS

We, as business and technology educators, must determine the best way to support the "new" economy with its focus on new business models and digital transformation. For probably one of the first times in history, in-demand workplace skills are fundamentally changing within an individual's work life, requiring additional learning past the traditional educational training. There are many options for learning now through Internet-based options including online courses, bootcamps, and for-profit certification programs.

As educators in the higher education system, we need to transform our educational offerings, what we teach and how we teach, to support the success of existing and new workers and to be sustainable as an institution. We first need to understand the in-demand work skills and be the first to the table with education that develops the worker outside their traditional stove-piped

role. We need to modularize our offerings to be manageable in today's fast changing field and to allow our students to make timely advances in their organization. We began by breaking down our master's graduate program into stackable certificates and will later be working on modularizing courses, for example, converting a 3-credit course into 3 1-credit courses so that each can be taken in a short sprint.

Finally, in this world of personalization, we need to understand the individual needs of students. There is so much diversity in the background of our graduate students: many are career-changes, others are looking for higher-level positions in their discipline, many need to develop soft skills to support today's team environments, while others our transitioning from technical to management positions. We need to understand individual student needs and career objectives and personalize their educational experience as much as possible. The concept of the "guidance counsellor" in high school may need to be reinvented at the graduate level and we will continue to research this concept as we formally assess the success of our stackable certificates.

9. REFERENCES

Abel, J. R., & Deitz, R. (2014). Do the Benefits of College Still Outweigh the Costs? *Current Issues in Economics and Finance, 20*(3), 1-11.

Accenture. (2016). Bridge the Gap: Rebuilding America's Middle Skills. Retrieved from https://www.hbs.edu/competitiveness/Documents/bridge-the-gap.pdf

Arbeit, C. A., Bentz, A., Cataldi, E. F., & Sanders, H. (2019). Alternative and Independent: The Universe of Technology-Related "Bootcamps". *RTI Press Publication No. RR-0033-1902. Research Triangle Park, NC: RTI Press.* Retrieved from https://www.rti.org/rti-press-publication/alternative-and-independent/fulltext.pdf

Austin, J. T., Mellow, G. O., Rosin, M., & Seltzer, M. (2012). *Portable, Stackable Credentials: A New Education Model for Industry-specific Career Pathways*. New York, NY: McGraw-Hill Research Foundation.

Bailey, T., & Belfield, C. R. (2017). Stackable Credentials: Do They Have Labor Market Value? *Community College Research Center Working Paper*. Retrieved from https://doi.org/10.7916/D8446038

Baralou, E., & Tsoukas, H. (2015). How is New Organizational Knowledge Created in a Virtual Context? An Ethnographic Study. *Organization Studies, 36*(5), 593-620.

Behreandt, D. (2019). The Age of Artificial Intelligence is Here. *New American, 35*(10), 10-19. Retrieved from https://www.thenewamerican.com/print-magazine/item/32202-the-age-of-artificial-intelligence-is-here

Bolster. (2020). State of Phishing and Online Fraud, Q1 2020 Report (COVID Edition). Retrieved from https://bolster.ai/reports

Brown, J., & Kurzweil, M. (2017). The Complex Universe of Alternative Postsecondary Credentials and Pathways. *Cambridge, MA: American Academy of Arts & Sciences*. Retrieved from http://www.amacad.org/sites/default/files/academy/multimedia/pdfs/publications/researchpapersmonographs/CFUE_Alternative-Pathways/CFUE_Alternative-Pathways_Landscape.pdf

Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Machines*. New York: W.W. Norton & Company, Inc.

Cappelli, P. (2015). *Will College Pay Off? A Guide to the Most Important Financial Decision You'll Ever Make*. New York, NY: PublicAffairs.

CIO Council. (2020). Future of the Federal IT Workforce Update, May 2020. Retrieved from https://www.cio.gov/assets/resources/Future_of_Federal_IT_Workforce_Update_Public_Version.pdf

Colbert, A., Yee, N., & George, G. (2016). The Digital Workforce and the Workplace of the Future. *Academy of Management Journal, 59*, 731-739. Retrieved from https://aom.org/uploadedFiles/Publications/AMJ/June_2016_FTE.pdf

Demirkan, H., & Spohrer, J. C. (2018). Cultivating T-Shaped Professionals in the Era of Digital Transformation. *Service Science, 10*(1), 88-109. Retrieved from https://doi.org/10.1287/serv.2017.0204

Dougherty, D., & Dunne, D. D. (2012). Digital Science and Knowledge Boundaries in Complex Innovation. *Organization Science, 23*(5), 1467-1484.

EdCast Team. (2018). Reskilling the Global IT

Workforce to be Future-Ready. Retrieved from https://www.edcast.com/corp/blog/reskilling-the-global-it-workforce-to-be-future-read/

Frenkel, S., Korczynski, M., Donoghue, L., & Shire, K. (1995). Re-constituting Work: Trends Towards Knowledge Work and Info-normative Control. *Work, Employment and Society, 9*(773-796). Retrieved from https://doi.org/10.1177/095001709594008

Frey, C. B., & Osborne, M. A. (2017). The Future of Employment: How Susceptible are Jobs to Computerization? *Technological Forecasting and Social Change, 114*(254-280). Retrieved from https://doi.org/10.1016/j.techfore.2016.08.019

Horn, M. B. (2020). Education, Disrupted. *MIT Sloan Management Review, 61*(2), 1-5. Retrieved from https://sloanreview.mit.edu/article/education-disrupted/

Kraaijenbrink, J. (2019). Strategy In A Volatile World. *Forbes*. Retrieved from https://www.forbes.com/sites/jeroenkraaijenbrink/2019/01/11/strategy-in-a-volatile-world/#46445484220b

Lanzolla, G., Lorenz, A., Miron-Spektor, E., Schilling, M., Solinas, G., & Tucci, C. (2018). Digital Transformation: What Is New If Anything? *Academy of Management Discoveries, 4*(3), 378-387. doi:10.5465/amd.2018.0103

Lederman, D. (2018). Online Education Ascends. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/digital-learning/article/2018/11/07/new-data-online-enrollments-grow-and-share-overall-enrollment

Marion, T., & Fixson, S. (2018). *The Innovation Navigator: Transforming Your Organization in the Era of Digital Design and Collaborative Culture*. Toronto, Canada University of Toronto Press.

Marion, T., Fixson, S., & Brown, G. (2020). Four Skills Tomorrow's Innovation Workforce Will Need. *MIT Sloan Management Review, 61*(2), 1-7.

PWC. (2017). The Talent Challenge: Harnessing the Power of Human Skills in the Machine Age. Retrieved from https://www.pwc.com/gx/en/ceo-survey/2017/deep-dives/ceo-survey-global-talent.pdf

Radoini, A. (2020). Cyber-Crime during the COVID-19 Pandemic. Retrieved from http://www.unicri.it/news/article/covid19_cyber_crime

Rivers, C., Gibson, S., Contreras, E., Livingston, T., & Hanson, P. (2019). Competency-based education: An evolutionary higher education business model. *Journal of Competency-Based Education, 4*(1), n/a-n/a. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1002/cbe2.1179

Sandeen, C. (2013). The New Postsecondary Landscape. *Continuing Higher Education Review, 77*, 28-39. Retrieved from https://files.eric.ed.gov/fulltext/EJ1089488.pdf

Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018). How Does the Digital Transformation Affect Organizations? Key Themes of Change in Work Design and Leadership [Article]. *Management Revue, 29*(2), 114-138. doi:10.5771/0935-9915-2018-2-114. (Accession No. 130683556)

Seshadi, D. V. R., & Tripathy, A. (2006). Innovation Trough Intrapreneurship: The Road Less Travelled. *Vikapla, 31*(1), 17-30. Retrieved from https://journals.sagepub.com/doi/abs/10.1177/0256090920060102

Sun, M. (2018). Businesses Predict Digital Transformation to Be Biggest Risk Factor in 2019. *The Wall Street Journal*. Retrieved from https://blogs.wsj.com/riskandcompliance/2018/12/05/businesses-predict-digital-transformation-to-be-biggest-risk-factors-in-2019/

Tabrizi , B., Lam, E., Girard, K., & Irvin, V. (2019). Digital Transformation Is Not About Technology. *Harvard Business Review*. Retrieved from https://hbr.org/2019/03/digital-transformation-is-not-about-technology

Tripwire. (2020). Remote Work And COVID-19 Cybersecurity Impact Report. Retrieved from https://www.tripwire.com/misc/covid-19-cybersecurity-report

Van der Steege, M. (2017). Introduction. In M. Van der Steege, R. Elkington, J. Glick-Smith, F. T. Moss-Breen, B. Krawchuk, N. von Stamm, S. Pearse, & E. Martin (Eds.), *Visionary leadership in a turbulent world: Thriving in the new VUCA context* (pp. 7–

24). Bingley, United Kingdom: Emerald Publishing.

Walter, A. (2016). How Will Digitalization Change Agriculture? *International Trade Forum, Special Report, 2*, 28-29.

Westfall, C. (2019). New Survey: Nearly Half of Workers Unsatisfied With Learning and Development Programs. *Forbes*. Retrieved from https://www.forbes.com/sites/chriswestfall/2019/10/08/new-survey-workers-unsatisfied-with-learning-and-development-programs-training-leadership/#3cb5d1f948a4

Wiles, J. (2018). Action Plan for HR as Artificial Intelligence Spreads. Retrieved from https://www.gartner.com/smarterwithgartner/action-plan-for-hr-as-artificial-intelligence-spreads/

Wiles, J. (2020). Build the Workforce You Need Post-COVID-19. Retrieved from https://www.gartner.com/smarterwithgartner/build-the-workforce-you-need-post-covid-19/

ZoBell, S. (2018). Why Digital Transformations Fail: Closing The $900 Billion Hole In Enterprise Strategy. *Forbes*. Retrieved from https://www.forbes.com/sites/forbestechcouncil/2018/03/13/why-digital-transformations-fail-closing-the-900-billion-hole-in-enterprise-strategy/#706753577b8b

Appendices and Annexures

Figure 1. The BILT Model

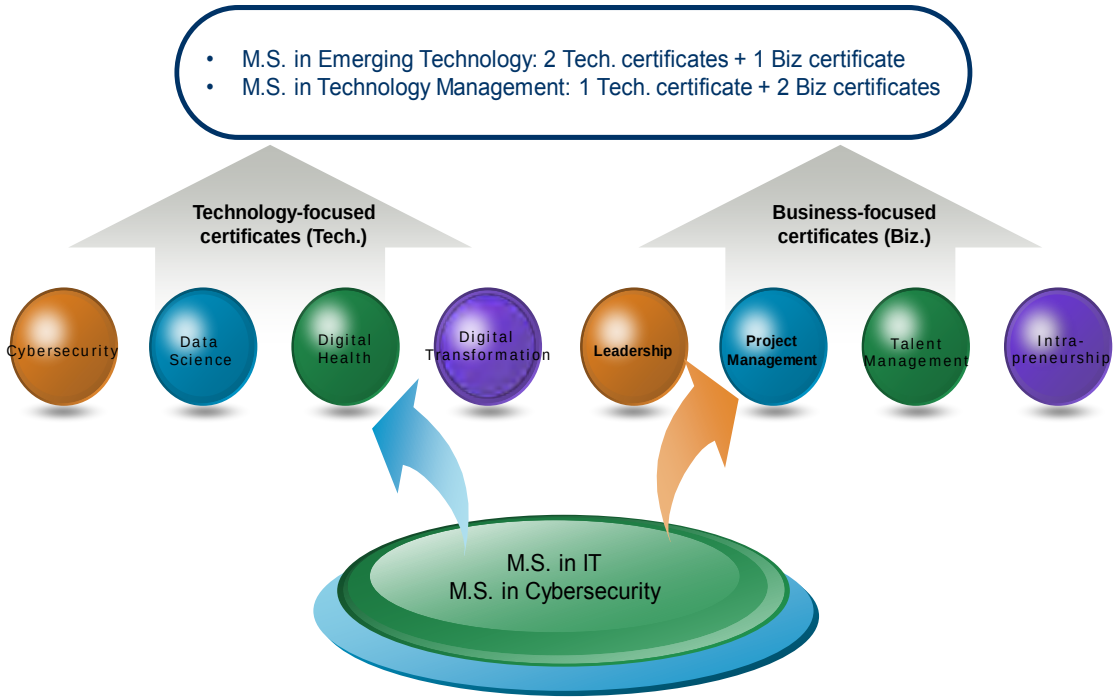

Figure 2. The Conceptual Framework of Stackable Credentialing