

Vulnerability of Workforce to AI Automation and Ethical Reactions

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Abstract—Work in the technology sector is changing as a result of artificial intelligence (AI). Automation will be used to accomplish many of the same job functions, altering existing job structures and presenting ethical challenges related to job loss, fairness, and the evolving nature of work. This paper focuses on how AI-driven automation affects two IT-related jobs: software quality assurance (QA) testing and IT help-desk support. By employing a mixed-methods research design, consisting of document review and a comparative case assessment, this study examines the task breakdown of each job, including how susceptible the individual tasks are to being automated, as well as how the roles are changing across the two fields. The results of this study found QA testing to be highly automatable, given its heavy reliance on repetitive and rule-based tasks. The result will be the development of hybrid jobs that focus on overseeing and validating outputs generated by AI. Conversely, the IT help-desk support job is less susceptible to being automated because it primarily requires contextual judgment, communication skills, and emotional intelligence. The study also discusses the ethical implications of task replacement by interpreting the results formed by the utilitarian versus deontological views of ethics, illustrating the trade-off between increased efficiency and employee displacement caused by AI automation. Ultimately, this paper contributes to our understanding of how AI will affect two different IT jobs through a comparative occupational analysis of how AI will impact both professions, and provides recommendations for the responsible implementation of AI by means of employee training and utilization of a human-centered model for governance.

Keywords—AI Driven automation, Ethical analysis, Workforce displacement, Human Centered Work

I. INTRODUCTION

The rapid development of artificial intelligence (AI) and machine learning (ML) technologies is changing work organization across many sectors. Instead of replacing entire jobs, current evidence suggests AI will automate certain job tasks while reconfiguring required skills and roles. Studies indicate machine learning excels at pattern recognition and

data-driven prediction, but lacks contextual reasoning, ethical judgment, and accountability, areas where human workers have a comparative advantage [1].

Initial estimations of automation risk indicate that almost 47 percent of the jobs in the United States could be computerized, especially those that were routine and repetitive in nature [2]. Later task-based strategies, however, believe that these estimates exaggerate the risk of displacement by not considering the variability within occupations. Task diversity being the overall proportion of jobs that can be completely automated, a relatively small percentage of jobs is completely automatable (around 9 percent), and most jobs undergo partial task transformation instead of being fully replaced [3]. This difference is especially applicable to technical jobs (like software quality assurance (QA) testing and IT help-desk support) that involve both routine technical work and non-routine decision-making.

This task-based perspective is further supported by historical trends of technological change. Although automation has increased productivity, it has also created new types of work, including monitoring, supervision, and coordination of automated systems [4]. This shift has led to hybrid jobs that integrate technical performance with supervision and interpretative duties. Companies adopting AI increasingly require workers to acquire skills for system governance, data interpretation, and AI-assisted decision-making [5], [6]. Research also shows that a strong digital skill base can help mitigate automation's employment impact, making reskilling and adaptation policies important [7].

With such advancements, the implementation of AI into working systems brings up significant ethical issues. On the one hand, algorithmic management systems have the ability to make the process more efficient; on the other hand, they can diminish workers' autonomy, stress, and accountability mechanisms unless managed appropriately [8], [9]. The latter are of particular concern to software-related areas, like QA testing, where AI systems are likely to introduce the problems regarding fairness, transparency, and bias in

automated decision-making [10].

Nevertheless, a major limitation of the available research is that it does not provide a comparative analysis between occupations that are very different in the kind of tasks they perform, but their operations are in the same technological field. In particular, there is little literature discussing the differences in the impact of AI-based automation on software QA testing and IT help-desk support. A high percentage of structured and repetitive tasks that are increasingly automatable are part of QA testing, but IT help-desk work is more prone to interpersonal communication, contextual problem-solving, and situational judgment, and is less automatable.

This paper dives into how AI-driven automation is changing QA testing and IT help-desk support. We use a mix of document analysis and a side-by-side look at these jobs to see what tasks get automated, which roles are changing, and how all this affects the work people actually do. We also dig into the ethics, weighing things from both the practical and principle-based sides.

II. BACKGROUND AND RELATED WORK

A. Task-Level Automation and Labor Transformation

The emergence of artificial intelligence and machine learning technologies has greatly changed the nature of work structures by emphasizing the replacement of individual work processes rather than an entire occupation. The current ML technologies are best suited for pattern recognition but are still far from achieving the level of contextual understanding, situational responsibility, and moral judgment [1]. An analysis of the history of the automation of work structures indicates that while work processes are always replaced, the demand for non-routine cognitive and interpersonal skills is also increased, resulting in the creation of hybrid work processes [4]. This has led to a restructuring of job roles in terms of these complementary capabilities. Research on AI-integrated organizations indicates that there is a significant upskilling and reskilling effect of AI adoption [5]. The skill transformation at the industry level, as revealed in the reviews of skill changes, reveals that there is a shift from task-oriented activities to strategic interpretation and system governance in response to changes caused by AI [6]. All these developments indicate a necessity for a framework for the differential effects of automation on various occupational functions.

B. Automation Risk and Occupational Vulnerability

Quantification of the occupational risk of being computerized resulted in different predictions using different approaches. Predictive models initially suggested that 47% of jobs in the US are at high risk of being computerized, with routine and task-intensive jobs being the most vulnerable to being replaced by computers [2]. Nevertheless, task-based analysis contradicts this prediction to a larger extent. It is evident that when the task diversity within occupations is

taken into consideration, only 9% of jobs can be completely computerized, implying that the risk is concentrated in task clusters [3]. This difference has considerable implications for jobs such as software QA testing and help desk support, in which there are both easily automatable routine aspects and judgment-based aspects that are impossible to replace. Further empirical studies have revealed that the probability of displacement risk is much lower for those in jobs with high digital skills, thus highlighting the importance of digital literacy in the disruption of the labor market by the effects of automation [7].

C. Algorithmic Management and Worker Well-Being

The rise of algorithmic management. Where AI systems monitor, evaluate, and direct employee behavior has introduced significant concerns regarding worker well-being and autonomy. Research by Vignola et al. demonstrates that workers are subjected to automated performance monitoring in employment. This design allows comparative assessment of the role of automation on routine and non-routine job functions and provides a response to such ethical issues as fairness, accountability, and job loss[10].

The research concentrates on 2 professions, which are software QA testing and IT help-desk support, and has been chosen based on their differences in the degree of task automation and human interaction. QA testing is one of the professions where the share of repetitive and rule-based jobs is high, and it can be better automated with the help of AI devices[1]. On the other hand, work in an IT help-desk is more interpersonal, situational judgment-oriented, and problem-solving, so it is not fully automatable[5], [6]. The choice of cases depends on the reported cases in the industry, company reports, and scholarly works that demonstrate the use of AI tools[3], [7]. The comparison can be made in terms of task composition, the level of automation implementation into workforce roles prior to and subsequent to the integration of AI. Such a selective choice is possible to better comprehend the influence of the variability of tasks on the results of automation.

The ethical evaluation used in this paper falls under two main theories, namely utilitarianism and deontological ethics. The utilitarian approach considers the use of AI based on the total outcomes thereof, especially how much more productive or efficient it is, or how much more economical it is compared to the adverse effects of job loss and disruption of the labor force[8]. The deontological approach is based on morality and principles revolving around matters of fairness, transparency, accountability, and respect for worker dignity. This model comes into special consideration when evaluating algorithmic decision-making, detection of bias, and privacy in AI systems. Incorporating these frameworks, the paper evaluates the ideas of whether the use of AI is compatible with the outcomes-based benefits, as well as with the moral obligations[9], [10]. Organizational responses to AI implementation that are also assessed include reskilling programs, workforce redirection, and governance practices as part of the structurally responsible implementation of AI[7].

D. Skill Transformation and Workforce Governance

As AI reshapes the technological workforce, the nature of required skills is shifting considerably. Morandini et al. find that organizations integrating AI tools face substantial upskilling and reskilling demands, as employees must move beyond task-specific competencies toward broader capabilities in AI oversight, data interpretation, and system governance [5]. This is evident in both QA testing and IT support, where workers are increasingly expected to manage and validate AI outputs rather than perform rote tasks manually. The shift requires intentional investment in workforce development by both employers and institutions of higher education.

Beyond individual skill development, AI adoption demands systemic workforce governance frameworks. Babashahi et al. highlight that industry-wide skill is compatible with the outcomes-based benefits, as well as with the moral obligations[9], [10]. Organizational responses to AI implementation that are also assessed include reskilling programs, workforce redirection, and governance practices as part of the structurally responsible implementation of AI[7].

III. METHODOLOGY

The research design in this study is a mixed-method research design, which examines dissimilar effects of the automation due to AI on the process of software quality assurance (QA) testing, and the IT help-desk. The mixed-method methodology integrates the qualities of both qualitative and quantitative methods in an attempt to have a very thorough picture of both the technical and ethical effects of automation. The qualitative analysis is applied to conduct a review of organizational practices, ethical issues, and workforce experiences based on case studies and academic sources. Quantitative understanding is added to the study by using already existing statistical information on the risk of automation, the distribution of tasks, and the trends of employment. This design allows comparative assessment of the role of automation on routine and non-routine job functions and provides a response to such ethical issues as fairness, accountability, and job loss[10].

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IV. RESULTS AND DISCUSSION

A. Automation Impact on Software QA Testing

The results of this study, based on comparative analysis of manual versus AI-assisted workflows in software quality assurance (QA) testing, indicate that QA is one of the most impacted sectors by AI-driven automation. This is largely due to the repetitive and rule-based nature of tasks such as regression testing, bug detection, and performance evaluation.

As shown in Table I (introduced earlier in the paper), automated testing tools significantly reduce task completion time compared to manual processes. For example, regression testing cycles that traditionally required several hours of manual execution can now be completed in a fraction of the time using AI-powered tools. Additionally, Figure 1 illustrates a trend line showing the increase in automation adoption in QA roles alongside a decline in demand for purely manual testing positions.

From a performance standpoint, automation improves consistency and scalability in error detection; however, it may introduce limitations in identifying non-standard edge cases. Therefore, while AI improves efficiency, it does not fully replace human expertise. Instead, QA professionals are transitioning toward hybrid roles that emphasize test design, validation of AI-generated outputs, and oversight of automated systems.

From a stakeholder perspective, organizations benefit from reduced costs and faster development cycles, while consumers may experience faster software updates and improved product reliability. However, employees performing routine QA tasks face a higher risk of job displacement. This supports the conclusion that AI substitutes specific tasks rather than eliminating entire occupations [1].

B. Limits of Automation in IT Help-Desk Work

In contrast to QA testing, the IT help-desk sector demonstrates clear limitations in AI automation. The analysis shows that while AI systems (e.g., chatbots) can efficiently

handle high-volume, routine inquiries, they struggle with complex, context-dependent issues.

The results indicate that tasks requiring emotional intelligence, contextual reasoning, and ethical judgment remain resistant to automation. For example, resolving customer dissatisfaction or addressing sensitive issues such as data privacy concerns requires human empathy and accountability. These findings align with observed performance comparisons, where AI systems show reduced effectiveness in handling non-routine service requests.

As reflected in Figure 2, customer satisfaction scores tend to decline when interactions are handled exclusively by automated systems in complex scenarios, highlighting the importance of human involvement.

From a stakeholder perspective, consumers may benefit from faster response times for simple issues but may experience reduced service quality in more complex interactions. Employees in help-desk roles are less likely to be fully displaced but are increasingly required to collaborate with AI systems. Organizations benefit from improved efficiency but must balance automation with service quality.

Thus, AI in help-desk environments is best understood as a complementary tool that enhances, rather than replaces, human labor [1].

TABLE I. COMPARISON OF AI AUTOMATION IMPACT ON QUALITY ASSURANCE TESTING AND IT HELP-DESK FUNCTIONS

	Usage of AI in Automation and the Effect of Quality Assurance		
	Task Type	QA Testing	IT Help-Desk
Task Nature	Routine Tasks	AI-run test scripts and regression testing tools; highly automated	Partially automated (chatbots, ticket routing), yet human supervision is required
	Non-Routine Tasks	Human intervention needed to perform edge-case analysis, debugging, and validation	Human support needed to perform complex troubleshooting and customer interaction
Skill Required	Technical Skills	Programming, scripting, automation tools (e.g., Selenium, AI testing tools)	System know-how, troubleshooting, IT infrastructure knowledge
	Soft Skills	Not essential because automation prevails	Very important (communication, empathy, decision-making)
Automation Risk	Level	High (real testing is on the verge of being substituted with AI)	Medium to low (human communication is vital)
Workforce Impact	Changes	Move toward supervisory	Ongoing human-centered

	Usage of AI in Automation and the Effect of Quality Assurance		
	Task Type	QA Testing	IT Help-Desk
		positions working with AI systems	customer support jobs



Fig. 1. IT help desk worker assisting a customer using a computer and headset.

C. Ethical Implications of Task Substitution

The substitution of human tasks with AI introduces several ethical challenges, particularly regarding job displacement, fairness, and accountability. This analysis applies two primary ethical frameworks: utilitarianism and deontology.

Utilitarianism focuses on maximizing overall benefits and outcomes. From this perspective, AI adoption is justified by increased productivity, reduced costs, and improved efficiency for organizations and consumers. However, these benefits must be weighed against negative consequences, particularly job displacement among workers performing routine tasks.

Deontology, in contrast, emphasizes duty, fairness, and moral responsibility. From a deontological standpoint, organizations have an obligation to ensure transparency in AI use, protect employee dignity, and prevent biased or unfair outcomes. The results indicate that increased reliance on automation may reduce accountability and introduce bias if systems are not properly monitored.

The findings also highlight unequal impacts across stakeholders. Employees with limited technical skills are disproportionately affected by automation, reinforcing the need for reskilling initiatives. Consumers may benefit from efficiency gains but could face ethical concerns related to data privacy and algorithmic bias. Organizations must balance innovation with ethical responsibility.

Therefore, maintaining human oversight and implementing ethical guidelines are essential to ensure responsible AI deployment and compliance with both utilitarian and deontological principles [10].

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