RESKILLING AND UPSKILLING BE GAME CHANGERS FOR THE FUTURE-READY WORKFORCE: UNIVERSITY EDUCATION 4.0

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Article History: Received: 08.02.2023 **Revised:** 23.03.2023 **Accepted:** 08.05.2023

Abstract

The purpose of the present conceptual research paper is to provide deep insights into how industry 4.0 is revolutionising especially at the present technology-driven business practices. According to the World Economic Forum, the adoption of modern technologies will necessitate retraining for 50% of all workers by 2025. Over two-thirds of the abilities that are necessary in today's work needs will change in five years. In 2025, a third of the necessary talents will be technology-related skills that are not yet seen as being vital to today's employment requirements. Hence, this paper emphasises the importance of upskilling and reskilling an organisation's workforce where technology plays an important role as an intervention in the process. Discussions were made on top skills sought by the industry to realize Industry 4.0 and presented a blueprint as a reference for people to learn and acquire new skills and knowledge

Keywords: Education 4.0, Industrial revolution, Skill sets, Reskilling, upskilling, competencies, Experiential training, Future-ready workforce, Human capital

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DOI: 10.31838/ecb/2023.12.si6.008

1. Introduction

Globally, Industry 4.0 (I4.0) is revolutionizing engineering and manufacturing I4.0, a virtual reality emulsion system erected on traditional manufacturing, transforms it with artificial intelligence, machine literacy, hyperactive-gathered structure, deep literacy, virtualization, and more in order to produce an intelligent product system (Li, 2018, 2020; Xu et al., 2018; Li & Zhou, 2020; Xu et al., 2014). Technology, Money, and Labour were factors that pointedly influences drastic improvements in the industrial revolution. Therefore, it's time to think about the human resources required to realize Industry 4.0's strategies. In its Future of Employment Report 2020, the World Economic Forum predicted that by 2025, half of all workers globally would require reskilling **(Schwab & Zahidi, 2020).**

This estimate does not account for everyone who is currently unemployed. Prior to COVID-19, the emergence of automation and new technologies drastically altered the nature of the workforce, necessitating a critical need for widespread upskilling and reskilling. The urgency of this need has increased recently. Experts predicted that 65% of youngsters entering elementary school now would eventually work in entirely new profession kinds that do not currently exist in 2016 World Economic Forum research **(Schwab & Samans, 2016).** One of the main objectives of the STEM programme that provide skills, knowledge, and attitudes needed for an entrepreneurial culture **(Li, 2020).**

As per the Employment Report 2020, the World Economic Forum released the information that by 2025, reskilling is the required factor for half of all workers globally (Schwab & Zahidi, 2020). The number of people who are unemployed at the moment is not included in this estimation. Prior to COVID-19, the rise of automation and new technology fundamentally changed the makeup of the workforce, making it imperative that everyone acquire new skills. Recently, the need's urgency has grown.

According to a 2016 World Economic Forum study (Schwab & Samans, 2016), experts anticipated that 65% of children entering primary school today will eventually work in completely new profession types that do not yet exist. One of the key goals of the STEM course, which offers knowledge, skills, and understanding, is to foster the development of innovative curricula and new, diverse educational activities.

While some individuals and educational institutions are already making changes in preparation for a day when cyber-physical systems and artificial intelligence (AI) will make it possible for their enterprises to link internationally, others may still be unsure of how Industry 4.0 will affect the educational system. We focus on reskilling and upskilling the workers in this study so that they are prepared for Industry 4.0 and beyond.

Literature Review

Industry 4.0 fundamentally alters both the creation of a cyber-physical system and the digitization of manufacturing. It describes the association of production and process technologies, integrates vertical and horizontal value chains, and digitalizes product and service offerings in order to develop new production and economic value chains. This shift will have a significant effect on higher education, which is in charge of fostering scientific innovation, disseminating knowledge, and training a workforce for the future.

The number of publications on the future of work and the main skills that will be essential to the development of technology has been made public by the World Economic Forum (Schwab & Samans, 2016; **Schwab & Zahidi, 2020).** Regarding the present changes in work needs and hiring practises across industries, the writers collated the views of chief strategy officers and human resources officers from leading international corporations. These studies assess the skill requirements of the job market and track the rate of change. The top 10 skills for 2015, 2020, and 2025 are displayed in Table 1. (Gray, 2016; Whiting, 2020). right side contains a list of the top 10 skills for 2015 under Column 1, and the top 10 skills for 2020 under Column 2. The third column from the middle compares the movement of the top skills between 2015 and 2020. For instance, sophisticated problem solving is ranked first in both 2015 and 2020, while critical thinking jumps from fourth to second place in 2020. The top skills in 2015, 2020, and 2025 are depicted in the first column from the left.

Table 1 Review of reports of top 10 skills Which are in High Demand Skills

25/20/15*	in 2025	20/15*	in 2020	in 2015
1	Analytical thinking and innovation	1, 1	Complex problem solving	Complex problem solving
2	Active learning and learning strategies	2, 4	Critical thinking	Coordinating with others
3, 1, 1	Complex problem-solving	3, 10	Creativity	People management
4, 2, 4	Critical thinking and analysis	4, 3	People management	Critical thinking

5, 3, 10	Creativity, originality, and initiative	5, 2	Coordinating with others	Negotiation
6	Leadership and social influence	6	Emotional intelligence	Quality control
7	Technology use, monitoring, and control	7, 8	Judgment and decision making	Service orientation
8	Technology design and programming	8, 7	Service orientation	Judgment and decision making
9	Resilience, stress tolerance, and flexibility	9, 5	Negotiation	Active listening
10	Reasoning, problem-solving	10	Cognitive flexibility	Innovativeness

"Data Source: Gray (2016). The ten skills you need to thrive in the Fourth Industrial Revolution. World Economic Forum, January 19, 2016; and Whiting (2020). These are the top 10 job skills of tomorrow – and how long it takes to learn them. World Economic Forum, October 21, 2020". * 25/20/15: skills in 2025, skills in 2020, and skills in 2015; 20/15: skills in 2020 and skills in 2015.

Emerging Disruptive Technology in Industry 4.0

The emergence of disruptive technology has expedited the demand for upgrading. For instance, over the past four years, the global supply chain has seen considerable changes. Examples include automated warehouse operations, digital shipping data exchange at seaports, and electronic commerce. Disruptive technologies are providing society with new opportunities to manufacture goods and services that were previously unimaginable with the use of innovative materials, methods, and inventive technology applications.

As a result, workers in the service and manufacturing sectors will need new skills. Our working practices are already altering as a result of artificial intelligence, cloud computing, and mobile internet. Change will happen swiftly even though 6G and quantum computing are still in their early stages of development.

Table 2 Disruptive Technology in Industry 4.0

AI & ML	"Artificial intelligence is the capacity of a computer or robot to carry out conditioning constantly performed by intelligent beings". (https://www.britannica.com/technology/artificial-intelligence; Chen et al., 2021)
Quantum Computing	"A new paradigm known as quantum information technology may reuse data other than double data made up of 0 and 1(Sigov etal., 2022). The digital revolution is incorporated with quantum Physics, opening up new openings for artificial intelligence and nanotechnology" (Kim, 2017)
5G & 6G	"A new generation of networks of cellular is called 5G is intended to increase data transmission efficiency. In order to support fully vertical applications, all functions, including sensing, communication, processing, caching, control, location, radar, navigation, and imaging, will be integrated into 6G, which will connect in whole thing, provide full-dimensional wireless coverage, and connect everything.
IoT, IIoT	"IoT and IIoT connect the network of physical objects (https://www.oracle.com/internet-of-things/what-is-iot/). The Internet of Things (IoT) links supply chain asset tracking software for trucks and other assets with remote sensors for goods transportation and fabrication and material handling equipment".
Data Sciences & Business Intel-licence	"Data scientists must employ coding, data mining, modelling, analytical skills, and other methods to wring value and meaning from the data. Human-machine interaction, quantitative reasoning, and information technology comprehension were also recognised by Darmont et al. (2002) as critical abilities in data sciences and business intelligence".
Cybersecurity	"Cybersecurity, as defined by Merriam-Webster's online dictionary, is the process of taking precautions to prevent unauthorized access to or attack on a computer or computer system. A critical initial step in preventing cyber assaults is to identify acceptable and workable techniques to persuade employees and end users of various technologies to secure their personal and organizational information assets" (Sigov et al., 2022).
Green Energy	"Green energy comes from renewable resources. Energy that is clean, sustainable, or renewable is referred to as "green energy." Leaders from around the world, energy sector administrators, and well-known corporate executives have all

	stressed the need for a clean energy policy in order to advance Industry 4.0".

Artificial Intelligence (AI) : Following the exponential rise of sensors and computer chips, the advancement of algorithms, and the support of big data, the development and use of artificial intelligence (AI) have increased since 2000, but especially since 2015. AI has been acknowledged as a strategic information technology innovation tool to boost businesses' competitiveness. A few of the AI-based technologies that enable extensive data analysis skills for applications in a range of industries include deep learning, machine learning, and language processing (Chen et al., 2021).

Quantum Computing: It is a game-changing technology to uses quantum physics to understand how information is processed and sent. It combines the research on information and communication technology (ICT) with the effects of quantum physics, including theoretical problems with computational models and experimental quantum physics themes. The application of Industry 4.0, which integrates the digital revolution into the physical world and offers new potential in artificial intelligence and nanotechnology, is expected to undergo a significant paradigm shift as a result of quantum technologies. (Kim, 2017)

5G and 6G: The goal of 5G, is to improve the effectiveness of transmitting the information. These networks provide lower latency, higher data rates, massive device connectivity, larger capacity, more dependable service quality, and lower prices when compared to fourth generation (Sigov et al., 2022). Though, Various data types cannot be exchanged in real-time by IoT and 5G devices. The next edition of 5G, 6G, is rapidly approaching. Compared to 5G, 6G will support a wider variety of applications. A comprehensive vertical application, comprising sensing, communication, computing, caching, control, location, radar, navigation, and imaging, will be possible with 6G thanks to its ability to connect everything, give all-dimensional wireless coverage, and integrate all functions.

Networking, IoT, and IIoT: In manufacturing and other critical industries, networking, IoT, and IIoT have had a substantial impact on the number of networking specialists.

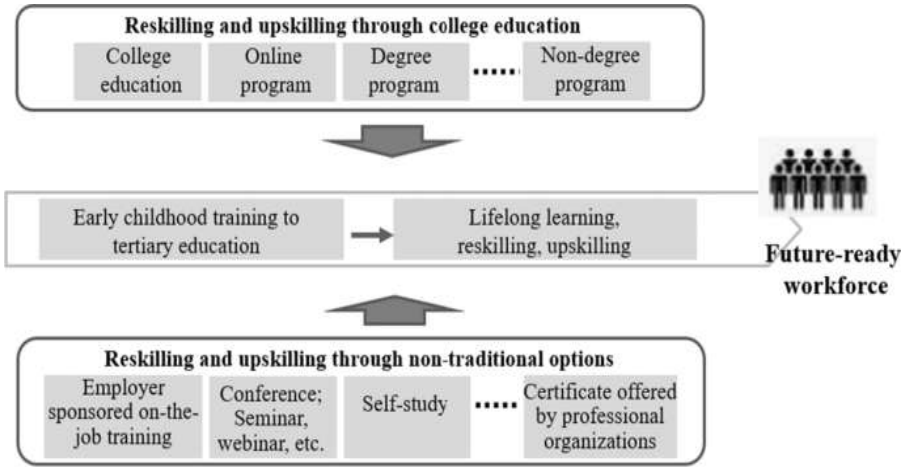
Data Science and Business Intelligence: In the year of 2025, around 30% of the entire data will be in "real-time" format. Real-time data, as opposed to historical data, is information that is gathered through customer insights or business hardware and software as business operations are underway. Industries start to discover new methods to engage when operational technology and information technology intersect.

Cybersecurity: Cybersecurity In the digital age, technologies like computers, the Internet, and smart devices are necessary for day-to-day operations. Although we value the efficiency and ease that the new technologies provide, their use also presents us with new risks and difficulties. The number, volume, and sophistication of cyberattacks have risen recently, affecting businesses of all sizes and across all sectors. (Lu & Xu, 2018)

Green Energy: The significance of a clean energy plan as part of the new industrial era. It has been emphasized via energy sector managers, well-known corporate executives, world leaders

New Knowledge Resource: The success of educational institutions owes a lot to the knowledge assets it pos-sesses. Knowledge resources development and management are key concerns for HEIs. Conventional knowledge management through formal libraries may start losing its relevance and effectiveness with the growing technological interventions. Newer technological concepts such as cloud-based storage facilities are opening new dimensions in knowledge management systems.

Reskilling and Upskilling through College Education:



Experiential Learning: Every programme leading to a degree in higher education must include experiential learning. Universities have developed a student-cantered programme to offer a practical, industry-focused learning experience, but they also prioritise improving students' capacity to apply theories to practical issues. The path to become a future-ready employee includes internships. Students are better able to explain their professional objectives and become stronger candidates for future employment by working in their chosen area and developing relationships with businesses and consumers before graduation (Li, 2020). While we wait, we should develop quantitative rubrics for evaluating students' critical thinking, problem-solving, and critical thinking abilities throughout the experiential learning projects.

Professional Certificate: Many professional associations provide credentials based on Professional Licence Exams.

Re Certificate: Industry maintains current with the newest best practises and emerging technologies. For example, nurse practitioners will need to double their expertise every three years or even more swiftly to provide patient care in the Information Age.

Company-Sponsored on-the-job Training: Ellingrud et al., 2020 point of view, A company's offer to its employees should be the focus of the design phase of a future-of-work programme because the interaction between an organisation and its workers happens both ways. Businesses must advance compelling and explicit value propositions if they want to be sure that their staff members are aware of the benefits of utilizing new skills and technologies.

Self-study Open Course Programme: The availability of online self-study courses has increased recently, making it easier for people to upgrade or reskill their intellectual potential. The MIT Open Courses program's stated objectives are to "unlock knowledge" and "empower brains." The free, publicly accessible, openly licenced MIT Open Courseware (OCW) digital library contains excellent educational materials that are presented in an approachable manner. On-campus at MIT, more than 2,500 courses are available, and students have access to additional learning tools.

Challenges of Reskilling and Upskilling in college Education

Upskilling and reskilling present some obstacles as well as opportunities. One-fourth of the 116 executives at large companies polled by McKinsey in 2017 had a clear knowledge of how future automation and digitization would affect the need for skills. For one-fourth of the respondents, it was impossible to assess the business case for employee reskilling programmes due to a lack of resources or knowledge. Additionally, almost a third of respondents thought that their current HR infrastructure would be unable to put into practise a new strategy meant to close widening skill gaps **(Ellingrud et al., 2020).** The challenge of reskilling drives more severe in operationally intensive industries including jobs related to operations, transportation, manufacturing, and retail.

Because many operational jobs are repetitive in nature and are therefore well suited for automation or digitization, those industries will suffer a greater degree of change than the industry average. Employees in these fields also typically have less schooling than those in professional ones. Retraining will therefore be essential if one segment of the middle class is to remain stable.

Another obstacle is the unwillingness of employees to spend time and money on upgrading or retraining themselves for the future. The older age group changed their attitude because they are against change in the workplace since it will interfere with their typical workday. Accessibility and affordability are problems. Businesses should

offer their employees the chance to learn, unlimited access to the Internet and information, and financial flexibility such as tuition help. Curriculum alignment to Industry 4.0 competencies should start right away. The curriculum's design must place an emphasis on skills that employers value and offer a wide range of evaluation criteria **(Maisiri & Van Dyk, 2021).**

Workers who have lost their jobs recently are looking for stronger job safety. Thus, public monies have not been distributed in a sufficient amount to assist upskilling and reskilling. The public sector will need to collaborate with corporate groups to make investments in a workforce prepared for the future and for tomorrow's jobs, as well as to take immediate action on long-overdue reforms of the education and training systems.

2. Conclusion

Around 2025, 50% of whole workers will require additional training due to the use of new technology, forecasts of the World Economic Forum. More than two-thirds of capabilities will be evaluated in five years. The qualifications needed for today's occupations will change. Technology-related abilities that are not yet viewed as being essential to today's employment needs will make up one-third of the required skills by 2025. In this article, we've described the key competencies that companies need in order to execute Industry 4.0 and given readers a roadmap to utilize as a resource as they gain new knowledge and skill sets.

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