

THE 21ST CENTURY TECHNOPRENEURIAL SKILLS COMPETENCE AMONG UNIVERSITY STUDENTS: A COMPARISON STUDY BETWEEN PROGRAMS, GENDER AND AGE

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ABSTRACT: The 21st-century technopreneurs' skills are to examine to promote urgent skills that university students should master as a vital resource for future careers and business competencies. The study aims to identify the comparison between study programs, gender, and age among university students on behalf of technopreneurial skills interests competencies. The research method used in this study ran under the qualitative research method to explore programs' study gender and age to determine the effect of the independent variable on the dependent variable outcome. In response, this study sought to explore 21st-century technopreneurial competencies, particularly in educational management. The research was conducted at one of the state universities in Yogyakarta, Indonesia. The respondents for this study were university students; the technique was performed using an instrument that passed a reliability test by writing the research question. Data were collected through an online questionnaire survey using google forms relevant to the data obtained, and the data analysis returned a Cronbach Alpha of 0.866 percent. The research sample selected 139 university students, and the sample size indicates a depth of understanding of technopreneurship competencies among university students. The findings revealed that: (1); the study program correlates university students could possess appreciable technopreneurial skills based on program studies. (2) Hence, the researcher concluded that there is no significant association between the university student's level of gender and age of the students and study programs' prioritization of 21st-century technopreneurial skills. Thus, there was no correlation in competencies between their perception based on their study program, gender, and age. The p-value of the chi-square test all returned statistically insignificant at alpha 5%. Thus, this study also reiterated the need for higher learning institutions to constantly upgrade their curriculum by offering professional development courses. And training programs for their students to turn out strategic thinkers and change-makers who will have the relevant skills needed to succeed in a rapidly changing global business and work environment.

Keywords: technopreneur; competency; entrepreneurship; 21st-century skills; technology

1. INTRODUCTION

This paper compares technopreneurs skills among university students based on program study, gender, and age-required 21st-century skills. technopreneurial skills. Technopreneurship is one

of the resource components that combine meaning with known technical and entrepreneurial skills to create new technological knowledge [1]; A notable phenomenon in this century is the heightened interest in the globalization of socio-economic activities aided by information and communication technologies (ICT) [2]. Although this has continued to pose a challenge for young adults globally, optimism about entrepreneurial talent abounds in this highly globalized 21st-century economy [3]. Today, there is no doubt that the development of information communication technologies (ICT) plays an essential role in nations' economic growth and development [4]. A nation's shift from underdevelopment to industrial-based development has been linked with its rate of information communication technologies adoption and innovation [5].

Earlier technopreneurial skills, the subsequent proliferation of information-communication devices such as computers and smartphones, and new knowledge have increased exponentially, increasing new economic enterprises that are breaking the frontier of technopreneurship. Integrating entrepreneurship with information communication technologies (ICT) to advance their global competitiveness [6]. Notably, on an individual basis, these technological skills, which are invented to make our lives simpler, have somewhat made it more complex as more individuals are forced to compete for the limited available resources and economic opportunities. Especially in the 21st-century workplace, career and job skills, even though this complexity leads to the development a technologically driven knowledge society in rapid growth [7].

The traditional workplace, where the work that needs to be done is broken up into smaller and specific job tasks, has been long reported as a disappearing job [8]. As the new workplace of the 21st century continues to compete around knowledge and information-based activity, an employee's ability to process information with the aid of technology has become equivalent to their ability to remain relevant or gainfully employed in the workplace [9]. This situation leaves university students facing a vast and increasing number of complex and interlinked problems in their career prospects [10]. Therefore Fresh Graduates of both gender, depending on the level of their age, are looking forward to working in different sectors of today's technologies. They will be forced to acquire new skills and ways of reasoning in job skills. In the 21st century, the economy has shifted from technology based on commodities and manual labour to one based on knowledge and highly digitally oriented human capital resources [11]. As information communication technologies remain dominant in the 21st-century workplace, institutions of higher learning act as a catalyst in fostering and turning out highly technologically proficient 21st-century human capital resources by offering major courses concerning information communication technologies and entrepreneurship [12].

Recently, information-communication technologies have significantly impacted how new business ventures are imagined and created [13]. An economy rapidly grows and performs brightly cleverly if entrepreneurs make remarkable progress in various sectors of that economy with the applicability of information-communication technologies[14]. Arising information-communication technologies, a paradigm is leveraging the potential of a collaborative workforce and collective intelligence to build and launch more sustainable entrepreneurial

enterprises [15]. Although technopreneurialship is relevant and timely, there is a limited amount of literature on university students' understanding and perception of technopreneurs skills as a vital resource for career and business success in the 21st century. The demand for information-communication technology-related skills in today's job market requires job seekers to bring relevant and updated technological know-how. Else, they are left behind [16].

However, there has been a significant discussion among university students' competency based on the study program interest considering gender, while technopreneurs skills fully drive achieving their opportunities through appropriate age [17]. In the previous study related to this paper, the role among university students in the 21st century is to establish independent activities in bringing opportunities to create self-business relevant to their study positions to enhance technopreneurs skills [18]. 21st-century skills, which are elaborated on in this study, are the most appropriate for student's goals in the 21st-century skills and the future requirements for students' skills, innovation, competitiveness, and mindset to think critically to produce the criteria of the digital age community which encompasses technopreneurs skills [19]. In contrast, increasing the need for technopreneurial skills among university students can help their competence and motivate them by learning and making research publications in various fields, including technology skills that are required by the 21st century.

1.1 Objectives of this Article

In a bid to the position of the university graduates for more outstanding and flawless performance in the 21st-century job market, it is necessary to examine the technopreneurs' skills of these students to ensure that they are in sync with the current demands of the job market. Else they might be left behind as the world progresses in the Fourth Industrial Revolution Era 4.0. to create a digitalization of business mindset and career for the workplace in using the 21st-century skills as the primary objective road map. In addition, constructing a dynamic business in a digital era is one of the objectives for university students to improve profoundly by holding an independent competency based on technopreneurs' skills granted by global experiences in Era 4.0.

This study sets out the overall aim of providing timely information while exploring how students understand technopreneurs' skills to comprehend and prioritize technopreneurs skills in university as a much-needed resource for their career and business success in the 21st century. Specifically, this paper focuses on the following three objectives: (a) To determine the level of technopreneurs competencies among gender and age of university students. (b) To provide skills for university students to become self-employed as a vital resource for their business career to compete in the 21st century, and (c) to examine for any significant association between the university students and study programs shows technopreneurs skills, such as a resource for their career and business success in the 21st century, based on their study program, gender, and age.

This study is motivated by the increasing demand for technologically survey graduates who can meet the 21st-century globalized job market requirements. The main contributions of this study are: It contributes to the body of literature on technopreneurialship, especially concerning emerging markets economics such as 21st century online jobs. It also showcases

university students' prioritization of technopreneurial skills resources for career and business success. The findings highlighted in this study will enable the relevant stakeholders across various sectors of the economy to take the necessary initiatives towards continually positioning university students on the right pedestal for more extraordinary career and business success in 21st-century skills. The university students manage to have many strengths and commitment attitudes toward personal competencies rather than gender and age social in entrepreneurial.

2. LITERATURE REVIEW

Emergence and conceptual definition of 21st-century skills in our contemporary business world, the qualified human capital resource remains a significant indicator of achieving an organization's goals and global competitiveness [20]. The needed technopreneurial skill sets for education and career success have been labelled 21st-century skills. Graduates with these skills facilitate their respective organization's growth and survival in the ever-evolving competitive global business landscape. This is so because university education fosters the development of nations' ability, character, civilization, and dignity by creating highly-skilled, competitive human resources.

Workers with aging skill sets have been challenged and displaced, as their lack of technological skills limits their respective business organizations' productivity [21]. These 21st-century skills have been indicated as critical success factors for students to secure and sustain their career and business progress [22]. The lack of adequate training concerning acquiring these skills either at the university level or on the job has contributed to the workplace skills gap and the stagnation of economic growth in many countries [23]. Therefore, from the perspective of gender in this study, the students manage to understand better the meaning of technopreneurial skills related to influence job skills encompass with the appropriate skills based on age and gender, as many cognitive skills include university students being motivated by the study program, teamwork, improve learning technologies skills based on student's concepts and abilities that have the extent to be relevant with 21st-century job skills [24].

In synthesizing these 21st-century skills, several frameworks have been developed, among which include that of the partnership for 21st Century Skills (P21, 2007) as cited, which has identified three skills for technopreneurial competency of the 21st century as they are listed below:

- i. Competency in learning skills techniques that encompass; [problem-solving and critical thinking; creativity and innovation; communication and collaboration]
- ii. Competency in literacy skills which contain; [technopreneurship; ICT literacy; media literacy;]
- iii. Competency in Life skills encompasses; [adaptability and flexibility, initiative and self-direction, leadership and responsibility, social and cross-cultural skills, productivity and accountability, and outcomes of entrepreneurial competencies.

According to [25], 21st century skills include critical thinking, creativity, collaboration, leadership, perseverance, and management skills combined with performing effectiveness and

efficiency. Notably, most of the definition of 21st-century skills in literature includes communication-related skills.

2. Entrepreneurship, Technopreneurship, and Technopreneurial Skills

Prior research on entrepreneurship education focused on the debate on whether entrepreneurs were born or made [26]. This debate centered on two approaches; the trait-based and the competency-based approach. While the trait-based approach postulates that entrepreneurs are born with innate and peculiar traits that cannot be learned, the competency approach argues that entrepreneurs can be formed with relevant training and experience [27]. In this paper, the researcher supports the competency-based approach, as university students can become successful technopreneurs with adequate activity in entrepreneurship combined with technology.

As many organizations strive to cut costs and become more innovative in this 21st century by disengaging redundant employees and job tasks [28], the strong connection between information-communication technologies, innovations, and entrepreneurship cannot be overemphasized. Information technologies facilitate the reinvention and creation of failing and new organizations, respectively, which integrates technology as a significant resource in their 21st-century business operations [29].

While entrepreneurship could be seen as a process that involves taking a bold and imaginative route from established business norms, the success of entrepreneurship is driven profoundly by technological innovation. Technopreneurship involves the innovative application of technical science and knowledge, either individually or by a group of persons, in creating or managing a business enterprise. It also addresses the risk associated with such a business enterprise in line with the stated goals and objectives.

Technopreneurship has been described as the melting pot between technology, capital, and a supportive environment, as information-communication technology has remained a strong revolutionary driver since the late 20th century. That means that technopreneurship is derived from combining two words, "technology" and "entrepreneurship," creating technology-intensive business startups. These technological business startups could range from small to large enterprises [30]. The concept of technopreneurship has been known to represent a new breed of intelligent entrepreneurs interested in information technologies [31]. Therefore, technopreneurial skills involve an entrepreneurial ability to leverage digital technologies combined with the power of the internet to initiate and execute most of the processes required to launch and maintain a business startup. A previous study on the nature of technopreneurship has defined the perceived opportunity based on business-driven elaborated among the entrepreneurs, whether university students as well beneficiaries and looking to create a new product including technology skills required [32]. Hence, technopreneurship has been introduced as a technology framework to express the results of gaining technopreneurs in job skills.

2.3 Technopreneurial Skills Competencies Among University Students

The dynamic nature of the workplace today necessitates the development of technological skills in this 21st-century knowledge-driven economy to propel university students into

successful careers. A proactive approach to workforce preparedness must be tailored to the dynamic technological demands of today's globalized job market[33]. On the other hand, the higher educational institution remains a great platform to strengthen the connection between existing skills required for both genders' activities. Indeed, university students need the current era that requires more experiences related to their positions in learning skills of industrial revolution 4.0 [34]. However, these skills face various challenges in case university students contradict one another due to the absence of technology skills.

Nevertheless, the need for university students' technopreneurs' skills is to be a critic to think of new opportunities covered by the digital age to integrate with learning skills from curricula updated by the 21st-century abilities [35]. Due to the significance of technopreneurs' skills needed for business purposes, jobseeker among university students is emphasized as the Fourth Industrial Revolution foundation (IR 4.0). In striving for a solution for temporary unemployment among university students, undergraduate students are encouraged to manage an independent business career based on technology [36].

3. METHOD

The study employed a qualitative research method to explore the competency of university students' technopreneurial skills based on study programs, gender, and age by discovering the technopreneur's talents, which refers to the scientific process of systematically investigating a research problem. This study was conducted at one of the State universities in Yogyakarta during the academic session 2021/2022. Meanwhile, the study has adopted qualitative research methods to discover convenience sampling techniques of competence. The researcher himself developed the research instrument and pilot tested with the relevant adjustment made to capture the best responses maximally. The instrument passed a reliability test by returning a Cronbach Alpha of 0.866 percent. Primary data were collected via the device (Google form) distributed online to various university students' online class groups across the university's multiple departments using a questionnaire survey. The survey took the participants about 10 minutes to complete. Data collection was done from March to the end of April 2022.

The research instrument had a total number of 22 questions, of which 7 captured the demographic characteristics and others measured the research variables of the study using 5 points Likert scale. A total of 139 responded duly completed responses were used in this study, and descriptive statistics, specifically chi-square analysis, were employed in analyzing the data. The research questions were obtained through technopreneurs' experiences based on 21st-century skills. However, these questions are in the online google form, which is relevant to the data obtained. In answering the first and second research questions, the responses to the respective questions measuring the variables were graded and ranked into three categories of Low ($X < M - SD$), Average ($M - SD \leq X < M + SD$), and High ($X \geq M + SD$). Where: X = Individual Score, M = Mean Score, and SD = Standard Deviation.

In the sequel to proffering answers to the third research question, the following hypothesis was developed and tested:

1. H1: There is no difference among gender and age in university students' technolpreneurial skills levels based on their study program.
2. H2: There is no difference among university student technolpreneurial skills levels based on gender.
3. H3: There is no difference among University student technolpreneurial skills levels based on age.

Demographic Characteristics of Respondents

Parameter	Frequency	Percentage (%)
Total Respondent	139	100
Education Level		
Bachelors	61	44
Masters	49	35
Doctorate	29	21
Gender		
Male	57	41
Female	82	59
Age Group		
0 -18	15	11
19 -22	42	30
23 – 27	37	27
Above 27	45	32
Marital Status		
Single	102	73
Married	36	26
Divorced	1	1
Study Program		
Business Oriented	15	11
Non-Business Oriented	124	89

Data are presented in figures and percentages

4. ANALYSIS AND FINDINGS RESULTS

The study results revealed that university students could possess appreciable technolpreneurial skills based on program studies. They highly prioritized this skill as a significant resource to their career and business success in this 21st century. Regarding research question one, 61% of the respondents were reported as possessing average levels of technopreneucial skills. In comparison, 27% and 12% reported high-level competencies in technopreneurial skills, respectively.

Table 1. Level of Technopreneurial Skill

Code	Category	No of Respondents	
Class	Criteria	Figure	Percentage (%)

3	High	$X \geq 9$	38	27
2	Average	$7 \leq X < 9$	85	61
1	Low	$X < 7$	16	12

Mean Score = 8 , & Std. Dev. = 1

For research question two, 70% of the respondents were reported as averagely prioritizing technopreneurial competencies skills as a vital resource to their career and business success in the 21st century. In comparison, 14% and 16% of the respondents belong to the high and low levels, respectively.

Table 2. Prioritization of Technopreneurial Skills 21st Century Success

Code	Category		No of Respondents	
	Class	Criteria	Figure	Percentage (%)
3	High	$X \geq 49$	20	14
2	Average	$39 \leq X < 49$	97	70
1	Low	$X < 39$	22	16

Mean Score = 44 , & Std. Dev. = 5

In testing the hypotheses developed from research question three, all assumptions failed to pass the test as all p-value from each chi-square statistic were insignificant at alpha at 0.05%, respectively (H1: P = 0.380; H2: P = 0.366; H3: P = 0.713). Hence, the researcher concluded that there is no significant association between the university students' prioritization levels of technopreneurial skills as a vital resource for their career and business success in the 21st century and their study program, gender, and age, respectively.

5. DISCUSSION AND FINDINGS

5.1 Discussion

The study's objective is to investigate the literature on entrepreneurial competencies on behalf of programs study, gender, and age among university students. In this 21st-century globalized world of technopreneurship engagements, where 21st-century skills and technology seem to be essential, advancement continues at an unprecedented pace, and processing technopreneurial skills swiftly and accurately is recognized as integral for wealth accumulation[37]. This is consistent with the recent study on adopting various technologies such as artificial intelligence (AI) in the workplace for university students' competencies, indicating that this rapidly changing, technically inclined job market requires an agile and innovative approach to human capital development[38]. For 21st-century university graduates to continually excel in their career and business prospects, acquiring the relevant skillset such as technopreneurs skills remains relevant as the world moves onward with the Industrial and technological revolution. This was sweeping the globe, leaving the ability to build strategic decisions more demanding and complex.

A Comparison by Wei-Loon Koe has indicated no difference in technopreneurs intentions between male and female students in technopreneurial competencies [39]. However, other research has been done on the influence of gender on the entrepreneurial intentions of journalism students. Based on the data on the impact of gender on the entrepreneurial intentions

of management students [40], the study mentions that gender business has significantly and positively affected their choice to engage in entrepreneurship projects in 21st-century technopreneurial skills.

To answer all the above challenges that are related to university students' technopreneurs skills, typically sophisticated by technology that will create different product skills atmosphere within lifestyle projects; a) economic changes individually as students life will lead to a significant change in the way of thinking, planning, communicating and managing the policy of self business income; b) getting a better and strong understanding of the abilities of entrepreneurship during the process business projects; c) gender students having a strong desire of being creative, innovation in case any challenges breakaway from organizations among students due to making business competitions for both male and female in university. The findings highly contribute to the technopreneurial studies that have examined university student competencies in specific contexts for establishing a small business that effectively overcomes various employee problems and challenges for the 21st-century business [41]. These findings encompass set off for considering potential dynamic competencies rather than considering gender and age characteristics among the university students further no discrimination side. These competencies can be learned and developed to work with entrepreneurial activities meaning communicating and working with non-entrepreneurial teamwork. In addition, research has identified various entrepreneurial competencies in different contexts effectively related to 21st-century skills as opportunities ruling university students to make critical decisions for learning self-efficacy skills.

According to one of the articles, motives for entrepreneurship and establishing an independent business for self-employment notably [42]; however, it also shows this article's objective behind such competencies of technopreneurial skills consistent with university students' skills to improve financially by self-access their own business. Indeed, the study includes the identity striving for both genders skills has to be made a connection dedication through the process of business network skills according to the research referred by [43]. Therefore, the findings in this context demonstrate that interaction between programs study, gender, and age motivates self-employment experiences brought by 21st-century technopreneurial skills. On the other hand, the findings confirm university students, through the study programs, tend to have powerful persistence toward technopreneurial competencies. The recent results correlate with self-confidence in students with technopreneurial goals, risk-taking, competencies, and programs study's curriculum in learning that university should encourage students to provide workout activities skills according to the training employed [44]. The findings from this study highlight that university students' technopreneurial skills can take on the challenges of the 21st century. Still, a constant effort must be made to grow and sustain the on-campus entrepreneurial culture for university students rather than gender and age consideration throughout the 21st century.

5.1.1 Limitation of Study

Notably, this study has some limitations as the data used herein was collected from a small sample using a self-reporting questionnaire. The study has the potential for joint self-bias

assessment and generalization errors. The researcher had to resort to this approach due to the current covid-19 pandemic.

5.2 Conclusion

This study aimed to extend 21st-century technopreneurial skills as a career for both gender male and female characteristics in university. The study has given the dynamic demands of the 21st-century job market. It remains the responsibility of educators to continually identify core competencies that are essential for the success of future leaders and offer effectively. Methods of delivering educational content to develop these competencies. As workforce development remains integral for economic growth and development, the need to invest significantly in information technology skills is paramount. Aspiring student technopreneurs across Asia and the world should be adequately equipped with technological and business skills.

Previous studies mention that there is no difference in technopreneurs intentions among university students, study programs, gender, and age. As revealed by this study, there are many differences in technopreneurs' skills. The future career and business success of these university students seem bright only if the relevant authorities continually give more focus and attention in these regards. University graduates who remain ill-equipped to meet the highly competitive job market requirements are likely doomed to fail in reaching their full potential. The findings of this study provide fresh insight into competency and the technopreneurs' skills of university students to critically analyze and digitally overcome whatever challenges come their way upon graduation, as these skills remain paramount for their success in the 21st century.

Based on the above conclusion, the author can be confirmed that the comparison of the following findings between study programs, gender, and age, shows that understanding the role of gender competency in 21st-century technopreneurial skills can achieve innovation skills between males and females. Meanwhile, study programs consider learning skills, including solving technical problems, critical thinking, creativity, communication and collaboration skills. The study program's objective was to promote an entrepreneurial spirit among university students to have high self-employment projects competencies.

REFERENCE

- [1] M. Bomani, G. Gamariel, and J. Juana, "University strategic planning and the impartation of technopreneurship skills to students: Literature review," *J. Gov. Regul.*, vol. 10, no. 2 Special issue, pp. 196–203, 2021, doi: 10.22495/JJGRV10I2SIART1.
- [2] A. A. Abbas, "The Bright Future of Technopreneurship," *Int. J. Sci. Eng. Res.*, vol. 9, no. December, pp. 563–566, 2018.
- [3] M.-S. Oukil, "A development Perspective of Technology-Based Entrepreneurship in the Middle East and North Africa," *Ann. Innov. Entrep.*, vol. 2, no. 1, p. 6000, 2011, doi: 10.3402/aie.v2i1.7986.
- [4] O. Elijah, "Technopreneurship: A View of Technology," vol. 17, no. 7, 2017.
- [5] M. Zaidi, A. Rozan, T. Academics, and I. N. Safety, "A study on entrepreneurial intention among information technology technopreneurs RAMESH K S @ MOHD ZAIDI BIN ABD ROZAN Presented as a Partial Fulfillment of the Requirements for

- the Degree of Master Of Science (Information Technology) MSc . IT," no. April, 2014.
- [6] W. Bridges, "Jobshift: How to Prosper in a Workplace Without Jobs," *Am. J. Heal. Pharm.*, vol. 53, no. 21, pp. 2671–2671, 1996, doi: 10.1093/ajhp/53.21.2671.
- [7] E. Van Laar and A. J. A. M. Van Deursen, "Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers : A Systematic Literature Review," no. January, 2020, doi: 10.1177/2158244019900176.
- [8] G. Elia, A. Margherita, and G. Passiante, "Technological Forecasting & Social Change Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process," *Technol. Forecast. Soc. Chang.*, vol. 150, no. October 2019, p. 119791, 2020, doi: 10.1016/j.techfore.2019.119791.
- [9] A. Putnam, A., & Sanchez, "Digital Skills for the 21st-Century Workforce," *Fed. Reserv. Syst. Fed. Reserv. Bank Philadelphia*, 2019.
- [10] A. E. Goldberg, K. A. Kivalanka, and K. Black, "Trans Students who leave College: An Exploratory Study of Their Experiences of Gender Minority stress," *J. Coll. Stud. Dev.*, vol. 60, no. 4, pp. 381–400, 2019, doi: 10.1353/csd.2019.0036.
- [11] R. Ferreras-Garcia, J. Sales-Zaguirre, and E. Serradell-López, "Sustainable Innovation in Higher Education: The Impact of Gender on Innovation Competences," *Sustain.*, vol. 13, no. 9, pp. 1–13, 2021, doi: 10.3390/su13095004.
- [12] D. Yordanova, J. A. Filipe, and M. P. Coelho, "Technopreneurial Intentions Among Bulgarian STEM Students: The Role of University," *Sustain.*, vol. 12, no. 16, pp. 1–19, 2020, doi: 10.3390/su12166455.
- [13] W. Nor *et al.*, "Fostering Students' 21st Century Ckills through Project Oriented Problem Based Learning (POPBL) in Integrated STEM Education program," vol. 17, no. 1, 2016.
- [14] A. Ghafar, "Convergence Between 21st Century Skills and Entrepreneurship Education in Higher Education Institutes," *Int. J. High. Educ.*, vol. 9, no. 1, pp. 218–229, 2020, doi: 10.5430/ijhe.v9n1p218.
- [15] S. Ra, U. Shrestha, S. Khatiwada, and S. W. Yoon, "The Rise of Technology and Impact on Skills," *Int. J. Train. Res.*, vol. 17, no. 1, pp. 26–40, 2019, doi: 10.1080/14480220.2019.1629727.
- [16] H. Peschl, C. Deng, and N. Larson, "Entrepreneurial Thinking: A Signature Pedagogy for an Uncertain 21st century," *Int. J. Manag. Educ.*, vol. 19, no. 1, p. 100427, 2021, doi: 10.1016/j.ijme.2020.100427.
- [17] M. Farhangmehr, P. Gonçalves, and M. Sarmiento, "Predicting Entrepreneurial Motivation Among University Students: The role of Entrepreneurship Education," *Educ. Train.*, vol. 58, no. 7–8, pp. 861–881, 2016, doi: 10.1108/ET-01-2016-0019.
- [18] E. Kyndt and H. Baert, "Entrepreneurial Competencies: Assessment and Predictive Value for Entrepreneurship," *J. Vocat. Behav.*, vol. 90, pp. 13–25, 2015, doi: 10.1016/j.jvb.2015.07.002.
- [19] E. Economics, "Technopreneurship Entreprenology) as the Holy Grail of SMEs Growth : a Historical analysis," vol. 7, no. 3, pp. 67–74, 2016.
- [20] S. Saad, A. S. M. M. Hoque, and Z. Awang, "Technopreneurial Marketing (TM): A

- Construct for Integrating Emerging Technopreneurship and Marketing Perspectives," *Proceeding Int. Semin. Entrep. Bus. 2019*, no. November, pp. 1–9, 2019.
- [21] Z. Yenni, U. Verawardina, M. Dewi, and A. L. Lubis, "Need Analysis of Developing 21st Century Learning Skill in Technopreneurship in the Digital Age," *Psychol. Educ.*, vol. 58, no. 5, pp. 1–8, 2021.
- [22] Y. Suleiman and L. A. Tunbosun, "Assessing the Relationship between Technopreneurship Education and Business Intention among Undergraduate Students in Kwara State , Nigeria : A Partial Least Square Approach (PLS-SEM)," vol. 4, no. 2, pp. 1–15, 2019.
- [23] W.-L. Koe, N. E. Alias, N. H. Marmaya, I. A. Majid, M. Mohamad, and M. Mohamad, "Likelihood in Choosing Technopreneurship as Career Among Undergraduate Students," *Int. J. Acad. Res. Bus. Soc. Sci.*, vol. 10, no. 5, pp. 686–696, 2020, doi: 10.6007/ijarbss/v10-i5/7241.
- [24] W. L. Koe, M. H. Mahphoth, N. E. Alias, R. Krishnan, and A. F. Arham, "Factors Influencing Intention Towards Technopreneurship Among University Students," *J. Educ. Soc. Res.*, vol. 11, no. 1, pp. 162–169, 2021, doi: 10.36941/jesr-2021-0016.
- [25] S. M. Drake and J. L. Reid, "Integrated Curriculum as an Effective Way to Teach 21st Century Capabilities," 2018.
- [26] L. M, M. R. E, and R. P, "The Effectiveness of Entrepreneurship Education: What Matters Most?," *African J. Bus. Manag.*, vol. 6, no. 51, pp. 12023–12032, 2012, doi: 10.5897/ajbmx12.001.
- [27] B. Bird, "Toward a Theory of Entrepreneurial Competency," *Adv. Entrep. Firm Emerg. Growth*, vol. 21, pp. 115–131, 2019, doi: 10.1108/S1074-754020190000021011.
- [28] K. Sjöblom, H. Lammassaari, L. Hietajärvi, K. Mälkki, and K. Lonka, "Training in 21st Century Working Life Skills: How to Support Productivity and Well-Being in Multi- Locational Knowledge Work," *Creat. Educ.*, vol. 10, no. 10, pp. 2283–2309, 2019, doi: 10.4236/ce.2019.1010164.
- [29] M. Janssen, V. Weerakkody, E. Ismagilova, U. Sivarajah, and Z. Irani, "A framework for Analyzing Blockchain Technology Adoption: Integrating Institutional, Market and Technical Factors," *Int. J. Inf. Manage.*, vol. 50, pp. 302–309, 2020, doi: 10.1016/j.ijinfomgt.2019.08.012.
- [30] W. Sutopo, "The Roles of Industrial Engineering Education for Promoting Innovations and Technology Commercialization in the Digital Era," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 495, no. 1, 2019, doi: 10.1088/1757-899X/495/1/012001.
- [31] M. I. S. Bin Mazla, M. K. Bin Jabor, K. Tufail, A. F. N. Yakim, and H. Zainal, "The Roles of Creativity and Innovation in Entrepreneurship," vol. 470, no. ICoSD 2019, pp. 213–217, 2020, doi: 10.2991/assehr.k.200921.035.
- [32] T. Y. Nian, R. Bakar, and M. A. Islam, "Students' Perception on Entrepreneurship Education: The Case of Universiti Malaysia Perlis," *Int. Educ. Stud.*, vol. 7, no. 10, pp. 40–49, 2014, doi: 10.5539/ies.v7n10p40.
- [33] A. Sahin, M. Kim, and M. Yoon, "The Development and Validation of a 21st Century

- Skills Instrument: Measuring Secondary School Students' Skills," *J. Res. Sci. Math. Technol. Educ.*, vol. 2, no. 2, pp. 85–103, 2019, doi: 10.31756/jrsmte.223.
- [34] A. Ana, D. Meirawan, V. Dwiyantri, and S. Saripudin, "Character of Industrial 4.0 Skilled workers," *Int. J. Eng. Technol.*, vol. 7, no. 4, pp. 166–170, 2018, doi: 10.14419/ijet.v7i4.33.23524.
- [35] I. Hameed and Z. Irfan, "Entrepreneurship Education: A Review of Challenges, Characteristics and Opportunities," *Entrep. Educ.*, vol. 2, no. 3–4, pp. 135–148, 2019, doi: 10.1007/s41959-019-00018-z.
- [36] Q. 'Aini ABDULLAH, N. HUMAIDI, and M. SHAHRUM, "Industry Revolution 4.0: the Readiness of Graduates of Higher Education Institutions for Fulfilling Job Demands," *Rev. Română Informatică și Autom.*, vol. 30, no. 2, pp. 15–26, 2020, doi: 10.33436/v30i2y202002.
- [37] Y. P. Ho, P. C. Low, and P. K. Wong, "Do University Entrepreneurship Programs Influence Students' Entrepreneurial Behavior? An Empirical Analysis of University Students in Singapore," *Adv. Study Entrep. Innov. Econ. Growth*, vol. 24, pp. 65–87, 2014, doi: 10.1108/S1048-473620140000024003.
- [38] W. Y. Wong, T. H. Sam, and S. W. Yu, "An Innovative, Practical-based and Commercial-based Approach: Techno-Commerce Entrepreneurship Shaping the Outcome-based Learning," *Proceeding - 2020 IEEE 8th Conf. Syst. Process Control. ICSPC 2020*, no. December, pp. 140–145, 2020, doi: 10.1109/ICSPC50992.2020.9305778.
- [39] R. A. Hassan, "Self-Efficacy and Self-Independence in Promoting Self-Employment Intention among University Students," *J. Res. Business, Econ. Manag.*, vol. 6, no. 2, pp. 888–893, 2016.
- [40] W. Nowiński, M. Y. Haddoud, D. Lančarič, D. Egerová, and C. Czeglédi, "The Impact of Entrepreneurship Education, Entrepreneurial Self-Efficacy and Gender on Entrepreneurial Intentions of University Students in the Visegrad Countries," *Stud. High. Educ.*, vol. 44, no. 2, pp. 361–379, 2019, doi: 10.1080/03075079.2017.1365359.
- [41] A. Bagheri and M. Abbariki, "Competencies of Disabled Entrepreneurs in Iran: Implications for Learning and Development," *Disabil. Soc.*, vol. 32, no. 1, pp. 69–92, 2017, doi: 10.1080/09687599.2016.1268524.
- [42] M. Norstedt and P. Germundsson, "Motives for entrepreneurship and establishing one's own business among people with disabilities: Findings from a scoping review," *Disabil. Soc.*, vol. 0, no. 0, pp. 1–20, 2021, doi: 10.1080/09687599.2021.1919504.
- [43] S. Knox, L. Casulli, and A. MacLaren, "Identity work in different entrepreneurial settings: dominant interpretive repertoires and divergent striving agendas," *Entrep. Reg. Dev.*, vol. 33, no. 9–10, pp. 717–740, 2021, doi: 10.1080/08985626.2021.1890231.
- [44] A. Kyguolienė and L. Švipas, "Personal Entrepreneurial Competencies of Participants in Experiential Entrepreneurship Education," *Manag. Organ. Syst. Res.*, vol. 82, no. 1, pp. 37–51, 2019, doi: 10.1515/mosr-2019-0012.