Journal of Information & Optimization Sciences
ISSN 0252-2667 (Print), ISSN 2169-0103 (Online)
Vol. 45 (2024), No. 7, pp. 1921–1929
DOI : 10.47974/JIOS-1743

Skills and competencies for industry 5.0 : Millenial perspective for sustained career growth

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Abstract

The study investigates students' perceptions of Industry 5.0 and the competencies they deem crucial for success in this transformative era. The research gathers comprehensive insights from students across various academic fields using a mixed-methods approach, including surveys, interviews, and focus groups. The findings elucidate students' understanding of Industry 5.0, their adjustments to its requirements, and the competencies they perceive as vital.

By integrating research findings into curriculum development, educational institutions can ensure students possess the digital literacy, critical thinking, flexibility, and innovation skills essential for success in Industry 5.0. The study found a strong relationship between Educational intervention, technology integration, industry exposure on Upskilling and competencies.

Subject Classification: *M1.*

Keywords: *Industry 5.0, Future workforce, Competencies, Innovation, Curriculum development, Dynamic job market, Digitalization.*

1. Introduction

With evolving role of Industry 5.0 there has been a lot of technological advancement, workforce, understanding the skills and competencies required for success is paramount. This chapter introduces Industry 5.0 as the latest phase of industrial evolution, characterized by collaboration and interaction between all important resources both man and machines, resilience, and data-driven decision-making. It explores students' perspectives on these skills, discusses their challenges in developing them, and suggests strategies to enhance their readiness for Industry 5.0. It represents an important shift in industrialization, where advanced technologies like robotics, artificial intelligence (AI), and the Internet of Things (IoT) are integrated with human capabilities. Unlike its predecessor, Industry 4.0, which focuses on automation and efficiency, Industry 5.0 emphasizes human-centric practices, resilience, and sustainability. This new era extends beyond traditional manufacturing, leveraging information technology developments to optimize processes and prioritize societal value over purely economic gains.

1.1 *Students' Perspective on Skills and Competencies*

Understanding students' perspectives on the skills and competencies needed for Industry 5.0 is crucial for educational institutions and policymakers. As the future workforce, students offer unique insights into their expectations and preferences, guiding curriculum development and

training initiatives. Their perspectives also help identify disparities between existing skill sets and industry demands, facilitating targeted interventions to bridge these gaps. Students' viewpoints inform the alignment of educational curricula with industry requirements. By incorporating their insights, educators can tailor courses to teach theoretical knowledge and practical skills essential for success in Industry 5.0. Collaboration with industry leaders allows educators to integrate practical experiences and case studies into teaching methods, ensuring students are equipped with relevant competencies.

Moreover, students' perspectives drive innovation in instructional practices. Their creativity and novel ideas inspire the development of teaching methods that promote innovative thinking, a valuable skill in Industry 5.0. By involving students in the educational process, educators ensure the relevance and effectiveness of teaching techniques in response to evolving industry demands.

1.2 *Need of study pertaining to challenges Faced by Students*

1. Rapid Technological Advancements: The fast-paced evolution of technology requires students to update their skills to remain competitive continually.
2. Continuous Learning and Upskilling: Industry 5.0 demands lifelong learning, necessitating students to develop ongoing skills.
3. Interdisciplinary Nature: Students must possess diverse skills beyond their primary area of expertise to thrive in interdisciplinary collaborations.
4. Pressure to Excel: High-performance expectations in a competitive job market can strain students' mental well-being.
5. Soft Skills Development: Besides technical skills, employers value soft skills such as communication and teamwork.
6. Flexible Education Systems: Educational institutions must effectively adapt to diverse learning styles and preferences.

Thus in times wherein we are talking about upskilling and competency it becomes important to focus on how through Educational intervention matched with industry exposure with technical integration can help for effective skill and competency development.

2. Literature Review

Studies have identified essential skills and competencies for industrial employees in the Industry 5.0 environment through a survey of experts, aiming to guide the development of modern engineers' educational systems. [1]

A Literature Review, explored skills and competencies necessary for Industry 4.0 and 5.0, emphasizing innovation, creativity, ICT, Big Data knowledge, and communication, aiding educational institutions in updating curricula [2].

It has been found that in for promoting and accelerating upskilling in various disciplines and better and sustainable transformation it highlighted the impact of Industry 5.0 challenges on education and proposed teaching approaches to develop future-ready engineers, emphasizing problem-based learning and essential skills like curiosity, agility, and leadership. [3]

Studies have introduced a Workforce Evolution Framework to understand workforce competencies in Industry 5.0 through A Reflective Framework for Understanding Workforce Evolutionary Pathways in Industry 5.0. The Framework addresses challenges such as resistance to change and skill mismatches and proposes targeted training strategies. [4]

A systematic literature review explores Industry 5.0 challenges, sectors must adopt real-time digital innovations and human-centric solutions. Higher Education Institutions are vital in equipping students with higher order skills and better upgradation, and sustainability. It is important to delineate teaching methodologies like problem-based learning, scenario-based learning, and non-traditional laboratories, crucial for fostering skills like problem-solving, creativity, and leadership. Aligning curricula with Industry 5.0 needs ensures professionals are adept in navigating the digital landscape. [5]

It is important that lifelong learning and digital competencies, particularly in fields like medicine and technology innovation, in preparing individuals for Industry 5.0. [6]

3. Research Methodology

3.1 *Research Objectives*

- Assess the evolving skill set required for Industry 5.0
- Examine the impact of Industry 5.0 on job roles and responsibilities.

- Assess the relation between the level of formal education and the acquisition of skills relevant to Industry 5.0

3.2 *Research Methodology*

The research utilizes a mixed-methods approach, combining quantitative and qualitative methods to study students' perspectives on the skills and competencies required for Industry 5.0. A questionnaire tailored to the research objectives was distributed to students across various institutions and colleges. Convenience sampling was employed, leveraging personal connections within the researcher's institute and other institutions.

Tools used -Structural Equation Modelling (SEM),SmartPLS4

- Variables:
  - Independent Variable
    - Educational Intervention
    - Industry Exposure
    - Technical Integration
  - Dependent Variables
    - Skills and Competencies
- For Collection of Data: Questionnaire (digital survey form)
- For some Preliminary Analysis, IBM SPSS 29
- Sample size: 100 students

Findings and Analysis

Before proceeding to Smart PLS4 for further analysis, the data underwent exploration and descriptive statistics on IBM SPSS.

The reliability analysis yielded a Cronbach's Alpha coefficient of 0.947, indicating satisfactory reliability. Cronbach's Alpha assesses internal consistency, with higher values suggesting greater consistency among scale items. PLS-SEM is ideal for small sample sizes and non-normal data distributions The conceptual framework was modeled as a Structural Equation Model with three exogenous variables (EI, IE, TI) and one endogenous variable (SC). PLS-SEM was chosen due to its suitability for non-parametric data and small sample sizes.

The analysis focused on the Measurement Model Analysis within PLS-SEM. Descriptive statistics and reliability values of Cronbach alpha, composite reliability and AVE values were within the range and also revealed high reliability and validity for EI, IE, SC, and TI constructs.

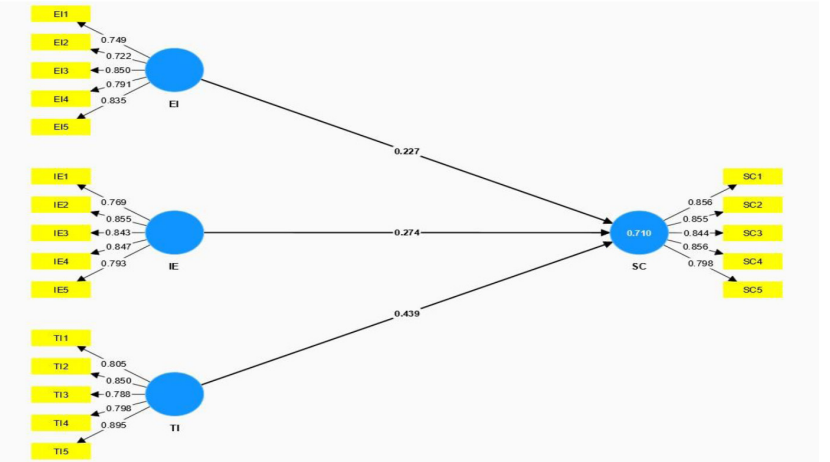

Figure 1

Measurement Model

R-square values indicated that the independent variables in the model explained a significant proportion of the variability in social competence (SC).R-square: 0.710,independent variables effectively explain social competence variability.

Further the correlation values(Table-3), Path coefficient, (Table-4), total effects(Table-5), Discriminant Validity, (Table-6) Model fitness(Table-7) were also run and found significant relationship. In Correlation all the constructs have **r value** above 0.5 indicating a good fit. In path coefficient Technology integration was found to affect skill and competencies majorly. Similar was found in total effects values as well. Discriminant value also followed significance as per Fornel and Lacker Criteria and Model fit values of NFI was found to be closer to one thus reflecting better fit of the model.

Table 1

Constructs reliability and Validity

Construct reliability and validity - Overview

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EI	0.850	0.859	0.893	0.626
IE	0.880	0.881	0.912	0.676
SC	0.897	0.901	0.924	0.709
TI	0.885	0.889	0.916	0.686

Table 2
Correlations

	EI	IE	SC	TI
EI	1.000	0.749	0.724	0.661
IE	0.749	1.000	0.725	0.698
SC	0.724	0.725	1.000	0.777
TI	0.661	0.698	0.777	1.000

Table 3
Path coefficients

EI	->	SC	0.268
IE	->	SC	0.205
TI	->	SC	0.457

Table 4
Total effects

EI	->	SC	0.268
IE	->	SC	0.205
TI	->	SC	0.457

Table 5
Discriminant Validity

	EI	IE	SC	TI
EI	0.791			
IE	0.749	0.843		
SC	0.724	0.725	0.842	
TI	0.661	0.698	0.777	0.828

Table 6

Model Fit

	Saturated model	Estimated model
SRMR	0.077	0.077
d_ULS	1.130	1.130
d_G	0.794	0.794
Chi-square	425.885	425.885
NFI	0.727	0.727

Conclusion

This research emphasizes the importance of preparing students with required skill set to get adapted with quick and prepared adoption towards new phase of industrial development, The findings emphasizes the need for a balanced development of technical expertise and soft skills to exist in rapidly emerging landscape of automation and digital transformation. [7]

Educational institutions must adapt their curricula and teaching methods to ensure students are equipped with diverse skill sets required by Industry 5.0. This involves integrating cutting-edge technologies into education and fostering creativity, problem-solving, and adaptability. [8]

Limitations

The study was limited to management students and similar study can be conducted for other streams and specialization. Larger sample size will yield far more better results. [9]

Recommendations

Collaboration between academia and industry is essential to provide students with real-world exposure and practical skills necessary for success in the modern workforce .By embracing a comprehensive approach to education and promoting continuous learning and creativity, students can be empowered to navigate the challenges of Industry 5.0 and drive positive transformations in the digital era, leading to a more promoting and inclusive longevity for all.

References

[1] S. Grabowska, S. Saniuk, and B. Gajdzik, "Industry 5.0: Improving humanization and sustainability of industry 4.0," *Scientometrics*, vol. 127, no. 6, pp. 3117–3144 (2022).

[2] R. Felicita, T. Shirmila, and W. K. Widodasih, "Fabric sustainability: An eco-conscious perspective of Indian consumers," *Journal of Statistics and Management Systems*, vol. 27, no. 1, pp. 169–186 (2024). DOI: 10.47974/JSMS-1210.

[3] M. I. Ciolacu, G. R. Alves, C. Terkowsky, A. A. Kist, and G. R. Alves, "Developing future skills in engineering education for Industry 5.0: Enabling technologies in the age of digital transformation and green transition," *International Journal of Engineering Education*, vol. 38, no. 2, pp. 758–774 (2022).

[4] A. Lagorio, C. Cimini, D. Romero, and A. A. Kist, "A reflective framework for understanding workforce evolutionary pathways in Industry 5.0," *Journal of Industrial Evolution*, vol. 10, no. 3, pp. 45–58, Year.

[5] G. Narkhede, B. Pasi, N. R. Rajhans, A. Kulkarni, S. Modgil, T. Nag, and D. Dennehy, "Industry 5.0 and the future of sustainable manufacturing: A systematic literature review," (2023).

[6] A. Nešić Tomašević, "Reshaping the future of work: Navigating the impacts of lifelong learning and digital competences in the era of Industry 5.0," *Social Informatics Journal*, vol. 2, no. 1, pp. 1–6 (2023).

[7] N. Wei, J. Yang, H. Lin, S. Chen, and C. Lee, "Effects of sustaining innovation and knowledge integration ability on innovation performance," *Journal of Statistics and Management Systems*, vol. 26, no. 8, pp. 1915–1927 (2023). DOI: 10.47974/JSMS-1089.

[8] P. Dwivedi and V. Chaturvedi, "Efficient team formation from pool of talent: comparing AHP-LP and TOPSIS-LP approach," *Journal of Enterprise Information Management*, vol. 33, no. 5, pp. 1293–1318 (2020).

[9] D. Aggarwal, V. Chaturvedi, and A. Ramachandran, "Health workforce talent management in a post-COVID-19 digital age," in *Multidisciplinary Perspectives Towards Building a Digitally Competent Society*, pp. 189–207 (2022).

Received April, 2024