



The Demographic–AI Nexus: Reimagining Labor Market in the Twenty-First Century

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Abstract

Artificial Intelligence (AI) is rapidly changing the face of labor market dynamics worldwide, offering opportunities and challenges. Research into the extent of job replacement and task reconfiguration by AI in the different sectors and workers' perception of the risks in each of the sectors. This report explores the nature of job replacement and task transformation with AI and identifies vulnerabilities across different sectors as well as attitudes and beliefs of employees. The world labor market is going through a drastic transformation with two important factors: demographic changes and the quick development of AI. Declining fertility and migration in the global context is affecting how the population is changing in terms of labour force. Meanwhile, AI technologies have been transforming industries, automating processes, boosting productivity, and altering work practices. In this paper, we examine how these trends will impact the future of work, since we are discussing the interplay between two trends: demographic trends and technological development powered by AI. The paper explores from a statistical, case study and theoretical viewpoint the conclusive evidence on the transition of the labour market, job displacement and job creation, the changing nature of the labour market skills and future socio-economic implications. The results show that although AI can replace some of the jobs, demographic issues like the aging population can result in labor shortages, which can be addressed by AI. Lastly, the paper acknowledges that policies focused on education, reskilling and strong governance of AI ethical issues will be crucial to achieve inclusive and sustainable economic growth and highlights several proactive actions, including lifelong reskilling, flexible education approaches and the principles of ethical use of AI, as necessary to successfully integrate AI. A successful transition will require the cooperation of policymakers, industry, and education for the transition to be inclusive and to foster digital literacy and skills development. Potential areas for further research are area deviations, firm-level case studies and long-term socio-economic influences of the use of AI. To conclude, the paper emphasizes significance of technological advancements and the adaptability of the workforce to guarantee sustainable economic development in the age of AI.

Keywords: Demography, Artificial Intelligence, Future of Work, Automation, Labor Market, Workforce Transformation.

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1. Introduction

Demographic transition is a model describing the changes in birth, death and natural growth rates that occur as the society becomes more prosperous and more urban. The concept of demographic transition theory was created by American demographers as alternative idea to the Malthusian ideas of population growth. Basically it represents the birth and death and natural growth rates of a society over time. "Time" in this model is proxy for industrialization, urbanization, and increases in wealth, since it is based on historical experience of Western Europe and North America as they went through Industrial Revolution. The demographic transition is study of demographic transition process, or how and why birth and death rates and the rate of change alter as an impoverished, rural, and traditional society becomes a wealthier, urbanized, and modern society. This can be demonstrated graphically using graph of birth, death and natural increase (Warf, B., 2025).

In the last decade, the field of Artificial Intelligence (AI) has considerably changed, reshaping different sectors and transforming the definition of roles. Despite its many advantages, AI has also sparked fears of job losses, especially in industries with repetitive, predictable work, tasks. But, like any technology, AI has its drawbacks, including concerns about job displacement, especially in industries with repetitive and predictable tasks. Research suggests that a significant number of jobs may be automated in near future, but extent of such automation is dependent on the industry, job function, and how much the industry is incorporating AI into its workforce at present. The topic of AI leading to job loss is hardly new. Previous studies have tended to concentrate on effect of automation on jobs across various industries (S. Chhibber, et al., 2025).

AI and automation have transformed working lives, jobs and employment practices. The potential value of AI-powered technologies is clear as companies aim to streamline their operations and cut expenses. However, such technologies have a broad appeal, which poses important ethical issues, especially about the effect on workers, job security, and future of work (Mustafa Kayyali, 2026). This study shows ethical concerns to AI and all other automated workspaces. Ethical reflections in the field of AI can support trades and make industries free, fair and better workspaces. This research will shed light on the potential of AI and automation to shape positive future for workers and organizations one that is done in an ethical manner.

The field of AI has grown rapidly in recent years, with applications in various industries. AI is a representation of human intelligence in a machine that can think and execute tasks using human intelligence (HI). The tasks can be learning, reasoning, solving problems, perceiving, comprehending natural language, and adapting to new circumstances. It is also emphasized that Generation Y (Gen Y) is establishing new paradigms for the workplace, success, leadership and professional relationships. 'Gen Y' has been dubbed 'Greatest Generation' and it is claimed that they have all the necessary gears in place to deal with the challenges of the here and now, as well as the challenges of the future (Hershatter & Epstein, 2010). There's a belief that being tech savvy and having good teamwork and collaborative skills means that Gen Y will be able to work in any industry (Reed et al., Psychology and Aging 29:1, 2014). The generation that came of age during this period experienced a great deal of technological change like advent of Internet and social media. Yet, there is a lack of inclusive indulgent regarding impacts of utilization of AI at an organizational level in human resources (HR). Hence, this research aims to gain insights into the perception of millennials of the use of AI and their possible reactions in the workplace. Therefore, this research will challenge the understanding millennial employees

have of the use of AI in their organizations, use of AI by them, and the effects of AI on their careers (Kodagoda, T., 2026).

As AI intersects with human augmentation, the world at work is changing from automation to collaboration and skill complementarity. In this study, the authors examine how reskilling is emerging as a strategic need for equipping employees for an AI-enhanced world. Through the analysis of theoretical models, cross-industry applications, and organizational strategies, it shows how skills have evolved from the past to become more hybrid and how adaptive and inclusive learning cultures are essential. Ethical, educational, and policy issues are also explored, as are future research agenda to maintain human relevance and creativity in AI world. In conclusion, it proposes that human AI amplification, combined with planned upskilling and reskilling measures, has the potential to transform the workforce into a more resilient, innovative, and equitable one (Lintang Tiaraningrum and Binastya Anggara Sekti 2026).

AI is now affecting practically every part of our daily lives, and has important consequences for our economy and our work of the future. To enable the alignment of AI with society, it is essential to broaden the understanding of AI and society among AI developers and members of the public. AI's practitioners must be more foresighted in the ethical and societal impact of their work, and society should increase its understanding of AI and its implications for society and the economy. There have been reports of fatal crashes of airplanes and autonomous vehicles caused by AI systems. It is important that national and international institutions become more adept at comprehending and predicting possible outcomes of AI, in order to enable proactive regulation, as opposed to only reactive. The understanding of the public on AI systems is very limited compared to what is required (Fleischmann, K.R., 2026).

Technological innovation and demographic change are on rise and changing nature of work. Industries are changing ways of doing work with the help of AI, robotics and automation technologies. Meanwhile, demographics around the world are in flux and affecting labor markets, such as migration and aging of the population and falling birth rates. Technological change has always been a driver of changes in jobs and job structures. The Industrial Revolution has been about mechanizing production, and the digital revolution (Maqsood, M. et al 2026) has been about the use of computers and information technologies in the workplace. The AI revolution is another paradigm change in the production of goods and labour today. Demographic changes also have an impact. Developed countries all over the world are facing a drop in birth rates and aging populations. The declining share of working age people in society can lead to shortages of labour, and puts a greater strain on social welfare systems. The Organisation for Economic Co-operation and Development (OECD) identified technological change, globalization and demographic transformation as some of the most important factors responsible for the transformations of modern labour markets. The other important factor is demographic change. The United Nations (UN) population goals are for the world's older population to double by 2050. A decline in size of working-age population and rise in dependency ratios could result from aging populations. But many developing areas such as South Asia and Africa are rapidly expanding youth populations that are coming onto the labor market (Berger, T., & Frey, C. B., 2016).

According to survey conducted by World Economic Forum (WEF) (Future of Jobs Report 2023), AI and automation could eliminate some jobs but create new ones, meaning there will be a demand for new skills among the workforce. The relationship between demographic shifts and AI in shaping the future of work is explored in this study. It discusses the implications for employment structures, skills of the workforce, productivity and public policy.

2. Literature Review

By 2030, the world will see significant transformation of its workforce, driven by economic, technological, demographic and environmental factors. Demographic challenges such as an ageing population and regional differences will create significant new challenges, such as a shrinking pool of workers, and an increasing divide in incomes, but digital technologies, automation and green industries will also create jobs. With so many jobs being created alongside jobs being lost, there will be a greater need for workers to become re-skilled, to learn throughout their life and for inclusive policies. Advancements in technology (Umar, M., et al. 2026), particularly AI, big data and robotics, will boost productivity and create job losses for routine and low-skill work, while also demanding a strategy for workforce adaptation. There will be a greater emphasis on analytical thinking, digital literacy, resilience, creativity and emotional intelligence skills, whereas manual skills will decrease. The variation across the sectors shows that skill development has to be targeted to achieve economic resilience and social equity. There is a need for cooperation between education providers, the industry and policy makers to promote inclusive growth, transition to the labour market and to fully leverage the opportunities that are emerging. This comprehensive analysis highlights the need to take action now to reskill and innovate workforce policies that will ensure a future workforce that can seize the opportunities of change for sustainable development and inclusive prosperity. The research focuses on contemporary, topical and pressing issues that are becoming significant in the global settings of today (Yoganandham, G., 2025).

Topics of research on the future of work include two important drivers of the labor markets: demographic change and technological innovation. The demographic transition theory is the theory that describes the process of population changes from high levels of fertility and mortality to low, as societies move toward economic development, increasing birth rates and longer life spans. Population aging creates a number of economic problems. There are more elderly people than there are young people of working age in the population, as a consequence of the falling birth rates and the growing life expectancy. This transition affects the pension systems, health care services and public finances. In the past few decades, the research of AI has also progressed at a fast pace. The ability of AI technologies like machine learning, NLP and robotics to undertake tasks once done by humans is growing. There have been many discussions about the impact of AI on jobs. It has been a subject of debate among scholars on the implications of AI for employment.

(Frey and Osborne, 2017) stated that a large share of jobs are likely to be vulnerable to automation. But later studies indicate that automation usually only has an impact on individual jobs and not on job categories. This results in the emergence of human AI collaboration, where AI complements human capabilities instead of replacing them. Technology innovation can thus have a potentially disruptive and potentially creating impact on the job market, according to the literature. AI's influence on the labor market will be shaped by economic policies, the skill of the workforce and education systems.

2.1 Demography and Economic Development

Demography is the statistical study of populations (in terms of their numbers, distribution and structure). There are several ways in which population influences the economic growth: (1) through the supply of labour, (2) through consumption patterns, and (3) through innovation potentials. In the past, nations with high working populations have had greater economic growth rates thanks to the “demographic dividend.” In many developed countries, however, there is now a time of demographic ageing. In a population, population ageing is the tendency of the proportion of elderly people to rise as the birth rate falls and life expectancy is extended. This trend leads to a larger proportion of older people compared to younger adults. Research shows that demographic ageing may result in reduced labor supply, increased healthcare expenditures, escalating costs of pensions, stronger strain on pension systems, and slower economic growth. But technological innovation can counteract these impacts by boosting productivity.

2.2 Artificial Intelligence and Automation

AI is a technology that involves computers carrying out tasks that would traditionally demand human intelligence. These activities include such tasks as problem solving, learning, perception and decision making. AI technologies include: Machine learning, Natural language processing, Robotics, Computer vision, and Predictive analytics.

The increasing adoption of AI has made significant strides in various sectors, including healthcare, manufacturing, finance, and education. Studies indicate that AI will not just replace roles, but redefine them by automating tasks within roles instead of entire roles. Research shows that AI will not take away jobs but will alter them, automating specific tasks within the job.

2.3 Theoretical Perspectives on Future of Work

Regardless of research done on the future of work, the knowledge of future workforce needs is still limited, and we are not adequately prepared to face the changing needs of the workforce. The bulk of the literature concentrates on unemployment due to AI and automation, with the idea that work in the future will only be “leftovers” after AI and automation have taken over. This view fails to see which kinds of jobs will flourish and develop in coming future. The future of work has been a subject of much study and discussion in current years. It has been one of the top ten “Big Ideas” for National Science Foundation's (NSF) investments in research since 2016 and regular series of WEF. But over the last few years, future of work has become more critical than ever, as well as more complicated, thanks to the pandemic and accelerated developments in AI. The dominant line of research tends to be limited to the perspective of job replacement and job loss as a result of AI and automation, which is problematic in the world of unparalleled Volatility, Uncertainty, Complexity and Ambiguity (VUCA) (Chang, Y. L., & Seo, B., 2025).

There are three key angles to consider when talking about AI and jobs.

1. Technological Unemployment Theory: According to this theory, automation will take the place of humans and create a high level of unemployment.

2. Job Transformation Theory: The view here is that technology is transforming jobs, not jobs themselves.

3. Complementarity Theory: This perspective suggests that AI serves as a tool to augment human efforts, improving productivity and decision-making processes. The modern research views are largely in favour of the third view the collaboration of humans and smart machines.

3. Research Methodology

In this study, research methodology is descriptive and analytical to analyze the trend in the labor market until 2030. It is based primarily on second-hand information from reports from international organizations, government publications, academic research and studies, industry surveys, and statistical databases. The sources offer information on macro-economic changes, technological developments, demographic developments and environmental developments that influence employment changes. Data collection and synthesis refers to the process of collecting and structuring relevant data where required and analysing the data to detect patterns, emerging trends and variations in skills demand and employment opportunities across sectors. The statistical forecasts and trend analysis help in grasping the possible futures of the labour markets in the world and in various regions. Besides, the methodology features comparative analysis between regions, sectors, and skill categories to reflect disparities, opportunities and challenges. The results are then analysed and provided to guide policies, companies and education providers on reskilling, upskilling, adapting workforces and recruiting people for work in inclusive ways. Briefly research methodly shows witness and learnings how all the dynamics related to technology, economy and environment will impact labour market by year 2030.

Analytical Framework: The study uses a conceptual framework that ties together demographic change, technological innovation, the transformation of the labour markets, and policy responses.

Data collection: For this study, data was composed from International bodies, references from different given resources, blogs, articles and papers like WEF, UN, OECD and reputed academic journals and conferences.

4. Global Demographic Trends

4.1 Population Aging

Population ageing is one of the most significant demographic changes of 21st century. The ageing population is growing in many countries at a very high rate. For example:

Region	Percentage of Population Age 65+ (2020)	Projected 2050
Europe	20%	30%
North America	17%	26%
East Asia	18%	35%

Table 1: Global population aging trends (Source: UN Population Division)

This age group demographic shrinks the pool of working-age people in the labor market.

4.2 Declining Fertility Rates

A number of countries are experiencing lower fertility rates. In 1950, fertility rate averaged approximately 5 children per woman but had declined to 2.3 children per woman in the year 2020. Decreased birth rates lead to a decrease in the future labour force and aging of the population.

4.3 Population growth of the youth in developing countries;

Developed countries have ageing populations, whereas many of the developing countries have large youth populations. The workforce in the South Asian countries and African countries is young, which has high demographic potential. This advantage, however depends on education quality, Employment opportunities and Economic policies, if job creation is lacking, large youth populations could be at risk for joblessness.



5. Artificial Intelligence in the Labor Market

5.1 AI Adoption across Industries

AI is transforming multiple sectors. These technologies improve efficiency and reduce operational costs.

Industry	AI Applications
Healthcare	Medical diagnosis, robotic surgery
Finance	Fraud detection, algorithmic trading
Manufacturing	Automated assembly lines
Retail	Recommendation systems
Education	Personalized learning platforms

Table 2: AI Applications

5.2 Automation Risk in Occupations

Researchers estimate that about 28% of employment in OECD countries is at high risk of automation. The jobs most vulnerable include those that have routine tasks, such as data entry clerks, Factory machine operators, and Telemarketing agents.

Those roles that rely on creativity, social interaction and complex decision making are less likely to be automated.

5.3 Skill Demand in AI-Driven Labor Markets

The skills needed to succeed in the modern workplace are evolving with the help of AI technologies. The OECD research findings indicate that AI has emerged as a threat to most of the highest-risk occupations, which now require new skills like creativity, collaboration and skills in management. Future skills that are important, Digital literacy, Data analysis, Critical thinking, Emotional intelligence, Creativity and updated AI Tools.

6. Interaction between Demography and Artificial Intelligence

The impacts of demographic change and AI are interdependent and affect the labor market.

6.1 AI as a solution to the labour shortage:

A shortage of labour may be a critical issue for countries with ageing populations in the future. Declining numbers of people in the workforce can be offset by the productivity boost automation and robotics can bring. For example: In manufacturing industries robots are in use, AI-powered logistics systems, and Customer service automation software. These technologies enable less people to make more products or services.

6.2 Productivity Enhancement

AI technologies can greatly boost productivity by automating repetitive tasks, improving data analysis skills, and supporting complex decision-making.

A rise in productivity can offset some of the economic issues stemming from population decline. According to economic models, innovation can help to drive economic growth to a greater extent than the size of the population.

6.3 Labor Market Transformation

AI doesn't necessarily take the place of human employees, but it does transform job roles. For instance: Human workers are more and more collaborating with AI systems.

Job	Traditional Role	AI-Enhanced Role
Doctor	Manual diagnosis	AI-assisted diagnosis



Job	Traditional Role	AI-Enhanced Role
Teacher	Standard instruction	Personalized AI-supported learning
Accountant	Manual bookkeeping	Data analytics and financial strategy

Table 3: AI workforce

7. Case Studies

7.1 Japan: Japan at the heart of the aging societies

Challenges and opportunities: Japan is home to one of the world's oldest populations. Its elderly population accounts for almost 30% of the population. Japan has been investing heavily in the development of robotics and automation in order to solve the problem of labor shortage. Examples include: Robots to help elderly care, Automated manufacturing systems, Customer service kiosks powered by AI, and AI-powered customer service kiosks. These technologies are key in sustaining productivity in the face of a shrinking workforce.

7.2 Germany: Industry 4.0

Germany has adopted a high-tech manufacturing approach called Industry 4.0, which uses AI, robots, and digital technology in the production process. Benefits include: Increased manufacturing efficiency, reduced labor costs, higher global competitiveness. Industry 4.0 shows how technology can augment humans and not replace them.

7.3 United States: AI in the Service Economy

AI is especially well-adopted in service sectors like finance, healthcare, and technology in the United States.

8. Policy Recommendations

Policies should be made to enhance the workspace and technological breakthroughs to confirm that AI can help in development and growth. These must be incorporated in STEM education also to build strong socio-economic systems. Governments, universities, and industries should also collaborate to prepare workers for the future labor market.

- 1. Education Reform:** Digital proficiency, critical thinking, and problem-solving should be prioritized in the education systems.
- 2. Lifelong Learning Programs:** Staff should always strive to improve their competencies to keep up with the competition.
- 3. Social Protection Systems:** Displaced workers can be assisted with policies like unemployment benefits and job transition programs.
- 4. Ethical AI Regulation:** Responsible development and deployment of AI should be guided by governments.
- 5. Public-Private Partnerships:** Government, universities, and industries can collaborate to facilitate innovation and development of the workforce.

9. Challenges:

Here they consider three main challenges, particularly focusing on the emerging countries: the impact of their increasing populations on use of land and resources in low-income countries. In many of these particularly in the poorest, this is a key contributor to deforestation, ecosystem degradation, and loss, because a significant proportion of their population relies on nature for their livelihood. Hence, there is a positive feedback between social and economic progress and nature protection and reduction of GHG. This suggests, however, that a lower rate of population growth will also involve a lower rate of growth in the labour force and this may be correlated with lower economic growth unless offset by higher productivity growth, which is difficult to attain in less progressive states. Last but not least, the financial consequences of growing up on the social security systems are

tackled as well. In many progressive countries, this procedure has begun prior and is now at a critical stage, as well as in numerous large and medium sized developing states, where this demographic transition has been very rapid during last few decades (Vial, J., 2026).

10. Future Outlook

How societies tame the synergy between demographic change and technological innovation will be the key to the future of work. Some scenarios for the future are:

- 1. AI-Enhanced Workforce:** People work in concert with AI to achieve greater productivity.
- 2. Automation-Dominated Economy:** Most of the mundane tasks are carried out by machines and most of the creative work is performed by humans.
- 3. Inclusive Digital Economy:** The benefits of technology are spread across the whole society via education and policy changes. This will be determined, to a large degree, by policy direction and employee flexibility.

11. Conclusion

Two forces driving the future of working are demographic change and AI. The changing characteristics of the labour force (due to aging populations, falling fertility and migration) impact on labour supply and economic growth. Meanwhile, AI is revolutionizing industries with its automation capabilities and productivity boosts. At the same time, AI is transforming industries by introducing automation and productivity enhancements. Although some jobs can be automated, demographic trends such as declining workforces may create an increase in demand for technology solutions. AI is not leading to widespread job losses but instead the new function of jobs. AI is not causing mass unemployment but rather new skills are needed. The findings indicate that, although job displacement will undoubtedly be a dominant theme in the future of work, the gains from this technological shift will be to those industries and individuals who are able to adapt. A proactive plan of action is needed to make this transition. Workforce strategies will require continuous reskilling and adaptive education systems, and smart and ethical use of AI. The key to a successful transition that doesn't leave anyone out will be through cooperation from policymakers, industry leaders, and educational institutions. It is ultimately the decisions that society makes about how to use this technology to create a more resilient, equitable and future-ready workforce that will determine the impact of AI. The key to positive future of work lies in investing in education, reskilling and responsible governance of AI. If proper policies and plans are in place, the use of AI by the workforce can be a factor in economic growth and improving the quality of life.

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Figures

Figure 1. Global Population Aging Trend

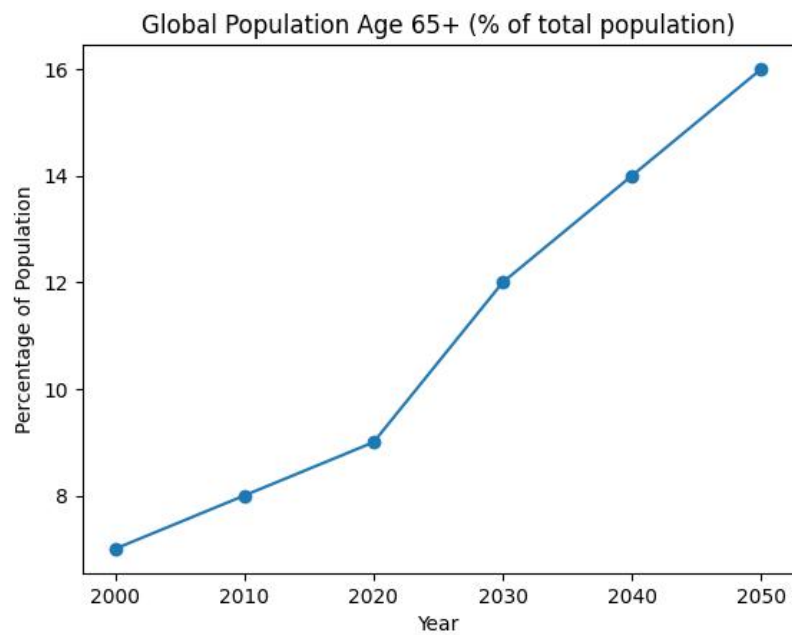


Figure 2. Estimated Impact of AI on Employment

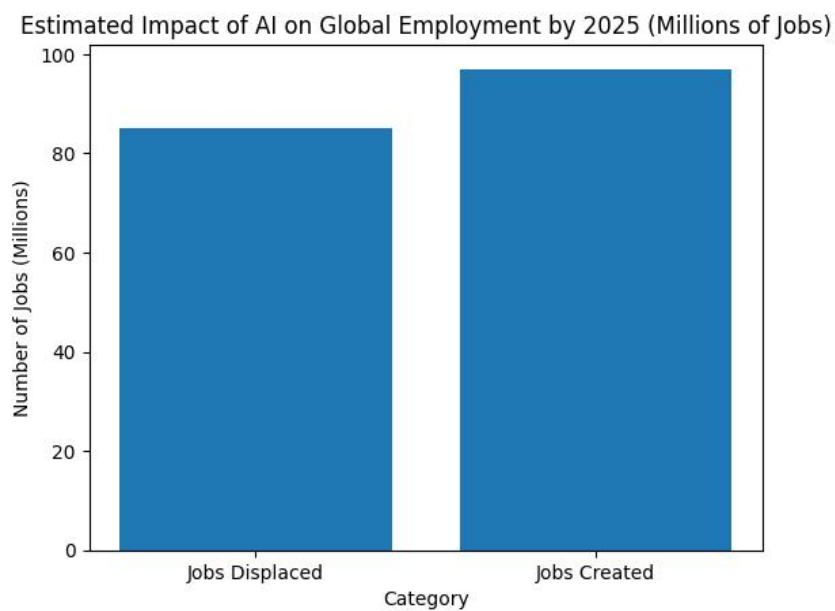


Figure 3. Projected Change in Workforce Skills Demand by 2030 (Fariba Chowdhury et al, 2025). Source: Inspired by World Economic Forum Future of Jobs Reports

<https://doi.org/10.5281/zenodo.20556049>

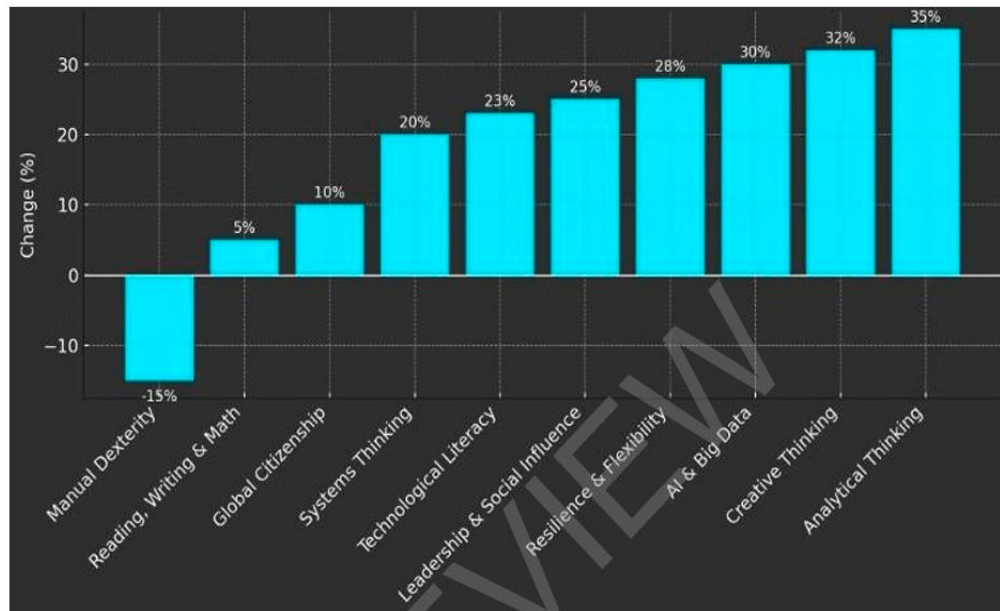


Figure 4. Net Job Impact vs Skill Importance by 2030 (Yoganandham, G., 2025)

