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Adapting to Automation: Workforce Preparedness in the Fourth Industrial Revolution

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***Abstract*—The Fourth Industrial Revolution, driven by artificial intelligence, robotics and automation, is reshaping how work is organised and raising concerns about job displacement and the readiness of the workforce. This paper examines how students, working professionals and job seekers perceive the impact of automation on employment and which skills they consider essential for the future. A descriptive, survey-based study was carried out using a structured questionnaire administered to 70 respondents selected by convenience sampling, supported by a review of nine influential studies and policy reports. Responses were analysed using frequency and percentage analysis and graphical representation. The results show that 42.9% of respondents believe technology may replace jobs, while 25.7% expect outright replacement and 24.3% do not. Information technology and software was perceived as the most exposed sector (82.9%), followed by manufacturing (32.9%). Technical/programming skills and problem-solving were each chosen by 65.7% of respondents as important for future jobs, followed by creativity and innovation (64.3%), and every respondent reported that technology improves work or study efficiency. The findings support the view that automation transforms work rather than simply replacing it, and they point to the need for continuous reskilling, stronger STEM education and industry–academia partnerships. Because the sample is small and dominated by young respondents, the results are indicative rather than conclusive.**

***Keywords*—automation, artificial intelligence, Fourth Industrial Revolution, future of work, job displacement, reskilling, workforce preparedness**

I. Introduction

The Fourth Industrial Revolution (4IR) is marked by the fusion of digital, physical and biological technologies and by a pace of change without historical precedent [1]. Artificial intelligence (AI), machine learning (ML), robotic process automation (RPA) and robotics now perform not only repetitive tasks but also complex cognitive activities such as data analysis, prediction, financial modeling and customer service. Because progress in digital technology is exponential rather than linear, its effects on the economy and on employment often appear unexpectedly disruptive [2].

Historical experience shows that technology eliminates certain tasks while creating new jobs that demand higher-order thinking, creativity and digital skills. Nevertheless, the rapid rise of AI and automation has created uncertainty among students, employees and job seekers, who are unsure whether machines will replace human labour, whether their current skills will become irrelevant, which new skills will be required, and whether enough jobs will exist in the future. This raises a critical question: will technology replace human jobs or create new possibilities?

Much of the available evidence addresses this question through occupational or task-level estimates for whole economies [3], [4]. Far less is known about how the people who will actually face these changes, particularly young students and early-career professionals, perceive the risks and the opportunities. Such perceptions matter because they shape decisions about education, training and career choice, and therefore the preparedness of the workforce.

This paper presents a survey-based study of workforce perceptions of automation. Its objectives are (i) to examine whether technology can replace human labour, (ii) to identify the industries perceived as most affected by automation and AI, (iii) to explore new technology-driven career opportunities and the skills they require, and (iv) to recommend adaptation strategies for workers, educators and policymakers. The study tests the hypothesis that technology transforms work by eliminating routine tasks and creating opportunities that require advanced skills.

The remainder of the paper is organised as follows. Section II reviews related work, Section III describes the proposed methodology, Section IV presents the results and discussion, and Section V concludes the paper.

II. Related Work / Literature Review

A. Occupation- and Task-Based Risk Estimates

Frey and Osborne [3] combined a machine-learning model with detailed occupational data to assess the susceptibility of more than 700 American occupations to computerisation. They concluded that about 47% of jobs were at high risk of automation in the coming decades, with clerical, sales, logistics and transportation roles most exposed. Their occupation-level approach was criticised for overstating risk because it does not distinguish between tasks within a job. Arntz et al. [4] therefore adopted a task-based approach using data for OECD countries and found that only about 9% of jobs were at high risk, with notable differences between countries owing to variations in employment structures, education levels and technology adoption. Policy briefs of the OECD [5] likewise emphasise tasks rather than occupations. They suggest that about 14% of jobs in OECD countries face high automation risk while many more will undergo significant task transformation, and they stress lifelong learning, vocational training and social safety nets.

B. Task Reallocation, New Tasks and Demand

Autor [6] argues that although automation reduces demand for routine work, it raises the value of problem solving, adaptability and interpersonal skills: machines take over routine tasks (“task reallocation”) while people concentrate on

non-routine, judgement-based activities. Acemoglu and Restrepo [7] extend this view with a task-based framework in which technology both displaces labour and reinstates it by creating new tasks, and they stress the role of institutions, legislation and education in determining whether the net effect is job loss or job creation. Goos et al. [8] explain job polarisation through routine-biased technological change: middle-skill, routine-intensive jobs are the most vulnerable, while low-skill service jobs and high-skill professional jobs expand, hollowing out the labour market. Bessen [9] adds a demand-side view, showing that the employment effect of automation depends on how technology changes product demand, which explains why sectors such as healthcare and information technology can grow alongside automation.

C. Employer Perspectives

From the employer perspective, the World Economic Forum [10] projects that automation may eliminate 85 million jobs by 2025 while creating 97 million new ones, especially in data, AI, cloud computing and the green economy, and that roughly half of all workers will need retraining. Together with the argument of Brynjolfsson and McAfee [2] that technology will transform rather than abolish labour and force workers to adapt quickly, these studies present technological change as a dual force that both removes and creates roles.

D. Research Gap

The reviewed studies rely mostly on economy-wide data, occupational databases or employer surveys. Fewer studies examine how students, early-career professionals and job seekers themselves perceive the risk of automation and the skills they will need. The present study addresses this gap through a primary survey.

III. Proposed Methodology

A. Research Design

The study adopts a descriptive, survey-based design. Its aim is to describe how technology is affecting employment and how students, workers and job seekers perceive the possibility that jobs may be replaced by robots or AI. The work was organised in three phases of about one month each: data collection (literature review, questionnaire design and collection of responses), data analysis, and reporting. The overall workflow is shown in Fig. 1.



Fig. 1. Workflow of the proposed methodology.

B. Population and Sample

The target population comprised students, working professionals and job seekers. A sample of 70 respondents was selected by convenience sampling. A moderate sample size was chosen so that responses could be collected within the available time frame.

C. Data Collection and Instrument

Primary data were collected through a structured questionnaire administered with Google Forms. The questionnaire had three sections: (1) demographics (age, gender and occupation); (2) technology perception (awareness of automation, perceived job risk and confidence in learning new skills); and (3) future outlook (views on whether technology will create jobs and which skills the future workforce will need). Open-ended questions captured additional opinions. Secondary data came from the journal articles, working papers, policy briefs and industry reports reviewed in Section II.

D. Data Analysis

Responses were summarised through frequency tables, percentage analysis and graphical representation using bar and pie charts. Common themes in the open-ended responses were identified and condensed to reflect the opinions of the respondents.

E. Hypotheses

Two hypotheses were formulated. H_1: technology will transform work by eliminating routine tasks and creating new opportunities that require advanced skills. H_0: technology has no effect on job replacement or workforce requirements. They were examined using responses on perceived job replacement, the opportunities created by technology and the skills needed for future jobs.

IV. Results and Discussion

This section presents and discusses the survey findings ($n = 70$).

A. Respondent Profile

Table I summarises the profile of the respondents. Most respondents (87.1%) were aged 21–30, 11.4% were below

20, a very small share were aged 31–40, and none were above 40. Females formed 55.7% of the sample and males 44.3%. Students were the largest group (64.3%), followed by private-sector employees (28.6%) and job seekers (7.1%). The sample is therefore youth-centric and reflects mainly the views of students and recent graduates, who are the most likely to be affected by technological change in the labour market. It may not represent mid-career or senior professionals.

TABLE I
DEMOGRAPHIC PROFILE OF RESPONDENTS

Variable	Category	Respondents (%)
Age	Below 20	11.4
	21–30	87.1
	31–40	Very small
	Above 40	0
Gender	Female	55.7
	Male	44.3
Occupation	Student	64.3
	Employee (private sector)	28.6
	Employee (government sector)	0
	Job seeker	7.1

B. Perceived Job Replacement

As Fig. 2 shows, 42.9% of respondents felt that technology may replace jobs, 25.7% believed that it will, 24.3% believed that it will not, and 7.1% were not sure. A clear majority (68.6%) therefore considers replacement at least possible, but only about one in four expects outright replacement. Concern about job loss, rated on a five-point scale (1 = lowest, 5 = highest), was moderate: 35.7% chose the midpoint, 31.4% chose 4 or 5 and 32.9% chose 1 or 2, giving a mean rating of about 2.9.

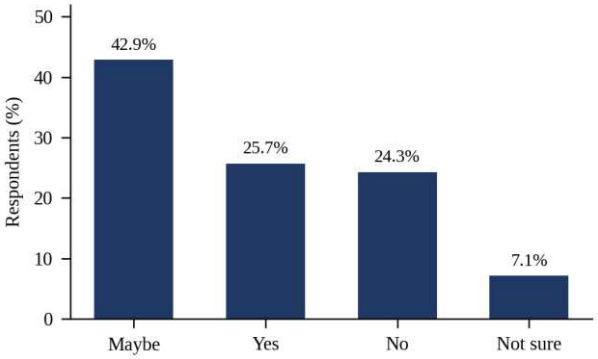


Fig. 2. Perception of whether technology can replace human jobs in the future.

C. Sectors at Risk

Fig. 3 shows the sectors that respondents believe are most at risk (multiple selections were allowed). Information technology and software was chosen by 82.9% of respondents, far ahead of manufacturing (32.9%), education (24.3%), other sectors (22.9%), healthcare (15.7%) and transportation (8.6%). The high perceived exposure of IT and software may reflect the visibility of AI tools in that field. It contrasts, however, with the literature, in which clerical, sales, logistics and transportation occupations were identified as the most exposed [3], and with the observation that information technology is expanding alongside automation because of demand growth [9]. Perceived risk therefore does not necessarily coincide with measured risk or with employment outcomes.

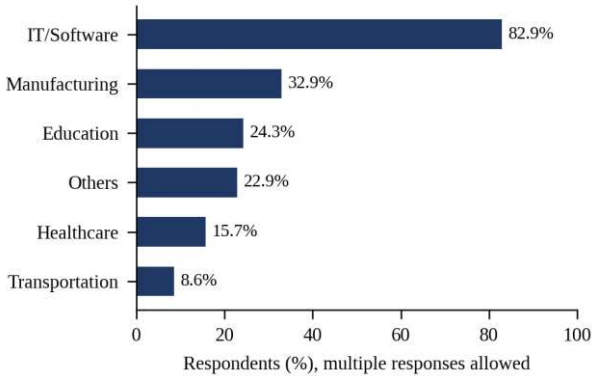


Fig. 3. Job sectors perceived to be most at risk due to technology.

D. Opportunities Created by Technology

Respondents were divided on whether technology creates more jobs than it replaces (Fig. 4). About 47% agreed or strongly agreed (38.6% and 8.6%), 40% were neutral and about 13% disagreed or strongly disagreed. The large neutral group indicates uncertainty about the balance between job destruction and job creation. The mildly positive tilt is consistent with employer projections of net job creation [10] and with task-based studies showing that new tasks offset part of the displacement [7].

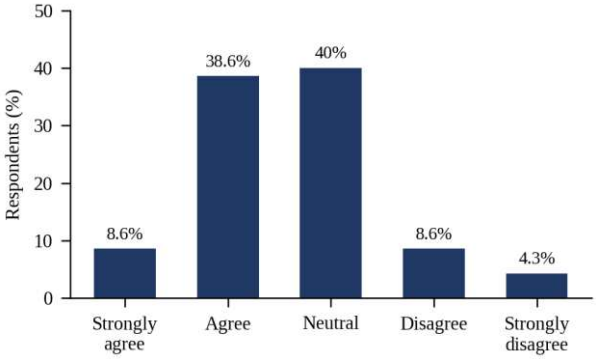


Fig. 4. Opinion on whether technology creates more jobs than it replaces.

E. Skills for the Future Workforce

Fig. 5 shows the skills that respondents consider most important for future jobs (multiple selections were allowed). Technical/programming skills and problem-solving were each selected by 65.7% of respondents, followed by creativity and innovation (64.3%), leadership/management (54.3%) and emotional intelligence (40%). Respondents therefore value technical competence and distinctly human capabilities together, which agrees with the view that automation complements problem solving, adaptability and interpersonal skills [6]. Every respondent (100%) reported that technology improves work or study efficiency. The open-ended responses stressed adaptability and reskilling: workers who embrace emerging fields such as AI, automation and robotics are expected to remain relevant, and technology is expected to transform jobs more often than to replace them, chiefly by automating routine tasks while creating new opportunities.

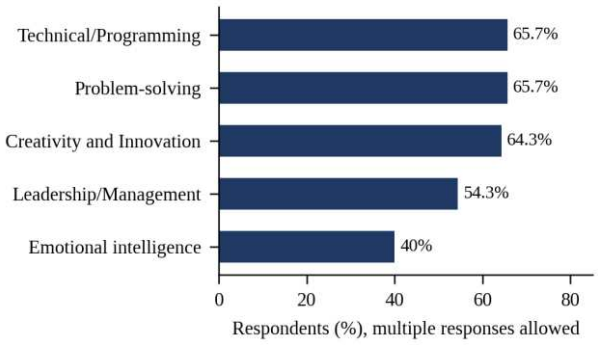


Fig. 5. Skills considered most important for future jobs.

F. Hypothesis Validation and Discussion

The results support H_1. Only a quarter of respondents expect outright replacement, all report efficiency gains from technology, and technical and problem-solving skills lead the ranking of skills needed in the future. On this evidence H_0 is not supported. Four themes emerge: young participants show fear but also optimism; automation threatens repetitive tasks while creating new digital roles; humans remain essential where creativity and emotional intelligence are needed; and a mismatch between existing skills and emerging requirements is a major concern. Because the sample is small and selected by convenience, these results are indicative rather than statistically conclusive.

G. Implications

The findings suggest five practical measures: promoting digital skill training, strengthening STEM education, encouraging lifelong learning, introducing government skill-development schemes, and fostering industry–academia partnerships. These are in line with the emphasis of the OECD [5] on lifelong learning and vocational training and with the call of the World Economic Forum [10] for large-scale reskilling.

V. Conclusion

This paper examined how students, working professionals and job seekers perceive automation and what preparedness they consider necessary in the Fourth Industrial Revolution. Drawing on a literature review and a survey of 70 respondents, it finds that technology is widely seen as capable of replacing some jobs, yet only about a quarter of respondents expect outright replacement. Information technology and software is perceived as the most exposed sector, respondents are divided on whether more jobs will be created than lost, and they regard technical, problem-solving and creative skills as the most important for the future. The relationship between technology and employment is therefore better described as redefinition than replacement, and preparing the workforce through continual learning, reskilling and policy support is critical for inclusive growth in the age of automation.

Limitations and future work. The sample is limited to 70 respondents and is dominated by early-career participants, geographic coverage is restricted, the data are self-reported and may involve bias, and perceptions were captured at a single point in time. Future research can explore the long-term impact of automation on career progression, role-specific skill development frameworks, comparative studies across industries and regions, larger samples that include mid-career and senior professionals, and the effectiveness of AI-based learning tools.

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