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Employability and STEM higher education: Are graduate students going soft?

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Employability and STEM higher education post-Covid: Are graduate students going soft?

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Introduction

One of the goals of Higher Education Institutions (HEIs) is to prepare their graduates to be workplace ready. Previous studies have established connections between work-ready graduates and sustained economic growth (Clarke, 2018). In periods of economic growth, employers can seek employees with well-developed transferable skills in areas beyond the discipline (Huang, Fisher, Ding, and Guo, 2021). However, there is no single set of skills that employers want from graduates (Maxwell and Armellini, 2018). Nonetheless, in periods of economic uncertainty and unpredictable labor markets, employers may adopt different measures or criteria for recruitment (Clarke, 2018), and potential employees may seek work elsewhere. The Covid-19 pandemic epitomizes the most significant moment of uncertainty the global economy has ever witnessed. With the ever-changing sanitary conditions and new waves of Covid-19, there is a lack of information on the necessary skills for workplace success or the future of the workplace (in general). This paper aims to bridge the gap between the skills that are (still) taught in graduate programs and the skills graduates genuinely need in the post-Covid workplace.

Purpose

Since early 2020, the Covid-19 pandemic has affected all industries worldwide. Airplanes were grounded, travel was halted, and many professionals were furloughed or simply out of work. Some of these professionals converted to other industries during this time or retrained for new opportunities. They were not prepared to routine to their ‘old’ jobs or ‘traditional ways of working. The previous dilemma of retaining talent has been overshadowed by the need to attract talented graduates to work in specific industries. Thus, the purpose of this ongoing research project is three-fold:

1. to identify the employability skills necessary to flourish in a post-Covid-19 workplace, particularly in STEM disciplines,
2. to attempt to fill the gap between STEM graduate student perspectives and employers’ perspectives, and
3. to make a stronger link between STEM HEIs and the real world.

In this developmental paper, we will focus on an initial reflection on the first objective, i.e., identifying the skills needed to be successful in the 21st-century workplace.

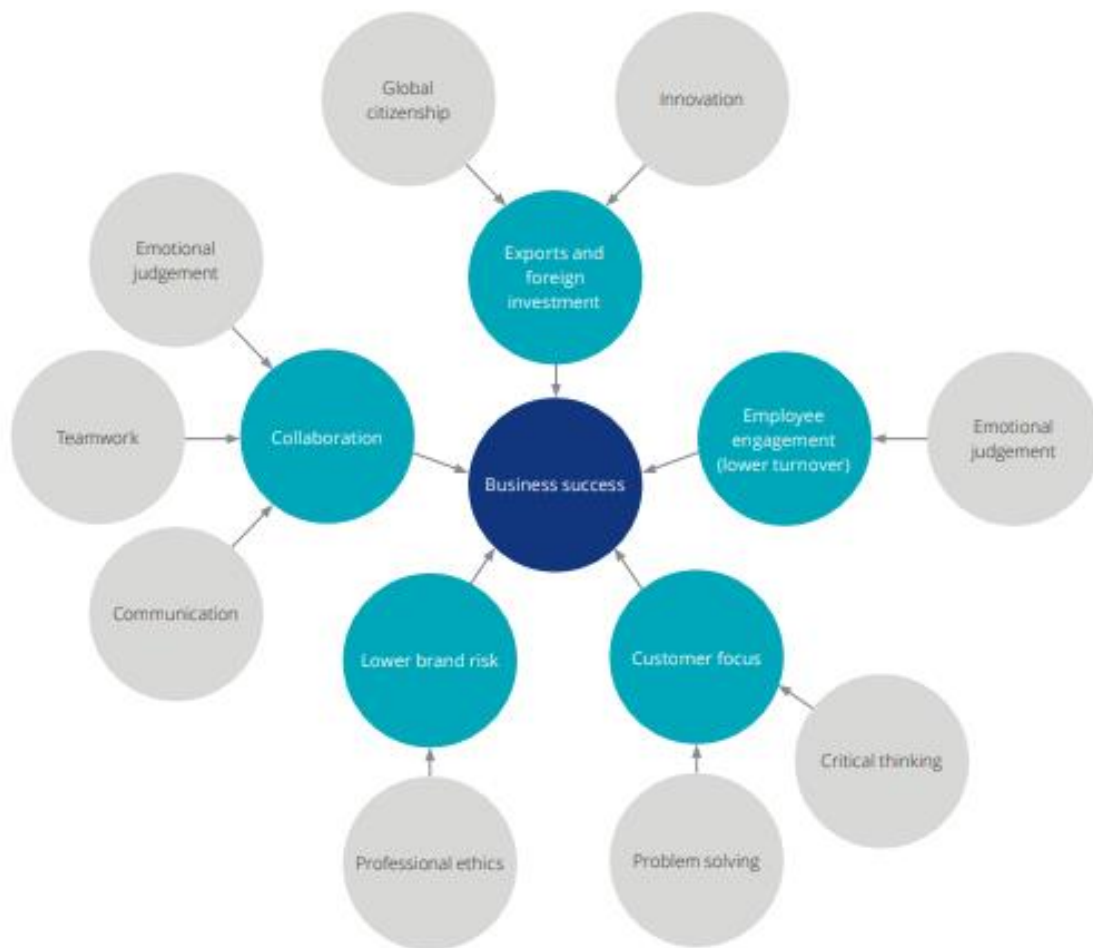
Contribution

Previous studies have addressed employability skills needed to be successful in the workplace. While earlier studies cited skills such as being a team player, self-motivation, communication, problem-solving, being proactive (McGunagle, 2016; McGunagle and Zizka, 2018), entrepreneurship, and self-management (Ng, Chan, Wut, Lo, and Szeto, 2021), this study aims to confirm if these skills are still the most relevant or determine the new skills that are more important in a post-Covid-19 economy. The findings from this study will be used to create a roadmap to help STEM attract talented employees again. The objective of this developmental paper is to narrow the gap between the skills graduate students acquire in STEM programs and the skills that employers seek. This study will contribute to the existing literature on talent management by co-creating an employability skills roadmap. Although this study is focused on STEM HEIs, it will interest all educational institutions regardless of level or discipline.

Employability- The Focus on Soft Skills

According to a report by Deloitte (2017), almost 2/3 of employment opportunities in 2030 will require soft skills because they have the potential to increase revenue and customer satisfaction (leading to further profits and retention). However, in the same report, 1/4 of employers reported having difficulty filling entry-level vacancies because applicants lack soft skills. Thus, finding candidates with hard skills or skills that could be taught on the job is less complicated than finding candidates with softer 'people' skills that enhance a company's reputation and success in employability. Figure 1 demonstrates how these soft skills can contribute to business success.

Figure 1: Ways that soft skills contribute to business success



Source: Deloitte Access Economics

(Deloitte, 2017)

These results confirm the predictions of the World Economic Forum in 2020, where they stated that critical thinking and problem-solving top the list of skills employers believe will grow in prominence in the next five years. However, the WEF also posited new skills in self-management, such as active learning, resilience, stress tolerance, and flexibility. Figure 2 summarizes the top 10 skills of 2025 that WEF in their report.

Figure 2: Top 10 skills for 2025



(World Economic Forum, 2020).

As seen in Figure 2, these skills have been cited in numerous studies (Karimi and Pina, 2021; Lisa, Henneleva, and Newman, 2019; Succi and Canovi, 2020; Yong and Ling, 2021). However, the one skill that is blatantly missing from the WEF list is communication. This study by the WEF is the only one we have found that has yet to cite communication as a critical factor to employability success. While it may fall under the category of ‘working with people’, this is an assumption; other factors may figure into the ‘working with people’ category in their study.

Employability- Link between HEIs and the workplace

Previous research has investigated the importance of including employability skills in HEI's curriculum (Karimi and Pina, 2021; Lisa, Hannelova, and Newman, 2019; McGunagle, 2016; McGunagle and Zizka, 2018; Succi and Canovi, 2020; Yong and Ling, 2021). While recommendations have been made, HEI seems slow to respond. Further, there is a growing gap regarding the responsibility for these skills. Succi and Canovi (2020) cite that employers continue to criticize graduate students' lack of transferable skills. According to a study by Karimi and Pina (2021), 96% of educators believe they have prepared the graduates with the necessary employability skills compared to 11% of employers who feel the same. This shows a dissent between the two entities that could make a difference for the graduates. Other disagreements between HEIs and employers cited in Karimi and Pina's (2021) study include the perceptions of soft skill competencies (65% of students feel very confident versus 30% of employers who agree) and critical thinking skills (70% of graduates are confident in their critical thinking skills versus less than 40% of employers who feel the same). A study by Yong and Ling (2021) posits that these different perceptions are the primary cause of the skills gap and, inevitably, continue to proliferate the employability problem. These types of dissension can lead to dissatisfied employers and demotivated employees who may depart early from the organization (Lisa, Hannelova, and Newman, 2019). While these and many other studies have analyzed the employability gap between HEIs and employers, the findings and recommendations seem to go unheeded. For this reason, we propose our project to find a realistic and practical roadmap to assist both HEIs and employers in bridging the gap.

Methodology

Based on the employability frameworks proposed by Hillage and Pollard (1998) and Knight and Yorke (2003), this study begins with a list of pre-Covid-19 16 employability skills previously published (McGunagle, 2016; McGunagle and Zizka, 2018) and provides additional employability skills that will be necessary for a post-Covid-19 economy.

The purpose of the survey is to close the gap between graduate skills and employers' requirements for employment. The pre-test is to gauge where the student perceives their skills are and which skills they think will be necessary for their future careers in the STEM industry.

Case studies allow researchers to explore complex phenomena in their natural settings, enabling a holistic understanding of the intricate relationships and dynamics involved. By examining multiple variables within a specific context, case studies provide a comprehensive view of the phenomenon under investigation (Yin, 2018). Case study methodology can be used for investigating phenomena in real-life contexts to gain deep insights and contribute to the existing body of knowledge.

The case study method involved a purposeful sample of MBA students from a STEM-based university in the United States. The data collection tool utilized was an online study in the student's courses. The survey was administered to 54 students in their MBA degree capstone course. The survey was completed by the 54 students from March through July 2022. There were 13 total questions, of which six were qualitative and seven were quantitative, that all students answered. The quantitative data were analyzed using Excel to provide a statistical summary for each of the seven questions. The mean and standard deviation for all responses were calculated to explore the distribution of each rating. The qualitative data offered an additional understanding of the students' perceptions of their skills. The qualitative data were analyzed using NVivo to determine themes from the questions in the study.

Results and Discussion

Qualitative Data Collection

Table 1: Employment Sector

Current Occupation	Number
US Government	14 (26%)
Military	11
Civilian	3
Transportation	32 (59%)
Aerospace	4
Aviation	23
Airline Industry	5
Other	8 (15%)
Telecommunications	2
Residential Real Estate	1
Textbook publisher	1
Finance/Banking	2
Full time student	2
Total	54

Table 1 shows the breakdown of the MBA students in this cohort. While eight derive from other industries, most students work within the transportation industry, mainly linked to aviation or the US Government. When asked if they intended to remain in the same employment upon graduation, 70% said yes. Of the 30% who responded negatively, they plan to change to the transportation industry. Thus, the transportation industry is the most sought-after for this MBA cohort.

The MBA respondents identified the most important hard and soft skills for their employment sector. For hard skills, they cited Accounting - Profit and loss statements, balance sheets, Computer Software - Excel, SAS, Hyperion CAD skills, Microsoft Office, Cybersecurity certification, Engineering, Finance-reinvestment and economics, Flying proficiency, Math, and Science. For soft skills, they reported the following nine skills: Communication skills/interpersonal skills/presentation, Conflict resolution, Critical thinking, Decision Making/Problem-solving, Innovation and Creativity, Leadership/Proactiveness, Analytical Skills, Teamwork, and Time Management. In Table 2, we compare the current MBA results to a

previous study conducted in 2016 by the same authors with employers of these graduates. Table 2 compares the results from this study versus the past one:

Table 2: Employer and MBA soft skill results

Soft Skills from 2016 (employers)	Soft Skills from 2022 (MBA students)
Written/oral/interpersonal communication	Communication/interpersonal skills/presentations
Team player	Conflict resolution
Problem solving, decision making ability	Critical thinking
Ability to synthesize, gather data	Decision making, problem solving
Leadership, proactiveness	Innovation and creativity
Self-motivated, high self-confidence	Leadership, proactiveness
Customer focus	Analytical skills
Negotiation skills	Teamwork
Adaptability	Time management

(McGunagle, 2016)

The results in Table 2 show several similarities between the soft skills identified by the two groups, such as communication skills, being a team player, problem solving/decision making, and leadership/proactiveness. However, there are still areas sought after by employers that students need to consider, leading to the conclusion that the gap continues to widen between employer and MBA student expectations. For example, employers seek those who can gather and synthesize data, are self-motivated with high self-confidence, are adaptable and customer-focused, and have strong negotiation skills.

Table 3: Graduate perceptions of soft skills

Quantitative Data Collection

	MEAN	SD
Q5 How competent do you feel in your ability to problem-solve?	4	0.934199
Q6: How competent do you feel in your ability to gather data?	4	1.124336
Q7: Thinking about how proactive you are, how would you rank yourself regarding this characteristic?	4	0.737653
Q8: How competent do you feel in your ability to motivate others?	4	1.179718
Q9: How competent do you feel in your communications skills?	4	1.25652
Q10: How competent do you feel in your team-building skills?	4	1.170435
Q11: How competent do you feel in your writing skills?	4	1.102364

The perception of the 54 students is that they feel confident that their skills noted in questions 5-11 reflect that a large percentage of the graduating students have a strong comfort level with those skills. This could suggest that graduating students believe they are prepared for the workplace compared to their future employers' perceptions noted in previous studies.

Table 4: Summary Findings

Percentage that Scored 3% or less

	Percentage
Q5: How competent do you feel in your ability to problem-solve?	15%
Q6: How competent do you feel in your ability to gather data?	24%
Q7: Thinking about how proactive you are, how would you rank yourself regarding this characteristic?	20%
Q8: How competent do you feel in your ability to motivate others?	20%
Q9: How competent do you feel in your communications skills?	6%
Q10: How competent do you feel in your team-building skills?	15%
Q11: How competent do you feel in your writing skills?	11%

The summary of findings in Table 4 provides an overview of the percentage of students that answered 3% or less in these questions. While we are aware that students traditionally score their skills higher, it is essential that they can rationally assess their skills and, eventually, work harder to acquire a strong comfort level that they have mastered the skill required. These percentages indicate that follow-up work is needed in our class development to ensure the student feels confident entering the job market or obtaining a promotion.

Practical implications

This paper highlights the disconnect between what MBA students and employers consider crucial employability skills. It is also a call to all STEM stakeholders, both internal and external, to re-assess the current curriculum and programs and collaborate to narrow the gap between graduate competencies and the real needs of the workplace. The employability frameworks of Hillage and Pollard (1998) and Knight and Yorke (2003) suggested the need for embedding employability skills into academic programs; the results of our ongoing study will attempt to close the gap by offering a practical roadmap to do so.

Next steps

We continue to conduct the same study with other MBA cohorts to confirm the results of this first group. We will then return to employers in these sectors to share our results. Through this exchange, we aim to create a roadmap for employment in the 21st century that will satisfy both employers and graduates in a post-pandemic environment. This roadmap will be shared with STEM HEIs as a starting place for revamping their programs in the future.

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