



The Implications of AI in the Workforce

An Interactive Qualifying Project Report submitted to the faculty of
WORCESTER POLYTECHNIC INSTITUTE in partial fulfillment of the
requirements for the Degree of Bachelor of Science.

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Sponsor

American National Standards Institute (ANSI) and WorkCred

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Abstract

The purpose of our project was to provide a comprehensive analysis about the current and future influences of AI on the workforce. We conducted archival research and held semi-structured interviews with experts from across the workforce to understand the current and the near-future impacts of AI on the workforce. The results show that AI is rapidly evolving, and policies should be put in place for regulating the use of AI. This swift evolution is causing a growing concern among the public, especially in terms of job loss, ethics, cybersecurity, and legality. People are also looking towards working in parallel with AI, while reducing its risk and improving its benefits. We developed a set of recommendations for current topics surrounding AI, including a roadmap for implementation.

Acknowledgements

This research was supported by our sponsors, American National Standards Institute (ANSI) and WorkCred. We thank our mentors Roy Swift, Cleo Stamatou, and Mary Saunders who provided insight and expertise that greatly assisted the research. We also extend immense gratitude to our advisors, Prof. Adrienne Hall-Philips and Prof. Lauren Mathews for their never-ending support and guidance. We thank Prof. Carol L. Stimmel for teaching us research fundamentals. We would also like to thank Associate Dean Kent Rissmiller for organizing this opportunity. We would like to acknowledge all our interview participants for sharing their opinions and experience to assist our research. Finally, to our institution Worcester Polytechnic Institute for this valuable opportunity and our group members for their dedication.

Authorship

Our paper's creation and editing process was fully collaborative. Initially, individual members took responsibility for drafting distinct subsections, ensuring a solid foundation was established. Subsequently, the team collectively contributed to improve each section, incorporating new information as it emerged. This phase was followed by an editing process, initiated by all members. This collaborative effort was crucial in adapting to various writing styles, leading to the final version presented here.

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Executive Summary

Introduction & background

Artificial Intelligence (AI) has increased in popularity in 2023 as it has been rapidly reshaping industries, earning the title of “Word of the Year” by Collins Dictionary (Stokel-Walker, 2023). AI has been designed to replicate human cognition and sensory perception. While AI technology research progresses, there is still a need for an analysis of AI’s impact on the workforce. AI represents a broad spectrum of technologies that utilize various computational methods to try to replicate human intelligence tasks like learning, problem-solving, and decision-making. The concerns surrounding AI encompass job loss, ethical considerations, cybersecurity risks, safety concerns, and pursuing trustworthy AI. Job role redefinition, task automation, and the emergence of new AI-related occupations require acknowledgment by governments, companies, and individuals. Addressing ethical concerns is also essential, especially regarding algorithmic bias, as demonstrated in criminal justice and healthcare. Cybersecurity threats and safety risks necessitate attentive management through oversight, regulation, and public awareness. President Biden's executive order of October 30, 2023, highlights the need for understanding and mitigating AI's societal impact. Despite concerns, AI has already seen implementation in diverse industries, influencing risk factors and reshaping employment dynamics. The integration of AI has led to shifts in required skills, with a demand for technical expertise in AI development trends. While repetitive tasks face automation, new opportunities arise in roles related to AI design, programming, and maintenance.

Methodology

The purpose of our project was to provide a comprehensive analysis of the present-day and anticipated future influences of Artificial Intelligence (AI) on the workforce, providing the American National Standards Institute (ANSI) and WorkCred data-driven recommendations that will initiate their research efforts in this field. To begin, we investigated and identified the current and potential economic, social, and ethical impacts of AI on the workforce. This archival research allowed us to gain a deeper understanding of the impacts of AI on the workforce while also creating a foundation to compare our results with. Our next step involved determining implications regarding AI in the workforce from industry stakeholders’ perspectives. Ten interviews were conducted with varying perspectives and positions to gather a general understanding of the current and future implementations of AI. Finally, we

analyzed the current impacts and stakeholders' opinions to uncover potential consequences and future challenges of AI in the workforce.

Results

Research and interviews reveal different aspects of AI. Economically, AI's impact spans automating transactions and minimizing risks, but concerns emerge about job displacement. Socially, AI offers education and accessibility benefits, yet inclusivity challenges persist. Ethical considerations center on design, governance, and privacy issues. AI holds promise for inclusivity but faces obstacles in biased representation. Ethical governance and training are crucial in shaping AI's positive societal impact, emphasizing inclusivity and ethical practices.

Discussion and Limitations

The results show the need for transparency in AI systems for trust and ethical commitment, especially in critical sectors like healthcare and finance. It also anticipates AI transforming instead of replacing jobs but stresses the need for educational changes. Regulatory frameworks at federal and state levels are vital, focusing on safety, privacy, and fairness. This information is beneficial to ANSI and WorkCred as they play key roles in setting standards and certifying professionals. However, the study acknowledges limitations, including a restricted search term approach, a limited number of sources, and potential biases in the interviewee selection process. Despite these limitations, the research features the importance of transparency, education, and regulation for the successful integration of AI in the workforce.

Recommendations

The first recommendation is aimed at WorkCred, focusing on the need for reskilling and AI literacy in today's dynamic workforce. This recommendation highlights the need for a workforce with adaptability and technological knowledge, particularly considering the impact of AI. It emphasizes the importance of reevaluating job roles and promoting skills necessary for effective performance in an AI-integrated environment. The recommendation advocates for continuous learning and adaptability from K-12 education to ongoing professional development. WorkCred is urged to establish reskilling programs that are in sync with the rapidly changing demands of an AI-driven workplace. These programs should concentrate on technical skills, and AI literacy. The ultimate desired outcome is to ensure that AI

integration enhances human value and labor rights, fostering a future where technology and human skills coexist.

The second recommendation, aimed at ANSI, centers on the regulation and mitigation of AI technologies. The recommendation highlights the need for customized risk assessments and ethical evaluations for each AI application. ANSI should advocate for specific legislation targeting risks like algorithmic bias and privacy violations, emphasizing robust governance and bias mitigation strategies. This recommendation stresses the importance of inclusive AI policies and practices, considering diverse demographic needs. Constant monitoring and evaluation mechanisms for AI developments are essential for ensuring equity. The ultimate desired outcome is to empower individuals with a clear understanding of AI usage, training processes, and methods for ongoing ethical and inclusive evaluation, making AI a tool for societal well-being and equity, not just a technological advancement.

1.0 Introduction

The rapid advancement of Artificial Intelligence (AI) has become a defining feature of the modern world, reshaping industries at a remarkable pace. Although the term “artificial intelligence” dates to 1956, it earned the title of “word of the year” in 2023 by Collins English Dictionary, signifying the heightened interest in AI (Stokel-Walker, 2023). As humanity navigates this technological revolution, our research strives to uncover the diverse implications of AI in the workforce. The increasing attention and concern surrounding AI rises in part from its performance in automating human tasks. While AI designed for such tasks can replicate human sensory perception and dexterity, it also has cognitive capabilities in several areas, including data analysis, pattern recognition, and decision-making. From debates surrounding the use of generative AI like ChatGPT in higher education to utilizing pattern detection for medical diagnosis, the implications and impacts of AI are widespread and not solely confined to specific areas like academia and medical research but rather affect the broader workforce. While the threat of AI invading people’s livelihoods continues to increase, a compelling counterview suggests that AI, rather than threatening jobs, could enhance the workforce. The concern surrounding the integration of AI into the workforce involves the uncertainties and challenges that accompany it. Although research on AI technology continues to advance, there is an absence of a comprehensive analysis of its short-term and long-term effects on the workforce.

Our research is sponsored by the American National Standards Institute (ANSI) and its affiliate, WorkCred. ANSI, a non-profit organization established in 1918, is not involved in developing standards. Instead, it provides a framework for fair standards development and quality conformity assessment systems, with a continuous focus on maintaining their integrity. WorkCred focuses on enhancing workforce quality by improving the credentialing system and preparing various stakeholders to effectively use it. Their support and expertise were vital to the advancement of our research.

Our goal is to provide a comprehensive analysis of the present-day and anticipated future influences of Artificial Intelligence (AI) on the workforce, providing ANSI and WorkCred data-driven recommendations that will initiate their research efforts in this field. Our first objective was to investigate and identify the current and potential economic, social, and ethical impacts of AI on the workforce. Expanding on this, our next step involved determining implications regarding AI in the workforce from industry stakeholders’ perspectives. Finally, we analyzed the current impacts and stakeholders’ opinions to uncover potential consequences and future challenges of AI in the workforce.

2.0 Background

In this chapter, we begin with a brief overview of Artificial Intelligence, including different forms of AI and its processes. This section also explores concerns surrounding AI such as impacts on jobs, ethics, cybersecurity, legislation, and safety.

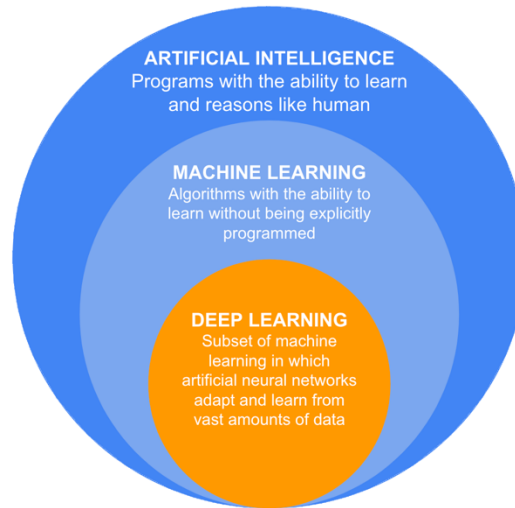
2.1 What is AI?

Artificial Intelligence represents a broad spectrum of technologies that utilize various computational methods to try and replicate human intelligence tasks like learning, problem-solving, and decision-making (Selenko et al., 2022) (see Figure 1). One of the principal methods is machine learning; a computerized learning process inspired by the neural structures and decision-making processes found in human intelligence (Selenko et al., 2022). Machine learning has two primary methods of learning: supervised and unsupervised. In supervised learning, algorithms analyze labeled data to identify patterns or make predictions (Selenko et al., 2022). In contrast, unsupervised learning allows algorithms to explore data without any labeled responses, aiming to discover inherent structures or relationships. Alongside these methods, another area within AI is computer vision, which uses algorithms to process, analyze, and understand images or video frames, enabling them to identify objects and activities. This field combines elements of machine learning, pattern recognition, and computational techniques to mimic the human ability to recognize and interpret visual data (Szeliski, 2020).

It is important to note that machine learning is just one technique within the broader field of AI, and there are other methods that simulate human intelligence. These methods often include natural-language processing (NLP), which involves machine-based analysis and generation of text, as well as pattern recognition techniques that aim to identify associations or regularities in data sets (Selenko et al., 2022). Generative AI is also worth mentioning as it is a pioneer in the generation of text. It is an advanced deep-learning algorithm capable of processing extensive datasets, such as the entirety of Wikipedia or Rembrandt's collected works. Through this, it acquires the ability to create outputs that are statistically based on the given prompts (Martineau, 2023). These methods collectively contribute to the capabilities of AI, thereby broadening its applicability across multiple domains.

Figure 1

What is AI made of?



Note: Adapted from ‘The Relationship Between Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL)’, by D. J. Hand, 2020, from <http://danieljhand.com/the-relationship-between-artificial-intelligence-ai-machine-learning-ml-and-deep-learning-dl.html>.

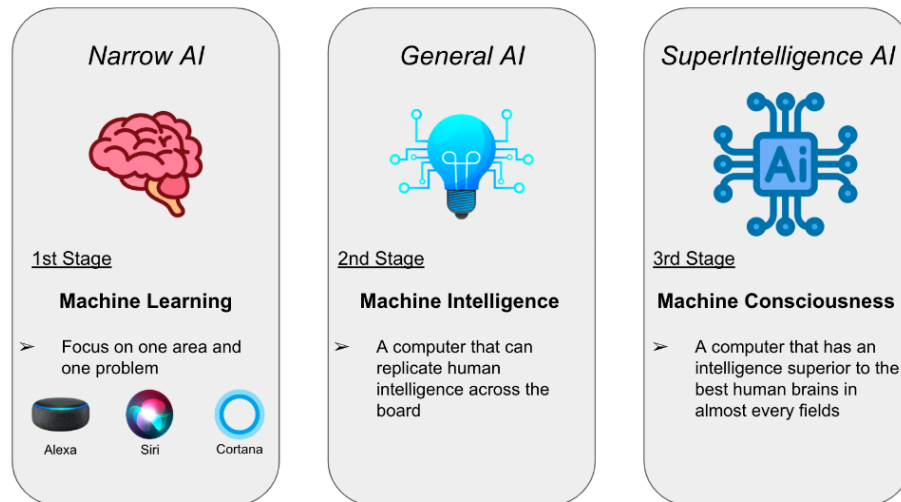
There are differences in the capabilities and potential impacts of the different forms of AI (see Figure 2). Currently, most forms of developed AI fall under the category of *narrow* or *weak* AI. This category specializes in performing specific tasks or solving problems but lacks the common intelligence to be wide ranging across domains (Escott, 2017). Additionally, researchers and philosophers discuss the prospects of Narrow AI eventually progressing towards Superintelligence. Superintelligence represents a theoretical form of AI, from creativity and social intelligence to complex problem-solving. This class of AI would be capable of outperforming the best human minds in every field, including scientific research, artistic endeavors, and social interactions (Escott, 2017). Understanding these different classes of AI is crucial for grasping the potential scope and impact of this transformative technology.

With the increasing interest in the theoretical and practical implications associated with AI, technological leaps are creating disruption in the workforce (Brynjolfsson & McAfee, 2014). These shifts manifest as changes in the types of jobs available, alterations in job responsibilities, and transformations in how tasks are executed (Bessen, 2018). Recognizing the extent to which AI can replicate human intelligence is necessary for exploring the effect AI will have on job roles. Such understanding provides insights into which tasks could be automated, thus potentially affecting workforce dynamics and job security (Arntz, Gregory, & Zierahn, 2016). However, the developments

and adoption of AI are yet to be fully studied, and as a result, the effect on job roles in relation to skills, training, and development is not precisely defined or captured (The White House, 2022).

Figure 2

Three Types of AI.



Note. Adapted from ‘*What is Artificial Intelligence? How does AI work and future of it*’, by Great Learning, 2020, from <https://medium.com/@mygreatlearning/what-is-artificial-intelligence-how-does-ai-work-and-future-of-it-d6b113fce9be>.

General AI has a broader and more transformative potential over Narrow AI. It is a system that can understand, learn, and apply knowledge in many contexts, like human intelligence but without inherent limitations. The exploration of General AI is not just a technological attempt; it's a multidisciplinary pursuit that intends to redefine our understanding of intelligence itself (Goertzel & Pennachin, 2007). As we face these technological advancements, it is important to consider the economic, societal, and ethical consequences of creating machines that can learn and think on their own.

2.2 Concerns surrounding AI

Governments, companies, and individuals must acknowledge changes in the labor force, including job role redefinition, task automation, and new AI-related occupations. Computers excel at complex and time-consuming tasks, yet they often find difficulty in executing tasks that are seemingly simple for humans (i.e., drawing). While technology may eliminate jobs like data entry and

telemarketing, it has the potential to elevate the quality of human work in more strategic and fulfilling capacities (Strack et al., 2021). However, these advancements also bring ethical concerns.

2.2.1 Job Loss

In 2023, AI eliminated nearly 4,000 jobs (Napolitano, 2023). The fear of technology taking over jobs is not a new phenomenon. John Maynard Keynes described in the 1930's how the pace of technology was far greater than the rate at which replaced labor could secure alternative work (Keynes, 1963). Today, the rapid development of automation, AI, and other technologies suggests that millions of jobs will be lost, dramatically reducing the role of humans in the economy. Many observers suggest that the COVID-19 pandemic amplified this effect in 2020 and will either boost or permanently establish digitization across several areas (Strack et al., 2021). However, other scholars in the debate believe that even though these technologies will eliminate some jobs and affect economic stability and income distribution, they will also create many others (Autor et al., 2020).

2.2.2 Ethical Concerns

Ethical risks, such as algorithmic bias, can result in unfair or discriminatory practices. These biases can appear in different sectors, from criminal justice to healthcare, affecting people's lives in many ways. For instance, in criminal justice, predictive policing algorithms have been found to disproportionately target minority communities, even when crime rates are comparable to other neighborhoods (Lum & Isaac, 2016). Statistics from the U.S. Department of Justice show that individuals who are Black are more likely to get arrested than those who are white (Heaven, 2020), pointing out the history of data being "weaponized" against Black people in the U.S. In healthcare, a study showed that an algorithm used to prioritize patient care was less likely to refer Black patients for additional care compared to white patients with similar health conditions (Obermeyer et al., 2019). These instances underline the urgent need to address biases in AI applications to ensure fairness and equity.

2.2.3 Cybersecurity

In cybersecurity, the rise of AI-driven cyber-attacks such as advanced persistent threats and socially engineered attacks are a growing concern (Brundage et al., 2018). Approximately 2,200 cyberattacks occur each day (Howarth, 2022). While AI can enhance security measures, it can also be

used to identify vulnerabilities in systems at speeds impossible for human hackers. For instance, machine learning can be employed to predict and mitigate Distributed Denial-of-Service (DDoS) traffic; however, it can also be used by opponents to discover new attack vectors or to mask their traffic patterns (Kolias et al., 2017).

2.2.4 Safety Risks

As for safety risks, poorly designed AI systems could make unintended and harmful decisions. During the span of four months, vehicles equipped with automated driving systems across the United States were involved in accidents that resulted in the deaths of eleven individuals (*11 More People Killed in Crashes Involving Automated-Tech Vehicles*, 2022). In healthcare, an AI-driven medical diagnostic tool could make an inaccurate diagnosis, leading to potentially harmful treatment (Kumar et al., 2023). Managing these risks often involves a particular approach that includes government oversight, industry self-regulation, and public awareness. Regular audits can be used to examine AI algorithms for biases and ethical inconsistencies. Since 2007, the concept of “human-robot” interactions has gained traction as it prompted human oversight in automated decision-making processes, particularly for critical applications (Goodrich & Schultz, 2007).

2.2.5 Is there a trustworthy AI?

Trust is the belief that someone or something is safe and reliable (Cambridge English Dictionary, n.d.). Trustworthy AI aims to be ethical, reliable, and robust throughout its entire life cycle. According to the guidelines laid out by the European Commission’s High-Level Expert Group on AI in 2019, AI systems should respect human autonomy, prevent harm, be fair, and operate transparently. The reference to European guidelines is noteworthy considering that Europe often serves as a template for regulatory frameworks and ethical standards that are adopted by other nations. Europe and U.S. announced their agreement to jointly develop a pilot project on Privacy-Enhancing Technologies (PETs), specifically for health and medicine applications (Engler, 2023). PETs are a category of technologies that aim to enable large-scale data analysis, while maintaining some degree of data privacy. Their initiative is oriented around AI risk and conducting research projects on AI for climate forecasting, emergency response, medicine, electric grids, and agriculture (Engler, 2023). The goal is to ensure that as people integrate AI into society, they do so in a way that brings benefits and minimizes risks to individuals and communities (European Commission, 2019).

2.2.6 Legislation

The rate at which the technological development of AI is progressing has triggered the formation of advisory and review panels around the world, including new legislation in the U.S. as an attempt to understand and protect against any negative societal impact. In 2017, a U.S. bill called “H.R. 4625 (115th): FUTURE of Artificial Intelligence Act of 2017” was introduced to address the significant impact of AI on society and the workforce. It recognized a knowledge gap in AI and mandated the formation of an advisory group to assess its potential impact on the workforce. The bill highlighted the need to understand how AI, automation, and robotics might displace or create jobs and how to maximize job-related benefits. It acknowledged that technological change driven by AI advancements would affect the future workforce. However, it did not specify any required skills and called for further research to address this gap (Clement, 2020). Following its introduction, the bill did not receive a vote in the subsequent session of Congress. As a result, the bill was never enacted (GovTrack.us, 2023).

In October 2023, President Biden issued an executive order focused leading AI’s development and manage its associated risks. The order covers various aspects, including AI safety and security standards, privacy protection, equity and civil rights, consumer and patient safety, support for workers, innovation and competition, American leadership abroad, and responsible government use of AI. These actions aim to ensure responsible and effective AI use, and the Administration will continue to work with Congress to pursue bipartisan legislation for responsible innovation (The White House, 2023). For more information on the executive order, refer to (<https://www.whitehouse.gov/briefing-room/statements-releases/2023/10/30/fact-sheet-president-biden-issues-executive-order-on-safe-secure-and-trustworthy-artificial-intelligence/>).

2.3 Integration of AI across industries

Despite these concerns, AI has already found its way into various industries, influencing both risk factors and the employment of workers. The growing likelihood of AI intensifying bias and other risks, particularly in cases where biased data was incorporated during the AI model's training underlines the need for regulatory measures to mitigate these risks (Candelon et al., 2021). Presently, AI is gaining greater adoption across the finance, healthcare, and retail sectors. Companies have started using AI for language processing, computer vision and image processing, and recommender systems (Stanford University, 2021). Workers are seeing a change in skills required by employers during the hiring process. Employers are looking for greater technical skills and seek to hire people who are experienced

in working with and training of the latest AI development trends (Ciftci, 2023). With the implementation of AI, repetitive tasks could easily be automated, reducing the number of workers needed to complete the same tasks while also increasing employer profits in the long run (Ciftci, 2023). However, workers are also seeing a separate set of jobs being created. Jobs that require the designing, programming, and maintenance of AI and other similar machines are seeing a greater demand (Ciftci, 2023). Hence, to get an understanding of the impact of AI on the workforce, this report will look at academic, governmental, media publications and stakeholders' viewpoints on how they have been impacted by AI integration.

3.0 Methodology

Our goal was to provide a comprehensive analysis of the present-day and anticipated future influences of Artificial Intelligence (AI) on the workforce, providing ANSI and WorkCred data-driven recommendations that will initiate their research efforts in this field.

To reach our goal, we followed a list of objectives:

1. Investigate and identify current and potential economic, social, and ethical impacts of AI on the workforce.
2. Determine implications regarding AI in the workforce from industry stakeholders' perspectives.
3. Analyze the current impacts and stakeholders' opinions to uncover potential consequences and future challenges of AI in the workforce.

3.1 Objective 1: Investigate and identify current and potential economic, social, and ethical impacts of AI on the workforce.

To achieve our first objective, we focused on reviewing articles based on search terms that we believed were relevant to the scope of our project. We selected four search terms: 'Artificial Intelligence and Econom*', 'Artificial Intelligence and Ethic*', 'AI and Social*', and 'AI and Accessibility'. The asterisks in these search terms allowed us to broaden our results by searching terms that start with the same letters. These terms were then utilized in three distinct search engines: Google Scholar, GovInfo, and Google News. Google Scholar is a database that contains scholarly and academic publications. GovInfo is a database containing government documents such as bills, executive orders, and more. Google News is a branch of the Google Search engine that specializes in news articles.

To manage the volume of publications, we decided to focus on the first three pages of results from each search engine. Each page typically contains about 10 articles, creating a total of approximately 30 articles. From these 30 articles, only four publications were selected after review by each group member on each database for one search phrase. Click [here](#) for the full archival research database. These publications were chosen based on specific criteria: publication date, author credibility, and abstract content. The articles needed to be recent, so we excluded references older than 10 years old to ensure relevance and suitability for our research, keeping in mind the fast-pacing change of technology. Author credibility was assessed by examining the author's education and expertise on the topic. Lastly, we evaluated the abstracts for elements relevant to our project's scope, such as discussions on the impact of AI on the economy within the workforce, ethical considerations, or accessibility issues.

After selecting our 48 sources, our next step was to review and summarize these articles into comprehensive paragraphs. See Tables 1a, 1b, and 1c for the details of these 48 sources. This summarization was crucial for facilitating the data analysis to be conducted in the third objective of our project. In addition to the sources already selected, we also incorporated a few extra sources. These additional sources are intended to provide specific examples or case studies that enhance our analysis. These sources were selected with the same criteria as the others.

Table 1a*List of Google Scholar Sources*

No.	Citation	Why this publication?
1	Morris, M. R. (2020). AI and accessibility. <i>Communications of the ACM</i> , 63(6), 35-37. https://doi.org/10.1145/3356727	1. Identifies how challenges for AI advancement Addresses users with disabilities 2. Considers inclusivity, bias, privacy, error, expectation setting, simulated data, and social acceptability
2	Abou-Zahra, S., Brewer, J., & Cooper, M. (2018). Artificial intelligence (AI) for web accessibility: Is conformance evaluation a way forward? In <i>W4A '18: Proceedings of the 15th International Web for All Conference</i> (pp. 1-4). https://doi.org/10.1145/3192714.3192834	1. AI has potential for accessibility however current limitations hinder its reliability as a replacement for accessibility standards
3	Touretzky, D., Gardner-McCune, C., Breazeal, C., Martin, F., & Seehorn, D. (2019). A year in K-12 AI education. <i>Wiley Online Library</i> , 40(4), 88–90. https://doi.org/10.1609/aimag.v40i4.5289	1. Launching an initiative to develop national guidelines for teaching AI in K–12
4	Mannuru, N. R., Shahriar, S., Teel, Z. A., Wang, T., Lund, B., Tijani, S., Pohboon, C. O., Agbaji, D., Alhassan, J. K., Galley, J., Kousari, R., Ogbadu-Oladapo, L., Saurav, S., Srivastava, A., Tummuru, S. P., Uppala, S., & Vaidya, P. (2023). Artificial intelligence in developing countries: The impact of generative artificial intelligence (AI) technologies for development. <i>Sage Journals</i> . https://doi.org/10.1177/02666669231200628	1. A different aspect of accessibility, this source investigates the potential impact of generative AI technologies on developing countries 2. Considers economic growth, access to technology, and the potential shift in education, healthcare, and the environment
5	Scherer, M. U. (2015). Regulating artificial intelligence systems: Risks, challenges, competencies, and strategies. <i>Harvard Journal of Law & Technology</i> . https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2609777	1. Talks about the impact of AI, including examples. 2. Entails the need for legislation.
6	Milojević, N., & Redzepagic S. (2021). Prospects of artificial intelligence and machine learning application in banking risk management. <i>Sciend</i> , 10(3), 41-57. https://doi.org/10.2478/jcbtp-2021-0023	1. Talks about the impact of AI on the financial sector and on the economy. 2. Gives multiple examples in the finance industry.
7	Frank, M. R., Bessen, J. E., Brynjolfsson, E., Cebrian, M., Deming, D. J., Feldman, M., Groh, M., Lobo, J., Moro, E., Wang, D., Youn, H., & Rahwan, I. (2019). Toward understanding the impact of artificial intelligence on labor. <i>Proceedings of the National Academy of Sciences</i> , 116(14), 6531–6539. https://doi.org/10.1073/pnas.1900949116	1. Talks extensively on the impact of AI on labor. 2. Gives examples in multiple sectors.
8	Raso, F. A., Hilligoss, H., Krishnamurthy, V., Bavitz, C., & Kim, L. (2018). Artificial intelligence & human rights: Opportunities & risks. <i>Berkman Klein Center</i> . http://dx.doi.org/10.2139/ssrn.3259344	1. Talks about the impact of AI on humans 2. Gives examples in Finance and Education sector.

No.	Citation	Why this publication?
9	Miller, T. (2019). Explanation in artificial intelligence: Insights from the social sciences. ScienceDirect, 267. https://doi.org/10.1016/j.artint.2018.07.007	1. Social Sciences in explainable AI 2. Article says explainable AI can build on research that suggests people define, generate, and evaluate explanations. This argues that people are biased in the explanation process
10	Berberich, N., Nishida, T., & Suzuki, S. (2020). Harmonizing artificial intelligence for social good. Springer Link, 33, 613-638. https://link.springer.com/article/10.1007/s13347-020-00421-8	1. How AI can be used for social good 2. Introduces "Takt" a behavior guiding form of AI, which enhances human interactions
11	Cowls, J., King, T., Taddeo, M., & Floridi, L. (2019). Designing AI for social good: Seven essential factors. SSRN. https://doi.org/10.2139/ssrn.3388669	1. Artificial Intelligence 4 Social Good (AI4SG) 2. Many beneficial projects of this have come to fruition 3. Unnecessary failures and accidental successes
12	Saveliev, A., & Zhurenkov, D. (2020). Artificial intelligence and social responsibility: The case of the artificial intelligence strategies in the United States, Russia, and China. Emerald Insight, 50(3). https://www.emerald.com/insight/content/doi/10.1108/K-01-2020-0060/full/html?casa_token=I6_QHdU2toUAAAAA:VNzmdhwZ2w2XKS9ST4A9ggWtmMtw2zYbTWza5TC89a7yRA8wm8Hba7EP7ym98eN4x-zzVucsmjUdTAEfpdNqp1DmAbvGYA6Y2rD0sKukTsw9znUpMgm0	1. Social responsibility aspect of AI and how utilization of AI for social responsibility are assessed 2. Authors call for further development to make AI socially beneficial
13	Huang, C., Zhang, Z., Mao, B., & Yao, X. (2023). An Overview of Artificial Intelligence Ethics. IEEE, 4(4). https://ieeexplore.ieee.org/abstract/document/9844014	1. Addresses the importance of investigating ethical issues and risks of AI
14	Bostrom, N., & Yudkowsky, E. (2018). The ethics of artificial intelligence. Artificial Intelligence Safety and Security. Taylor & Francis Group. https://www.taylorfrancis.com/chapters/edit/10.1201/9781351251389-4/ethics-artificial-intelligence-nick-bostrom-eliezer-yudkowsky	1. Addresses the need for transparency, predictability, and accountability in AI algorithms 2. Potential ethical implications of machines with moral status and the challenges posed by superintelligence
15	Li, X., & Zhang, T. (2023). An Exploration on Artificial Intelligence Application: From Security, Privacy and Ethic Perspective. https://ieeexplore.ieee.org/abstract/document/7951949?casa_token=uhonlKh40LIAA AAA:0vunHnxNohPTW75QyVoDb2kpu7NJt4bolISj_QfqAhnf35xYR2IgI9g7-HzIqqt3H8oUI3VLiw	1. Highlights the potential ethical challenges but also suggests countermeasures and recommendations for addressing these issues. 2. Practical insights for mitigating ethical risks associated with AI applications.
16	Etzioni, A., & Etzioni, O. (2017). Incorporating ethics into artificial intelligence. Springer Link, 21, 403-418. https://link.springer.com/article/10.1007/s10892-017-9252-2	1. Challenges commonly held beliefs about the autonomy and moral agency of AI-equipped machines 2. Cautions against relying on extreme outlier scenarios, such as the Trolley problem, as a basis for conceptualizing the ethical issues related to AI

Note. Rows 1-4 include sources related to ‘AI and Accessibility’. Rows 5-8 cover ‘Artificial Intelligence and Econom*’. Rows 9-12 are dedicated to ‘AI and Social*’. Rows 13-16 discuss ‘Artificial Intelligence and Ethic*’.

Table 1b*List of Google News Sources*

No	Citation	Why we chose
1	Render, J. (2023). 3 ways AI could dramatically change smartphone accessibility. Tom's Guide. https://www.tomsguide.com/features/3-ways-ai-could-dramatically-change-smartphone-accessibility	<ol style="list-style-type: none"> 1. Can help people communicate 2. AI could help people see more than ever 3. AI can make navigating phones easier
2	Henneborn, L. (2023). Designing generative AI to work for people with disabilities. Harvard Business Review. https://hbr.org/2023/08/designing-generative-ai-to-work-for-people-with-disabilities	<ol style="list-style-type: none"> 1. The potential: AI augments human capability 2. The challenge: getting this right isn't easy 3. How to get it right: work alongside individuals with firsthand experience
3	Fore, P. (2023, October 25). A majority of educators are concerned about how AI may boost cheating and plagiarism but think it will also boost accessibility, according to a new report. Fortune. https://fortune.com/education/articles/imagine-learning-digital-curriculum-2023-educator-ai-report/	<ol style="list-style-type: none"> 1. How educators view AI in the United States 2. How AI has affected students' performance 3. How AI promotes critical thinking
4	Taylor, M. (2023). The future of artificial intelligence in accessibility. Open Access Government. https://www.openaccessgovernment.org/the-future-of-artificial-intelligence-in-accessibility/165188/	<ol style="list-style-type: none"> 1. Blind author builds off personal experience and highlights inaccessibility and the bigger picture.
5	Brynjolfsson, E., & Unger, G. (2023). The macroeconomics of artificial intelligence. International Monetary Fund. https://www.imf.org/en/Publications/fandd/issues/2023/12/Macroeconomics-of-artificial-intelligence-Brynjolfsson-Unger	<ol style="list-style-type: none"> 1. Talks about the potential impact that AI could have on productivity growth, income inequality, and industrial concentration from a both positive and negative aspect. 2. Includes information about the impact on workers.
6	Conerly, B. (2023). AI and the economy: Which companies and industries will avoid artificial intelligence. Forbes. https://www.forbes.com/sites/billconerly/2023/07/22/ai-and-the-economy-which-companies-and-industries-will-avoid-artificial-intelligence/?sh=1f7569663fa4	<ol style="list-style-type: none"> 1. Talks about the ChatGPT. 2. Has information on negative impacts of AI and how that would impact various industries. 3. Talks about AI policies.
7	Hancock, T. (2023, September 26). The economies expected to benefit most from AI. Bloomberg. https://www.bloomberg.com/news/articles/2023-09-26/ai-means-china-s-economy-will-keep-lagging-us-new-report-shows?leadSource=verify%20wall	<ol style="list-style-type: none"> 1. US and China economies. 2. Impact of AI on jobs.
8	Probasco, J. (2023). Generative AI and its economic impact: What you need to know. Investopedia. https://www.investopedia.com/economic-impact-of-generative-ai-7976252	<ol style="list-style-type: none"> 1. Provides insight about ChatGPT and its impact on the economy. 2. How generative AI impacts various sectors. 3. Positives and negatives of generative AI. 4. The use of generative AI in other companies. 5. Talks about other sources on AI.

No.	Citation	Why we chose
9	Davidson, T. (2023). Intelligence for good: Using artificial intelligence to accelerate social impact. Fortune. https://fortune.com/2023/11/30/everfi-ai-for-good/	<ol style="list-style-type: none"> 1. How AI can accelerate social impact for the better 2. When AI is constructed and used responsibly, it has the potential to change how companies think of social impacts
10	Prothero, A. (2023). Artificial intelligence and social-emotional learning are on a collision course. Education Week. https://www.edweek.org/leadership/artificial-intelligence-and-social-emotional-learning-are-on-a-collision-course/2023/11	<ol style="list-style-type: none"> 1. How social emotional learning and AI are bound to intertwine 2. AI tools, such as ChatGPT could present issues for youth development of social-emotional skills
11	Milmo, D. (2023, December 6). AI firms “should include members of public on boards to protect society.” The Guardian. https://www.theguardian.com/technology/2023/dec/06/ai-firms-should-include-members-of-public-on-boards-to-protect-society	<ol style="list-style-type: none"> 1. Yoshua Bengo, referred to as one of the modern godfathers of technology 2. Democratic governance is needed for regulation 3. Timeline for emergence of a system that can evade human control is 5-20 years
12	McAlpine, K. (2023). AI in society: Perspectives from the field. Michigan Today. https://michigantoday.umich.edu/2023/12/08/ai-in-society-perspectives-from-the-field/	<ol style="list-style-type: none"> 1. How AI functions in society 2. Risk management that must take place to ensure AI implementation in society is fair and safe
13	Clark, J. (2023). DOD Committed to Ethical Use of Artificial Intelligence. U.S. Department of Defense. https://www.defense.gov/News/News-Stories/Article/Article/3429864/dod-committed-to-ethical-use-of-artificial-intelligence/	<ol style="list-style-type: none"> 1. Provides insights into the ethical considerations and policies of a major government entity in AI development.
14	Hise, B., & Dao, J. (2023). Ethical considerations in the use of AI. Reuters. https://www.reuters.com/legal/legalindustry/ethical-considerations-use-ai-2023-10-02/	<ol style="list-style-type: none"> 1. Practical suggestions for incorporating AI into the practice of law and emphasizes the importance of understanding the risks and benefits of AI tools
15	Pursuing the Ethics of Artificial Intelligence in Healthcare. (2023, October 25). Cedars Sinai. https://www.cedars-sinai.org/newsroom/pursuing-the-ethics-of-artificial-intelligence-in-healthcare/	<ol style="list-style-type: none"> 1. Pursuing the ethical development and deployment of AI technologies in healthcare. 2. Addresses the ethical considerations and challenges associated with the use of AI for diagnosis and treatment in healthcare.
16	UNESCO talks about its recommendation on the ethics of artificial intelligence in education. (2023). UNESCO. https://www.unesco.org/en/articles/unesco-talks-about-its-recommendation-ethics-artificial-intelligence-education	<ol style="list-style-type: none"> 1. Focus on education: specifically addresses the ethical use of AI in education <p>Emphasis on regulation and ethical frameworks: stresses the importance of regulating AI use</p>

Note. Rows 1-4 include sources related to ‘AI and Accessibility’. Rows 5-8 cover ‘Artificial Intelligence and Econom*’. Rows 9-12 are dedicated to ‘AI and Social*’. Rows 13-16 discuss ‘Artificial Intelligence and Ethic*’.

Table 1c*List of GovInfo Sources*

No.	Citation	Why we chose
1	Office of the Federal Register, National Archives and Records Administration. (2021, July 28). 86 FR 40810 - Artificial Intelligence Risk Management Framework. [Government]. Office of the Federal Register, National Archives and Records Administration. https://www.govinfo.gov/app/details/FR-2021-07-29/2021-16176	1. As leaders of AI development, the United States possess a unique opportunity to steer AI's future away from continuing biases against marginalized groups worldwide.
2	H. Res. 649 (IH) - Calling on the United States to champion a regional artificial intelligence strategy in the Americas to foster inclusive artificial intelligence systems that combat biases within marginalized groups and promote social justice, economic well-being, and democratic values. https://www.govinfo.gov/app/details/BILLS-118hres649ih	1. It is widely agreed that AI must be created, developed, utilized, and assessed in a reliable and ethical manner to enhance public confidence and trust.
3	National Institute of Standards and Technology (NIST), Commerce Department. (2022, September 29). Panel Summary Report: Risk Management & Industrial Artificial Intelligence, Informs Annual Meeting, 2021 (Virtual). [Government]. Commerce Department. https://www.govinfo.gov/app/details/GOVPUB-C13-ef5a2fbb1a7a0c1b04a02d95af757970	1. How risk is defined and who should be mindful of potential AI risks
4	National Institute of Standards and Technology (NIST), Commerce Department. (2022, March 14). Towards a Standard for Identifying and Managing Bias in Artificial Intelligence. [Government]. Commerce Department. https://www.govinfo.gov/app/details/GOVPUB-C13-9763c9cc5eda8562249fa6e860375a18	1. NIST has dedicated significant efforts towards ensuring the accessibility and fairness of AI systems. 2. Emphasis on systematic bias and accessibility for people with disabilities.
5	House of Representatives, Congress. (2018, April 17). Serial No. 115-79 (House Hearing) - Game Changers: Artificial Intelligence Part III, Artificial Intelligence and Public Policy. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/CHRG-115hhrg31118/CHRG-115hhrg31118	1. Has various speakers that talk about their experience with AI. 2. Talks about the positive and negative impacts of AI. 3. Gives a lot of figures and someone talks about how US and China are fighting to gain AI dominance.
6	Science and Technology Policy Office. (2019, December 31). American Artificial Intelligence Initiative: Year One Annual Report. [Government]. Science and Technology Policy Office. https://www.govinfo.gov/app/details/GOVPUB-PREX23-PURL-gpo136646	1. Talks about America's AI initiative. 2. Gives information about what US has done and plans to do. 3. Entails information about legislation. 4. US wants to continue having AI domination.
7	Science and Technology Policy Office. (2015, December 31). Preparing for the Future of Artificial Intelligence. [Government]. Science and Technology Policy Office. https://www.govinfo.gov/app/details/GOVPUB-PREX23-PURL-gpo75059	1. Talks about various impacts of AI on the government, workforce, economy and more.
8	Senate, Congress. (2023, March 7). S. Hrg. 118-25 - Artificial Intelligence: Risks and Opportunities. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/CHRG-118shrg52483/CHRG-118shrg52483	1. Positives and negatives of AI. 2. US government is ahead in the AI domination race and China is trying to gain control. 3. Generative AI and ChatGPT. 4. Talks about how AI algorithms could have unknown outcomes.
9	House of Representatives, Congress. (2019, June 25). Serial No. 116-32 (House Hearing) - Artificial Intelligence: Societal and Ethical Implications. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/CHRG-116hhrg36796/CHRG-116hhrg36796	1. How AI has been beneficial to the US economy and national security. 2. However, it also proved to be vulnerable regarding social issues.

No.	Citation	Why we chose
10	Congress. (2023, October 23). 169 Cong. Rec. S5127 - Artificial Intelligence (Executive Session). [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/CREC-2023-10-24/CREC-2023-10-24-pt1-PgS5127-5	<ol style="list-style-type: none"> 1. The risks of AI in everyday life and how they can be managed. 2. How safety measures can be implemented to refrain people from having to worry.
11	Office of the Federal Register, National Archives and Records Administration. (2021, July 28). 86 FR 40810 - Artificial Intelligence Risk Management Framework. [Government]. Office of the Federal Register, National Archives and Records Administration. https://www.govinfo.gov/app/details/FR-2021-07-29/2021-16176	<ol style="list-style-type: none"> 1. People with disabilities and how they have been affected 2. Impact on young children and students in the classroom, how learning and socializing has shifted
12	House of Representatives, Congress. (2018, April 17). Serial No. 115-79 (House Hearing) - Game Changers: Artificial Intelligence Part III, Artificial Intelligence and Public Policy. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/CHRG-115hhrg31118/CHRG-115hhrg31118	<ol style="list-style-type: none"> 1. Entails public policy jobs will be improved by technology; it will create safer environments and more social engagement. 2. Discrimination in things like facial and voice recognition
13	House of Representatives, Congress. (2019, February 26). H. Res. 153 (IH) - Supporting the development of guidelines for ethical development of artificial intelligence. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/BILLS-116hres153ih	<ol style="list-style-type: none"> 1. Guidelines aim to promote transparency, accountability, and fairness in the development and use of AI. 2. Emphasizes the need for interdisciplinary research about AI that is safe and beneficial.
14	Senate, Congress. (2021, May 18). S. 1705 (IS) - Artificial Intelligence Capabilities and Transparency Act of 2021. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/BILLS-117s1705is	<ol style="list-style-type: none"> 1. Overview of legislative efforts aimed at regulating and promoting ethical considerations in the development, and procurement.
15	House of Representatives, Congress. (2019, June 25). Serial No. 116-32 (House Hearing) - Artificial Intelligence: Societal and Ethical Implications. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/CHRG-116hhrg36796/CHRG-116hhrg36796	<ol style="list-style-type: none"> 1. Insights and recommendations from experts on how the United States can lead in the ethical development of AI. 2. Ensure meaningful public accountability in the development and deployment of AI systems
16	Office of the Federal Register, National Archives and Records Administration. (2020, December 7). 85 FR 78939 - Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government. [Government]. Office of the Federal Register, National Archives and Records Administration. https://www.govinfo.gov/app/details/FR-2020-12-08/2020-27065	<ol style="list-style-type: none"> 1. Importance of designing, developing, acquiring, and using AI in a manner that is respectful of the U.S.'s values 2. Emphasizes the need to foster public trust and confidence in AI, protect privacy, civil rights, and civil liberties

Note. Rows 1-4 include sources related to ‘AI and Accessibility’. Rows 5-8 cover ‘Artificial Intelligence and Econom*’. Rows 9-12 are dedicated to ‘AI and Social*’. Rows 13-16 discuss ‘Artificial Intelligence and Ethic*’.

3.2 Objective 2: Determine implications regarding AI in the workforce from industry stakeholders' perspectives.

To achieve the second objective, which was focused on analyzing perspectives from industry experts about the future of AI in the workforce, we employed an interview-based approach. First, we developed interview questions to collect data from individuals in the workforce. These questions were designed to align with key themes and findings drawn from our archival research completed in Objective 1, allowing for a thorough comparison between academic, governmental, and media publications and industry experts. Interview participants included individuals from various sectors, encompassing diverse workforce demographics, job roles, and experiences with AI technology adoption. The interviews conducted gathered their experiences, perceptions, and challenges related to AI in the workplace. With a semi-structured approach, open-ended questions were a crucial part of the interview format, which provided experts with the flexibility to freely share more about the different topics they find most pertinent. This not only enabled us to collect more comprehensive data but also to identify opinions and insights that may not be explicitly covered in scholarly literature.

In collaboration with our sponsor, we pre-selected five categories of industry stakeholders relevant to AI on the workforce including 1) policymakers/think tanks, 2) managers/HR professionals, 3) researchers 4) credentialing professionals, and 5) consumer advocates. Refer to Table 2 for a description of how we defined each stakeholder. While we had a core set of predefined questions applicable to all participants, at the request of our sponsor, we collaboratively developed tailored questions specific to address the expertise or experiences of individual participants within each stakeholder category. This approach allowed us to gather unique perspectives of each participant.

Table 2*Definition of Stakeholder Categories*

Industry Category	Description
Policymakers/Think Tanks	Government officials, representatives from think tanks, and regulatory authorities involved in shaping policies related to AI.
Managers/HR Professionals	Responsible for decision-making, AI integration, and human resource management.
Researchers	Experts and scholars with in-depth knowledge of AI trends and implications in the workforce.
Credentialing Professionals	Involved in verifying and assessing an individual's qualifications, skills, education, training, and experience. This process ensures that individuals meet certain standards or criteria, crucial in the workforce (Credentials: U.S. Bureau of Labor Statistics, n.d.).
Consumer Advocates	Individuals or organizations that work to represent and protect the rights and interests of consumers in various markets or industries.

With consent, these interviews were recorded, transcribed, and analyzed to categorize the data, allowing for the identification of recurrent themes, opinions, and viewpoints. Please see Appendix A for a copy of our consent form and Appendix B for interview questions. As our consent form stated, our results will refrain from using the names of our participants; however, participant numbers along with their organization and expertise are shown in Table 3.

3.3 Objective 3: Analyze the current impacts and stakeholders' opinions to uncover potential consequences and future challenges of AI in the workforce.

To address objective 3, we synthesized our findings from objectives 1 and 2 to develop a comprehensive understanding of the opportunities and challenges in the evolving workforce landscape. This structured yet flexible approach allowed us to identify similarities and differences between existing scholarly publications and expert perspectives on the role of AI in the workforce. Through our research and interviews, we sought to develop actionable recommendations for current and evolving topics surrounding AI. The synthesized data obtained in this objective was utilized to formulate evidence-based recommendations on the development of voluntary consensus standards and regulations for ANSI and WorkCred. These recommendations provided a roadmap for implementation, including short-term and long-term priorities.

Table 3*Participant Overview: Stakeholder Categories, Expertise, and Interview Dates*

Participant	Organization	Stakeholder Category	Expertise	Interview Date
1	Avue Tech Corp	HR Professional	Human Resources Leadership and Strategy	11/17/2023
2	ANSI National Accreditation Board (ANAB)	Credentialing	Leadership in Accreditation and Credentialing	11/16/2023
3	ANSI National Accreditation Board (ANAB)	Credentialing	Accreditation and Educational Leadership	11/13/2023
4	Certified Financial Planners (CFP)	Credentialing	Leadership in Financial Planning and Wealth Management	11/28/2023
5	Society of Certified Senior Advisors; Professional Testing	Credentialing	Leadership in Environmental and Professional Testing	11/28/2023
6	National Restaurant Association (NRA)	Policymaker and Credentialing	Leadership in Food Safety Certification	11/9/2023
7	Oracle	Manager and HR Professional	Accessibility and Inclusion in Technology	11/14/2023
8	Brookings Institution	Think tank	Economic Geography and Labor Policy Research	11/14/2023
9	American Association of Family & Consumer Sciences (AAFCS)	Consumer Advocate	Strategic Leadership and Organizational Management	11/17/2023
10	CertientAI	Researcher	Entrepreneur; Leadership in AI	11/16/2023

4.0 Results

4.1 Objective 1: Archival Research

After completing a systematic review of our 48 sources, we organized these into tables representing the sources selected and the justification behind these choices (see Table 1). Part of this analysis involved summarizing each document. The summaries offer key insights about AI and its implications and we identified emergent themes of economic, ethical, social, and accessibility considerations in AI. In order to not solely confine our research to the technological aspects of AI integration, we chose four themes that were broader in nature: economic, ethical, social, and accessibility. These aspects reflect the impact of AI on individuals and society. Economically, AI influences job markets and productivity. Ethically, it raises concerns about privacy, bias, and decision-

making. Socially, AI affects human interactions and societal norms. Accessibility focuses on equitable access and the digital divide, ensuring AI benefits are widespread and inclusive.

Next, we present a concise analysis of AI's economic implications, focusing on its transformative effects on industries and the job market, and its contribution to global economic growth. This section explores AI's challenges and opportunities, its impact on productivity and legal issues, and the dynamics of international AI competition.

4.1.1 Economic

AI has become increasingly prevalent in various industries, performing tasks once completed by humans, such as complex financial transactions and document reviews (Scherer, 2015). This has led to an “AI arms race” in the private sector (Scherer, 2015). Advances in AI and machine learning may modify automation, which could alter the jobs affected by technology (Frank et al., 2019). AI would cause jobs to be dislocated for a short period, until AI-related jobs become known (Hancock, 2023). The expansion across sectors could contribute up to \$15.7 trillion to the global economy by 2030 (PricewaterhouseCoopers, 2023). This raises concerns about unemployment and potential misuse of AI (Scherer, 2015).

The increasing integration of AI into daily life, from watches to autonomous vehicles, demonstrates both the promise and downsides of AI (Raso et al., 2018). AI would aid high-skilled labor, which would significantly increase income inequality (Hancock, 2023). This would require policy intervention to mitigate the income inequality and make sure that AI's economic benefits are equally divided (Science and Technology Policy Office, 2015). In banking, AI technologies like unsupervised learning could be used to reduce the risk of cyber-attacks and improve the overall risk management, especially in fraud prevention and anti-money laundering (Milojević et al., 2021). Unsupervised learning is a form of machine learning where algorithms analyze data without predefined labels, aiming to detect inherent patterns (Szeliski, 2020). Generative AI in finance could contribute up to a 7% increase in global GDP (almost \$7 trillion) and a 1.5% boost in productivity growth (Probasco, 2023). However, its impact on job displacement and income inequality is a concern, including its uneven distribution of benefits (Probasco, 2023; Brynjolfsson, 2023). The impact of digitalization could especially be seen in the manufacturing industry where robots are reducing employment opportunities in places like inventory tracking, collection of data analytics, improving safety ratings, and enhancing security efforts (Frank et

al., 2019; Bennett, 2023). Cautious adoption in sectors with higher stakes and regulations is required, especially in unionized industries (Conerly, 2023).

Financial technology (FinTech) is one of the more prominent domains affected by artificial intelligence (Cao et al., 2020). AI can assist in several areas, including database searching, cryptocurrency trends, mobile payments, among others (Cao et al., 2020). It can also be a driving force behind innovation in the fintech realm, potentially helping in operations and product development (Cao et al., 2020). Fintech is emerging as a crucial component of bank and financial start-up strategies. It can create innovative intelligence models that are able to satisfy customer economic needs (Arora et al., 2023). AI utilization in fintech expands past consumer digitalization and e-banking methods, as it is capable of creating additional value for customers and generating more money for enterprises (Arora et al., 2023). Recently, the finance sector has been rapidly evolving, especially after the introduction of AI and data science, which are both playing crucial roles in transforming this industry (Cao et al., 2020). They are impacting existing theories related to money, investment, credit, market, and regulation.

AI-driven automation may displace one-third of the workforce in the U.S. and Germany, emphasizing the need for supportive policies (Manyika et al., 2017; House of Representatives, 2018, Serial No. 115-79). The U.S. is a leader in AI research, competing with China's ambitious plan for a \$150 billion world-leading AI industry by 2030. Both countries are trying to dominate the AI race as they are the world's largest economies and would collectively gain about 70% of the global economic impact of AI by 2030 (Bank of America, n.d.). This would, however, increase the economic inequality within the countries, favoring 'owners of capital' more than most workers further increasing the economic gap between developed-world incomes and developing-world incomes (Hancock, 2023).

Next, we present an analysis of AI's social implications, focusing on its role in human interaction and the need for responsible deployment. This section covers AI's impact on society, emphasizing issues like biases, discrimination, and the importance of diversity and regulatory frameworks in AI development.

4.1.2 Social

AI's incorporation regarding social implications presents both opportunities and challenges. There is a need for trustworthy AI systems that feature interpretability, aligning closely with human decision-making processes (Berberich et al., 2020). This is crucial given the influence of biases and social expectations on how AI-generated explanations are perceived. A recent emergence called AI4SG, or Artificial Intelligence for Social Good, focuses on different ways AI can create positive impacts socially. Instances range from systems that can predict septic shock, to models that can put an end to poaching (Henry et al., 2015; Fang et al., 2015; Cowls et al., 2019). The designers of this project are said to face two major obstacles, unnecessary failures and accidental successes (Cowls et al., 2019). These obstacles reiterate that AI can be beneficial without intending to be but can also be a hindrance when attempting good deeds. For this reason, the implications must continue to be assessed to ensure society is safe when AI is involved in our everyday lives. A significant aspect of AI's social implications revolves around its capacity to function in sensitive topics without offending people (Berberich et al., 2020). AI is not typically relied on by humans for assistance in social interactions, but a recent AI innovation helps contradict this common conception. The introduction of Takt, a behavior-guiding form of AI, demonstrates AI's potential in enhancing human interactions, like doctor-patient communications (Berberich et al., 2020). This showcases the importance of AI in understanding emotions, improving social interactions, and ultimately contributing to 'societal potential', the interaction between human and AI capabilities in creating positive experiences (Berberich et al., 2020).

The ethical use and public responsibility of AI, especially in countries like the USA, Russia, and China suggests the need for creating guiding principles (Saveliev et al., 2020). These principles must ensure AI's benefits align with social responsibility as a global challenge, particularly in sensitive applications like caregiving and the risk of fostering an unhealthy reliance. AI's role in societal development can be seen through aiding farmers with weather data and using satellite imagery to prevent deforestation (Davidson, 2023). However, successful AI integration depends on responsible deployment that mitigates biases and discrimination, particularly in social impact initiatives. This is reiterated by AI's developing influence in social-emotional learning in education (Prothero, 2023). The use of chatbots for addressing social-emotional issues brings up concerns about training data transparency and the potential risk of substituting real human connection.

Researchers believe that individuals utilize specific biases and social expectations during training of AI explanations. It is thought that these biases and expectations can enhance human interactions with

explanatory AI (Miller, 2019). The societal biases absorbed by AI systems also exhibit the consequences of unchecked AI development (McAlpine, 2023). This stresses the need for regulation to prevent AI from creating barriers for marginalized groups, a concern also addressed in government discussions focusing on AI's role in reinforcing social issues like gender and race discrimination (U.S. House of Representatives, 2019, Serial No. 116-32; McAlpine, 2023). Companies that are in the process of developing powerful AI systems need a Board of Directors that have the best interests of society in mind, according to Yoshua Bengio, who is known as one of the 'modern godfathers of technology' (Milmo, 2023). He also stated that democratic governance is needed. A Board of Directors from these powerful AI companies needs oversight to be able to act in a different manner than the regulators (Milmo, 2023).

The lack of diversity in the AI industry also plays a crucial role in how AI systems function and whom they represent. The findings of AI Now's study show a decline in women's participation in computer science fields, suggesting a concerning trend in the inclusivity of AI systems (U.S. House of Representatives, 2019, Serial No. 116-32). AI's transformative potential in the workforce highlights the importance of initiatives like CTA's 21st Century Workforce Council in bridging skill gaps (U.S. House of Representatives, 2019, Serial No. 116-32). This action aims to bridge skill gaps through training methods in the workforce, which is necessary thanks to AI's ongoing implementation.

There is a consensus that AI must be developed and used in a way that is both trustworthy and responsible to gain trust from the public and ultimately be safely utilized (Office of the Federal Register, National Archives and Records Administration, 2021). Finally, the AI Labeling Act addresses concerns over manipulated content and trust in AI systems. By mandating transparent labeling of AI-generated content, this act aims to foster an informed and trustworthy environment, which is needed for AI's positive integration into society (Congress, 2023).

Next, we present an overview of AI's ethical dimensions, highlighting the formulation of ethical guidelines and their real-world application challenges. This section addresses key ethical principles and the practical dilemmas in sectors like finance, defense, and education, along with legislative efforts to ensure responsible AI deployment.

4.1.3 Ethical

The ethical landscape of AI spans across sectors, from national security to healthcare, and even robotics, each presenting different challenges and necessitating an examination of the pros and cons of AI implementation. AI's potential to revolutionize these sectors is significant, yet it comes with the need to address biases in gender, race, and socioeconomic factors, often coming from human programming (House of Representatives, 2019). Such biases are notably dominant in healthcare, where institutions like Cedars-Sinai strive to ensure AI's equitable application in patient care. This highlights the global requirement for ethical AI guidelines (Cedars Sinai, 2023). In parallel, the dominance of AI development by a few giant tech companies prompts concerns about independent auditing, power balance, and the replication of historical discrimination, showing the necessity of regulatory frameworks (House of Representatives, 2019).

This concentration of power mirrors healthcare concerns, where the accuracy and reliability of AI in diagnosis and treatment must be validated to avoid critical errors, reflecting a broader emphasis on public accountability and the implementation of ethical principles (Cedars Sinai, 2023). Another critical concern of decision-making made by AI entities is autonomous vehicles (AVs). For example, in one scenario, the AV may have to choose between hitting a pedestrian crossing the street or swerving and hitting a barrier, potentially harming the passengers in the car (Roff, 2018). The decision of what action the AV should take in each scenario is an ongoing debate and discussion among experts in the field (Roff, 2018). The debate includes who is responsible in the event of death – the original coder? The car manufacturer? Owner of the AV? It is increasingly important to consider the potential treatment to humans. AI applications can pose security and privacy threats to individuals. For example, these threats include the potential misuse of AI technology to steal private information and cause harm to individuals. Further, the ethical implications of the creation and destruction of AI applications is also of concern (Li & Zhang, 2023). The use of AI in society involves many ethical challenges. It is important to have strong ethical guidelines in every sector to make sure AI is used in ways that benefit everyone.

The ethical challenges of AI are a concern in most sectors it is being integrated in, highlighting the role of various entities in establishing ethical guidelines, ranging from international bodies to tech companies (Huang et al., 2023). These guidelines, based on principles like autonomy and justice, extend beyond AI developers to policymakers and the public (European Parliament, 2019), reflecting the global impact of AI technologies and the collective responsibility in their deployment. These guidelines are based off principles confirmed in both medical and AI ethics, offering a moral direction for AI's

evolution (Huang et al., 2023). Ethical design, decision-making, and governance are emphasized, promoting the integration of ethics from the initial stages of AI development. However, applying these principles in practice involves challenges, such as varying interpretations and the difficulties of real-world implementation. The ethical dilemmas in AI algorithms, as seen in financial decision-making, highlight concerns about discrimination and accountability (Bostrom & Yudkowsky, 2018). The concept of Artificial General Intelligence (AGI) adds even more difficulties, raising questions about ensuring ethical behavior in diverse scenarios (Betz, 2023). This discussion also extends to the moral agency of AI systems and the feasibility of solutions like supervisory AI programs or "ethics bots" (Etzioni & Etzioni, 2017).

In specific sectors, the U.S. Department of Defense's commitment to ethical AI in autonomous weapon systems (Clark, 2023) and lawyers' ethical use of AI tools (Hise et al., 2023) demonstrate the growing awareness of AI's ethical implications. Educational recommendations advocate for human oversight in AI applications (UNESCO, 2023), emphasizing AI as a complement to human judgment. Legislative initiatives like H. RES. 153 and the Artificial Intelligence Capabilities and Transparency Act of 2021 (Senate, 2021, S. 1705) demonstrate governmental recognition of the need for ethical AI guidelines, focusing on inclusivity, transparency, and societal wellbeing. These diverse perspectives and initiatives collectively show the imperative to incorporate AI development and application with ethical considerations, ensuring responsible use for societal benefit.

Next, we present an overview of AI's impact on accessibility, highlighting its potential and challenges in aiding individuals with disabilities. This section discusses AI's current limitations, ethical concerns regarding inclusivity and privacy, and efforts to improve accessibility and fairness in AI technologies.

4.1.4 Accessibility

The World Health Organization found that more than one billion people worldwide are living with a disability (Morris, 2020). Viewed from a social perspective, the extent of people's disabilities is influenced by the barriers to accessibility created by society (Morris, 2020). While AI technologies can eliminate several of these barriers, it comes with ethical challenges such as inclusivity, bias, error management, and inflated expectations due to misleading media portrayals of AI's capabilities (Morris, 2020). AI's current limitations, particularly in web accessibility, are evident, as it is not yet a reliable

substitute for comprehensive web accessibility standards, highlighting the need for ongoing progress in this area (Abou-Zahra et al., 2018).

Inclusivity is a major concern, as AI systems like speech recognition often fail to cater to diverse populations, including individuals with speech difficulties, dysarthria, or deaf accents, due to a lack of training data that is diverse (Morris, 2020). This exclusion could disrupt engagement with emerging computing technologies. AI technologies can also inadvertently disclose people's disability status through their computing actions, influencing how algorithms treat them and potentially affecting aspects like insurance coverage and job opportunities. For example, AI can identify individuals with Parkinson's disease based on their mouse movements, raising privacy concerns (Morris, 2020).

The trust and reliance on AI are also critical issues. Blind individuals, for instance, tend to over trust AI image captioning systems, even when the output is incorrect, which could severely affect the understanding of their surroundings (Morris, 2020). Similarly, there's a risk of AI contributing to further educational disparities in developing countries, despite its potential in enhancing writing skills and research capabilities in higher education (Mannuru et al., 2023). In the United States, national efforts are working towards making computing a fundamental component in K-12 classrooms. For example, the Association for the Advancement of Artificial Intelligence and the Computer Science Teachers Association collaboratively launched an initiative to develop national guidelines for teaching AI in K–12 (Touretzky et al., 2019). While educators recognize that Generative AI is guiding education and curriculum toward more critical thinking skills by pushing students to determine the right questions to ask and how to best obtain answers, they are also worried about cheating and plagiarism (Fore, 2023). According to the federal government, students across the country are struggling in many areas. For example, between 2020 and 2023 average test scores in mathematics and reading fell sharply for 13-year-olds. Further, only 15% of educators said they felt prepared to manage generative AI use in the classroom and 32% noted they are not prepared at all (Fore, 2023).

There are positive impacts of AI in assisting individuals with disabilities. Technologies like Apple's Personal Voice and Live Speech in iOS 17 are steps towards aiding communication for those with physical, motor, or speech disabilities (Render, 2023). However, technologies such as VoiceOver, a feature that describes image content while useful, have limitations in accurately describing content, stressing the need for continuous technological improvements and human oversight in digital accessibility (Taylor, 2023). Generative AI's role in employment for people with disabilities is noteworthy, with platforms like OurAbility using AI to help job seekers. However, the challenge lies in

achieving accurate and inclusive AI services within a widespread digital gap, considering that fewer than 3% of the top one million websites are fully accessible (Henneborn, 2023).

As a leader in AI development, the U.S. must counter biases in AI systems that can amplify inequalities. Unchecked data selection in algorithms can perpetuate biases, seen in facial recognition tech impacting darker-skinned individuals. Prioritizing inclusive algorithms in AI funding is crucial for fair representation (House of Representatives, 2023, H. Res. 649). This initiative is seen from NIST (National Institute of Standards and Technology), which work on fairness and accessibility, acknowledging biases from institutional processes like sexism and institutional racism. NIST's AI Risk Management Framework, is aiming to embed trustworthiness voluntarily, aligning with societal values (Office of the Federal Register, National Archives and Records Administration, 2021). AI becomes a considerable risk if and when it can make decisions beyond its verified training region (National Institute of Standards and Technology [NIST], 2022).

4.2 Objective 2: Interviews

To present the results for this objective, each interview and its findings were summarized. As a reminder, the questions posed to participants varied depending on their category as a stakeholder and, in some cases, were further tailored to individual participants (see section 3.2).

4.2.1 Participant 1

In an interview representing the HR Professional and Credentialing stakeholder categories, the participant serves as Vice President for Client Engagement at a company specializing in HR IT solutions for federal government clients in human capital management, recruiting, hiring, and employee development. Their organization delivers services through an HR IT platform, which incorporates AI and large language feature functionality. The participant shared that the longstanding use of AI in their organization dates back 25 years. The company's AI approach, as the participant described, is focused on specific functionalities: "Our use of AI includes generative AI and semantic search. We don't use it to generate content but to make inferences through semantic search within a closed content database." This AI application helps create comprehensive career stories for candidates, with a human-in-the-loop approach ensuring accuracy and relevance. The career stories are produced using information from resumés and all other submitted documents to describe someone's professional journey. When using AI in the hiring process, the participant stated that: "Hiring managers also have the opportunity to validate

AI's assessments. This approach ensures accuracy and allows AI to learn and improve." The participant also highlights the need to blend AI and human judgment: "We emphasize human verification in our platform. Candidates can review and correct AI-derived information in their career stories."

Regarding AI's impact on employment within their organization, the participant reassured that AI integration has not replaced any positions but acknowledged client concerns in HR about job security due to AI efficiency. On the topic of job displacement, the participant mentioned the transition of skills: "The focus is shifting towards strategic rather than transactional roles." The participant also mentioned the company's success in using AI to improve HR operations, such as in developing employee learning plans. To support the effective use of AI, the company provides training tracks in technical skills and for subject matter experts.

4.2.2 Participant 2

In an interview within the credentialing category, a participant who is Vice President of their organization collaborating with certification bodies explained how AI is increasingly being used in areas such as item generation for tests. The participant described this shift: "Historically, tests were created by subject matter experts, but now we're seeing a shift towards using AI for this purpose." This use of AI extends to generating exam questions using existing platforms with additional coding, with a focus on ensuring fairness, validity, and reliability. The participant also mentioned exploring AI in job analysis and exam proctoring.

When discussing concerns on the use of AI, the participant emphasized the challenges in ensuring AI models, based on large datasets, met fairness and ethical standards. They stated, "We require certification bodies to provide evidence that the AI platforms they use are fair, and transparent, and do not disadvantage any groups." This involves conducting psychometric analysis to ensure tests measure competence equitably across different groups.

When it comes to AI's impact on the workforce, the participant believes AI will not completely overtake different areas but will significantly ease processes, especially in Human Resources. AI is seen as a tool that can streamline hiring, enhance performance reviews, and assist in decision-making, complementing human roles rather than replacing them. The participant also addressed the issue of using white ink on white backgrounds in resumes to deceive AI systems during recruitment. Highlighting the importance of fairness and access, the participant noted, "It's crucial to ensure these AI platforms don't discriminate and that all job seekers have access to resources that make their resumes

AI-friendly." They stressed the emerging regulations to ensure equitable AI platforms, emphasizing the responsibility of users to demonstrate the right steps in avoiding discrimination.

4.2.3 Participant 3

In this interview, the participant observed that AI's impact varies in the areas of credentialing, learning program design, and assessments. In designing courses or certification exams, AI might struggle to incorporate crucial feedback from diverse stakeholders. However, for assessment processes like psychometric calculations, AI proves incredibly efficient, as explained by the participant: "AI can simulate a course with virtual participants to gather statistically significant data, helping to determine accurate passing scores and reducing errors in assessments." The participant anticipates a significant impact of AI on the assessment-based certificate industry, particularly in content development. AI technologies are being utilized to develop course content and create engaging, virtual learning experiences. This use of AI aligns with the latest trends in immersive educational methodologies.

When debating the consciousness and ethics of AI, the participant believed a monitoring mechanism is required. "When you think about artificial intelligence, ethics are always an issue, because you're not dealing with a conscious entity, you're dealing with an unconscious entity, which is kind of a robot." The participant also stressed the importance of privacy and the need for human oversight in AI's content creation to avoid ethical breaches. They noted, "AI systems must be designed to protect participant data... human monitoring [is needed] to ensure AI doesn't generate inappropriate or unethical content."

The participant acknowledged AI's ability to enhance process efficiency and data analysis capabilities. However, they cautioned about AI's limitations, especially in nuanced tasks like resume screening, where AI might overlook suitable candidates. The participant viewed the use of manipulative tactics like white ink on resumes to deceive AI systems as AI system flaws. This highlights the need for smarter, more ethical AI systems in job screening processes, emphasizing the balance between technological advancement and ethical considerations.

4.2.4 Participant 4

In an interview with a Managing Director in the credentialing category with finance expertise, the integration of AI in the credentialing and certification processes was discussed. The participant defined trustworthy AI as technology that is accurate and provides truthful information. They emphasized that trustworthiness in AI means the information provided must be factual and reliable, as the participant stated, "Trustworthiness means the information is actually true."

Regarding the impact of AI on the certification process, the participant noted that, currently, AI has not significantly altered their organization's certification procedures; however, there is growing interest in how AI will be examined and its ethical implications. They are contemplating the use of AI in creating additional exam questions, highlighting the importance of the trustworthiness of AI in this context. The participant also acknowledged that AI-assisted credentialing is still in its early stages, with its role and implications yet to be fully established. When assessing the ethical considerations of using AI in credentialing, the participant stressed the importance of the AI tool's source. Trust in an AI tool is not inherent but depends on the reputation and credibility of the provider. The participant explained, "Trust doesn't come merely because it's an AI tool; we need to know who else is using it and who's behind it."

On the topic of job displacement and biases from AI integration, the participant acknowledged that certain jobs might be replaced by AI. For example, the introduction of AI in creating exam questions could potentially reduce the need for human involvement in this process.

4.2.5 Participant 5

In an interview with a CEO in credentialing, the participant defined trustworthy AI, emphasizing the need for careful training, vetting, and testing. They stated, "Trustworthy AI should be a model that doesn't hallucinate or pose legality issues, like potential copyright infringement or providing dangerous or inaccurate responses." Discussing the impact of AI on credentialing and certification, the participant noted the changing nature of job functions, especially in grading or credentialing exams. "AI is beginning to alter job functions," they remarked, highlighting the need for understanding proper model development and applications.

The participant also spoke about ensuring the credibility and validity of AI-assisted certifications. Their approach includes human review and is based on known data, using techniques like supervised or unsupervised learning to refine AI model responses.

On the topic of ethical and fairness considerations, the participant stressed the importance of transparency in AI's use. "Transparency is key," they said, highlighting the need for clear communication about AI product usage, model training, and validation. Identifying challenges in AI integration, the participant pointed out issues like model construction, dataset sources, and potential biases. They explained that AI is being used to automate internal 'grey work' processes, allowing staff to engage in more creative and high-value tasks. 'Grey work' was described as everyday tasks that are productivity killers. Regarding industries where AI is targeting 'grey work', the participant mentioned customer service and content generation as areas where AI is increasingly applied. They noted that some clients are developing customized AI models for specific tasks like generating test questions, though these are still in the early stages of implementation.

4.2.6 Participant 6

In an interview with a Senior Vice President categorized as both a credentialing and policymaker stakeholder, detailed perspectives on Artificial Intelligence (AI) in the food sector were discussed. The participant defined AI as machine learning aimed at enhancing guest interactions and addressing labor issues, especially in quick-service restaurants. They described AI's current role, stating, "AI's current use in the industry is more about convenience at the counter, like kiosks or iPad ordering systems, rather than affecting kitchen operations."

The participant also discussed the potential benefits and drawbacks of AI from various perspectives. For business owners, AI is viewed as a solution to labor shortages and rising operational costs, a trend accentuated in the post-pandemic era. For workers particularly in high-end restaurants, "AI is unlikely to replace the human aspect of dining." However, in fast casual and quick-service settings, AI is starting to replace jobs, particularly where labor is scarce, raising concerns about losing the human element in dining experiences.

According to the participant, so far, AI has not led to new job roles emerging in the restaurant industry. Its adoption is gradual, focusing on enhancing point-of-sale systems, and its impact is more pronounced in quick-service restaurants. However, human roles are not completely displaced.

Regarding their organization's use of AI, the participant mentioned exploring its potential in examination and certification processes, particularly in creating exams and remote proctoring. While also highlighting credentialing program roles in validating workers' skills and knowledge. They noted the challenges, including "ensuring the security of exam content and gaining acceptance from

accrediting bodies." As AI's influence grows, they foresee potential changes in credentialing programs to incorporate skills necessary for AI-driven activities. However, the participant added, "For now, the main focus of our certifications, like food safety, is unlikely to change much due to AI."

4.2.7 Participant 7

In an interview with a participant in the manager and HR Professionals categories who focuses on web accessibility for people with disabilities shared their knowledge of AI which comes from personal interest outside of their official duties. The participant defined AI as technology that simulates human intelligence or cognitive tasks on a computer.

The participant mentioned publicly known AI applications at their company, including large language model generative AI for HR tasks, such as writing employee reviews and generating job postings. They described their organization's digital assistant, which uses AI for a conversational interface, integrating with company systems for easier information access. As the participant explained, "Publicly known applications include large language model generative AI for HR tasks."

On AI's impact on the software manufacturing workforce, the participant anticipated a positive impact on productivity. They referenced tools like GitHub Copilot, which assist in coding, noting, "AI will significantly boost productivity, especially in software development." The participant shared an example of a successful AI project in development, AI Assist, which assists in tasks like marketing emails and HR documentation by generating starter texts. This tool is seen as having the potential to save significant time and effort for users.

Discussing AI's effect on people with disabilities and those with low socioeconomic status, the participant highlighted that AI presents both opportunities and challenges. While advanced AI tools can improve accessibility, biases in AI could disadvantage people with disabilities if their needs are not considered in AI development.

As for how AI is influencing their role, the participant noted that they have not observed significant impacts within their company from their position but anticipate that the internal use of AI tools will become more prevalent in the future. Lastly, the participant emphasized the need for AI regulations or ethical guidelines in tech, advocating for a cohesive governance framework at the federal level. As they put it, "A cohesive governance framework at the federal level is necessary for AI regulation." This framework should address data privacy, ethical AI usage, and monitor bias. They also

highlighted the importance of considering AI's impact on education systems and businesses to ensure workforce competitiveness.

4.2.8 Participant 8

In an interview with a participant from the think tank category, AI was defined as "the use of technology to perform sophisticated or complex tasks that would typically require human effort." When asked about their opinion on the role of federal and state governments in regulating AI, the participant emphasized the need for a cohesive governance framework at the federal level. This framework should outline data rights, conditions for data sharing, and monitor bias and ethical AI uses. They proposed a digital identity wallet for Americans to enhance identity verification and data privacy. The participant highlighted, "At the federal level, there needs to be a cohesive governance framework outlining data rights and conditions for data sharing."

The participant noted that while private sector organizations have voluntary codes of conduct, effective regulation of AI is needed, especially in hiring processes. As monitoring AI for discrimination requires access to proprietary data and a workforce skilled in technology and legal infrastructure. "We need to have government workers whose job it is to both be able to monitor that, but they need to know enough about the technology and to be able to decipher what's going on in the algorithm, but also need to know the legal infrastructure. So, I think it's going to be a challenge to build up a workforce capacity of people at the state level, at the local level, and the federal level to be able to monitor these kinds of processes."

On the topic of credentialing for people working with AI, the participant argued that widespread credentialing seems impractical due to AI's broad nature. Instead, they advocated for education systems supporting continuous learning and adaptability, tailored to specific industry applications of AI.

One of the initial ethical concerns highlighted by the participant was the absence of a unified governance framework for data. "We lack a centralized agency to harmonize data governance across different federal and state entities," they stated, emphasizing the importance of establishing such an agency for effective and ethical AI regulation. Finally, when balancing AI-driven efficiency with workers' rights and job security, the participant recognized that AI both creates and destroys jobs. They suggested rethinking social and economic models, focusing on continuous learning opportunities, and adapting social institutions to a changing workforce.

4.2.9 Participant 9

In the interview with a participant from the consumer advocate stakeholder category, the participant defined AI as "software that takes actions based on its design, processing information and coming to conclusions based on specific data points, using algorithms and software." The use of AI within their consumer membership primarily consists of educators. As they are not directly involved in AI standard setting, their focus is on educating members about AI. Specifically, its various applications, and the differences between machine learning and learning AI, to help integrate it into their workplaces appropriately. In their organization, AI is not extensively used yet but is considered for tasks like evaluating data and identifying patterns. They noted that online chat systems, commonly used by their members, are typically AI-driven and improve over time through learning from past interactions.

When addressing concerns about privacy and data security in AI-powered systems, the participant highlighted the risks associated with AI's ability to identify individuals using multiple data points, as well as the potential for inherited biases from the data it is trained on. They recognized the need for regular checks and stated that resets are necessary to mitigate these biases. "A lot of studies have shown that you really must check the AI system on a regular basis because the AI is using data from your internal systems. And so, if the people that were doing those processes had bias, the AI will also have bias."

On the topic of AI's impact on customer experiences, the participant observed that AI systems often struggle with complex queries but are effective in evaluating large data sets and making system biases more transparent. The participant expressed that it is often unclear how AI is used, citing examples like banks using AI for loan applications without explicitly stating how or when AI is involved. They advocated for more transparency in this area.

The participant also expects companies to clearly indicate when customers are interacting with AI and to monitor AI systems to ensure expected outputs, adjusting as needed. They said, "Companies should make it clear when customers are interacting with AI."

4.2.10 Participant 10

In this interview within the researcher stakeholder category, the participant is an AI startup founder and chair of AI standards for the U.S. The participant has extensive experience in AI applications across various sectors. They defined AI as a tool for processing information and making decisions based on specific data points and algorithms. At his startup, the focus is on responsible AI in the government space. The participant elaborated on responsible AI, stating, "Responsible AI is a word that is used as a catch-all term for all companies that are doing work in AI in a responsible fashion. So, AI does more good than harm and benefits from AI are maximized by working in that space, and the startup I'm building intends to continue to build some products in that space."

When discussing harmful AI, the participant highlighted the range of potential negative impacts, from misuse in academic settings to more severe consequences like incorrect medical diagnoses or accidents in autonomous driving. They emphasized, "It's very unintended consequences due to mistakes made by AI which at the very extreme level could cause death."

In terms of AI standards, the participant is involved in developing international standards, including an AI management system standard. This standard aims to provide a framework for companies to create responsible AI, encompassing policies, risk assessments, and accountability measures. The participant explained, "There's a standard called AI management system standard, going to be released early next year, and it is going to create what is a basic framework of processes that companies should follow to create responsible AI."

The participant views AI as a major disruptor, stating, "It's often talked about as the next Industrial Revolution." Like the Industrial Revolution, AI will greatly impact the workforce by fundamentally altering job roles and necessitating AI literacy. They believe that while AI will automate many jobs, it will also open new opportunities in various fields, including space exploration. The participant sees AI as a force that can significantly assist marginalized groups, particularly through assistive technologies. They provided an example of a company creating wheelchairs controlled by facial expressions.

On an international scale, the participant noted that AI's impact varies between countries, with differing challenges based on demographic trends. They highlighted the competitive nature of AI development, as countries like China aim to lead this new industrial revolution. Finally, the participant advocated for credentialing in AI, asserting that companies and individuals working with AI should

adhere to standards and be trained in responsible AI practices. They suggested that educational institutions should offer courses on responsible AI usage.

4.3 Objective 3: Synthesis

This section is the synthesis of our archival research and stakeholder interviews which aims to uncover potential consequences and future challenges of AI.

4.3.1 Economic Aspects of AI

Archival sources, like Hancock (2023), indicated that AI can temporarily displace jobs, but new AI-related jobs may emerge. Participants, such as Participant 1, discussed how AI could affect job security by displacing roles. This view was confirmed by Participant 6, who believed that not all human roles will be eliminated. Participant 8 suggested that AI has the potential to both create and destroy jobs.

Archival sources like Frank et al. (2019) and Bennett (2023) revealed how AI is changing job roles in manufacturing. Tasks such as inventory tracking and improving security are now automated with AI and robots. Participant 5 talked about AI altering job functions, particularly in credentialing, while Participant 10 discusses how AI will change job roles across the workforce. Participant 5 talked about AI altering job functions, particularly in credentialing, while Participant 10 discussed how AI will change job roles across the workforce. However, Participant 6 contradicted this perspective, stating that the restaurant industry remains unaffected by AI's influence on job roles.

Archival sources, like Bank of America (n.d.), revealed the ongoing competition between the world's largest economies, the US and China, in the race for AI dominance. Participant 10 further confirmed these insights, emphasizing China's determined pursuit of leadership in this industrial revolution.

Archival sources, particularly Hancock (2023), explored the favorable economic effects of AI on 'owners of capital' compared to most workers. Participant 6 reflected these insights, discussing how AI presents a potential solution for labor shortages and escalating operational costs for business owners.

4.3.2 Social Implications of AI

Participant 3 stated how AI systems need to be designed to protect participant data, and human monitoring is needed to ensure AI does not generate inappropriate or unethical content. This related to the archival research because as found in objective 1, the designers of a project called Takt were said to face two major obstacles, unnecessary failures and accidental successes (Cowls et al., 2019). Inappropriate content could be wrongfully generated if a prompt is not perfected prior to the technologies' installment.

Participant 7 discussed AI's effect on people with disabilities and those with low socioeconomic status. Specifically, the participant highlighted that AI presents both opportunities and challenges. While advanced AI tools can improve accessibility, biases in AI could disadvantage people with disabilities if their needs are not considered in AI development. Archival research found that the need for regulation to prevent AI from creating barriers for marginalized groups is necessary. The concern was also addressed in government discussions focusing on AI's role in reinforcing social issues like gender and race discrimination (U.S. House of Representatives, 2019, Serial No. 116-32; McAlpine, 2023).

Participant 8 stressed that we should be rethinking social and economic models, focusing on continuous learning opportunities, and adapting social institutions to a changing workforce. Research found that Artificial Intelligence for Social Good (AI4SG) focuses on different ways AI can create positive impacts socially. Instances of this range from systems that can predict septic shock to models that can put an end to poaching (Henry et al., 2015, Fang et al., 2015, Cowls et al., 2019). These models are innovations that can be beneficial in a variety of ways to society.

4.3.3 Ethical Challenges of AI

Participant 1 emphasized the significance of human oversight in AI applications. Their organization employs a human-in-the-loop approach in their HR IT platform, improving the accuracy and relevance of AI-generated career narratives. This approach completes the advocacy by UNESCO (2023) for human oversight in AI, emphasizing the technology as an addition to human judgment rather than a substitute.

Simultaneously, Participant 5, highlighted the importance of transparency in AI's deployment, especially in ensuring the credibility of AI-assisted certifications. This need for transparency is also mentioned in legislative measures such as H. RES. 153 and the Artificial Intelligence Capabilities and

Transparency Act of 2021 (Senate, 2021, S. 1705), focusing on inclusivity, transparency, and societal wellbeing, and highlighting the need for clear and accessible information about AI operations. Further, Participant 2 mentioned the challenges of ensuring fairness and ethical standards in AI, particularly in test item generation. This concern reflects the issues in healthcare, as highlighted by Cedars-Sinai (2023), emphasizing the need for equitable AI applications in sensitive sectors and the global requirement for ethical AI guidelines.

Participant 7 stressed the necessity of AI regulations and ethical guidelines. Their advocacy for a cohesive governance framework at the federal level aligns with the views expressed in the House of Representatives' report (2019), which discusses the need to address biases in AI programming related to gender, race, and socioeconomic factors. The ethical dilemmas presented by autonomous vehicles, as pointed out by Participant 10, demonstrates the challenges of AI ethical dimension. The participant's concerns about the decision-making processes of autonomous vehicles in critical situations are supported by Roff's (2018) discussion, which highlights the ongoing debate among experts in this field.

4.3.4 Accessibility and Inclusivity in AI

Participant 7 pointed out that AI brings both opportunities and challenges for people with disabilities and those from lower-income backgrounds. This aligns with various archived sources on the topic. They specifically mentioned that if AI development doesn't consider diverse group's needs, it could disadvantage certain people. Archival research and interviews stressed the importance of using AI carefully and involving human judgment. Participants 1 and 5 highlighted the need for human input to ensure accuracy. They noticed that AI features often struggle to help people with disabilities like blindness or deafness. Issues like inaccurate image descriptions show the urgent need for better technology and human oversight in digital accessibility (Taylor, 2023).

Participant 3 and archival research findings also stressed the importance of protecting personal data, especially regarding people's disabilities (Morris, 2020). They also found that AI needs to be trustworthy and reliable. Participants 4 and 5 agreed on the need for better accuracy, this is seen through visually impaired users put too much trust in wrong AI results (Morris, 2020). Participant 9 suggested regulatory checks to reduce bias from data used to identify individuals based on multiple factors.

5.0 Discussion and Limitations

Our findings emphasize the need for AI systems to be transparent about their underlying training data and methodologies. This transparency is crucial for understanding AI decisions, fostering trust, and ensuring that AI operates within established legal and ethical boundaries. Such clarity is especially significant in sensitive areas like healthcare, finance, and legal systems where AI decisions have profound impacts. Despite fears of job displacement, there's a consensus that AI will not completely replace human roles but will instead transform the job market. This transformation is expected to generate new opportunities, particularly in fields requiring AI oversight and ethical governance. However, this shift necessitates an educational paradigm change, starting from foundational levels in schools to continuous professional development, ensuring that the workforce is prepared for an AI-augmented future. Recognizing AI's potential and challenges, our study underscores the critical need for robust regulatory frameworks at both federal and state levels. Such regulations should aim to ensure responsible AI development and use, with a focus on public safety, privacy, and fairness. Within private organizations, internal policies need to be rigorous and aligned with these broader regulatory standards. The roles of organizations like ANSI and WorkCred are critical for guiding voluntary standards for AI and to ensure individuals are properly credentialed. That is, these bodies are influential in setting industry standards and certifying professionals in various fields. Their involvement would ensure that individuals working with AI are adequately trained and adhere to the highest standards of ethical and professional practice. This approach is vital for maintaining the integrity and reliability of AI systems, ultimately contributing to public trust and the successful integration of AI in society.

This research encountered limitations in both the constraint of four keywords and the selection process of sources. Primarily, the total number of sources used, 48 from different databases, may not adequately reflect the complex nature of AI's impact on the workforce. This limited sample size cannot capture the full extent and diversity of all the perspectives which are crucial for a complete understanding of the topic. Additionally, our criteria of restricting the literature review to the first three pages of search results from each search engine and selecting only four publications per keyword from each database introduces another significant limitation. This approach risks losing valuable findings and insights found in sources listed beyond the first three pages or those that did not meet our specific selection criteria, potentially leading to an incomplete or biased understanding of the subject matter.

One of the major limitations of the research was the limited number of interviewees. These participants were provided by our sponsor, making us dependent upon their network for contacts

appropriate for our study. This caused us to have a limited sample size and prevented us from capturing the full range of perspectives on the impact of AI on the workforce. The variation in questions asked to different categories of stakeholders and individual participants, while beneficial for obtaining diverse insights, presents a limitation in our research. Our data was comprised of opinions and attitudes of AI, some that were driven by the associated industries and/or organizations of each participant. This methodological approach potentially introduced inconsistencies in the data collected, as not all the participants were asked the same set of questions. This led to challenges in directly comparing responses across different groups or individuals, potentially the overall generalizability of our findings.

6.0 Recommendations

This section outlines key recommendations from our research objectives, focusing on the implications of AI in the workforce. The recommendations are confirmed by the findings from our archival research and stakeholder interviews, addressing the economic, social, and ethical impacts of AI on the workforce, along with stakeholder opinions.

Our first recommendation is aimed at WorkCred, focusing on the need for reskilling and AI literacy in today's dynamic workforce. Our analysis demonstrates the necessity for a workforce that is both adaptable and knowledgeable in technology. Considering the influence of AI, it becomes crucial to reassess job roles and the skills essential for effective performance in an AI-integrated environment. This calls for a strong emphasis on continual learning and adaptability, extending from K-12 education through ongoing professional development. We suggest that WorkCred establishes reskilling programs that are in sync with the rapidly changing demands of an AI-driven workplace. These programs should concentrate on technical skills and enhancing AI literacy among employees. As a credentialing organization, WorkCred is positioned to evaluate, design, and implement training programs that effectively bridge skill gaps and anticipate future needs. In addition, we recommend fostering collaboration with educational institutions, industry leaders, and policymakers to promote life-long learning starting at the K-12 level. This approach is vital for ensuring that the adaptation to AI integration into the workforce is made seamlessly. Our desired outcomes of this initiative are an upskilled workforce, increased operational efficiency through AI integration, enhanced job security, and a significant boost in employees' confidence in their capabilities. The goal of this recommendation is to highlight that AI's integration into the workforce can enhance rather than undermine human dignity and labor rights, preparing society for a future where technology and human skill coexist.

Our second recommendation, aimed at ANSI, centers on the regulation and mitigation of AI technologies. Through our analysis, we've identified a critical need for tailored risk assessments and ethical evaluations for each AI application in society. We urge ANSI to advocate for the development of specific legislation aimed at mitigating risks such as algorithmic bias and privacy violations. This necessitates robust governance and bias mitigation strategies to ensure responsible and transparent AI usage. A key aspect of this recommendation is the development of AI policies and practices that are inclusive, considering the varied needs and challenges of different demographic groups. It is crucial to establish mechanisms for ongoing monitoring and constant evaluation of AI developments, ensuring that algorithms and databases are equitable and just. The desired outcomes of this recommendation are fostering the ethical use of AI, ensuring its inclusivity across all groups, and promoting transparency that enables informed decision-making and accountability regarding AI's benefits and limitations. The ultimate desired outcome is to empower individuals with a clear understanding of how AI is utilized, its training processes, and the methods used for its ongoing ethical and inclusive evaluation. This approach will ensure that AI is not only a technological advancement but also a tool for enhancing societal well-being and equity.

7.0 Conclusion

Given ANSI and WorkCred's role in ensuring the integrity of standards and credentials, and their interest in the evolving landscape of Artificial Intelligence (AI), the organizations are well positioned to explore AI's future impact on the workforce. Our analysis of the present-day and anticipated future influences of AI in the workforce supports ANSI's interest in AI, offering well-researched recommendations and evidence-based projections. We draw on expert opinions and data to navigate the relatively under-explored territory of AI's long-term effects. Our findings not only align with ANSI's commitment to addressing emerging challenges in various workplaces but also hold the potential to benefit society at large by illuminating AI's versatile implications. This alignment accentuates the significance of our research as a foundational resource for ANSI and WorkCred's ongoing exploration into AI's workforce implications.

8.0 References

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9.0 Appendices

9.1 Appendix A – Consent Form.

Informed Consent Agreement for Participation in a Research Study

Investigators: Noor Andre, Reda Boutayeb, Camden Harris, and Pranav Jain (gr-dc23-ansi@wpi.edu); Adrienne Hall-Phillips (ahphillips@wpi.edu) and Lauren Mathews (lmathews@wpi.edu) – faculty project advisors

Contact Information: gr-dc23-ansi@wpi.edu

Title of Research Study: The Implementation of AI in the Workforce

Sponsor: ANSI/WorkCred

Introduction:

You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks, or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of the study: To gather insights from the person/organization's usage and concerns toward AI, including their motivations for integration, stakeholder concerns, and future plans.

Procedures to be followed: You will answer questions about your opinions of, familiarity with, and use of Artificial Intelligence (AI). Interviews will be recorded for use by the investigators only and will be destroyed at the completion of the study. No identifiable information will be recorded.

Risks to study participants: There are no anticipated risks.

Benefits to research participants and others: There are no direct benefits to you for participating in this research study.

Record keeping and confidentiality: Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or its designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. At any time, if desired, any publication or presentation of the data will not identify you by name or organization. All data will be presented in aggregate and no responses will be attributed to a single participant.

Compensation or treatment in the event of injury: You do not give up any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact: Refer to contact information above. If needed, here is the contact information for the IRB Manager, Ruth McKeogh, Tel. 508 831-6699, Email: irb@wpi.edu and the Human Protection Administrator, Gabriel Johnson, Tel. 508-831-4989, Email: gjohnson@wpi.edu.

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By signing below, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

Study Participant Signature

Date: _____

Study Participant Name (Please print)

_____ Date: _____
Signature of Person who explained this study.

9.2 Appendix B – Interview Questions

Participant 1

1. What is your organization's definition of Artificial Intelligence (AI)?
2. What motivated your organization to integrate AI?
3. How do you balance human employees and AI tools?
4. What are the key benefits and challenges of using AI in your company?
5. Are any positions in your organization at risk due to AI integration?
6. Can you share examples of successful AI projects that enhanced productivity?

Participant 2

1. How are you currently describing AI?
2. How do you assess ethical and fairness considerations when using AI?
3. How do you think AI will affect the workforce?
4. What are your opinions on the use of white ink on white backgrounds in resumes to fool AI systems during initial recruitment stages?

Participant 3

1. Can you share your perspective on AI's application in credentialing, especially in terms of designing learning programs or assessments?
2. How do you think AI will specifically affect the assessment-based certificate industry?
3. Considering ethical and fairness issues, how do you assess these when using AI in credentialing?
4. What ethical standards do you think are crucial to implement in AI, particularly in credentialing?
5. What's your opinion on people using tactics like white ink on resumes to manipulate AI in job applications? Is this ethical?

Participant 4

1. What is your definition of trustworthy AI?
2. How has the integration of AI impacted the credentialing and certification process for workers? What measures have you put in place to ensure the credibility and validity of AI-assisted certifications?
3. How do you assess the ethical considerations when using AI in credentialing?
4. What are your thoughts on job displacement and biases that might result from AI integration?

Participant 5

1. What is your definition of trustworthy AI?
2. How has AI integration impacted the credentialing and certification process for workers?
3. Do you have any measures in place to ensure the credibility and validity of AI-assisted certifications?
4. Can you discuss the ethical and fairness considerations in using AI for certification or credentialing?
5. Are there any key challenges you foresee or have encountered with AI integration?
6. Do you have examples of industries or professions where AI has been efficiently used to target 'grey work'?

Participant 6

1. How does your organization define artificial intelligence? And has there been any industry-wide discussion regarding the potential scope of AI in the food sector?
2. What are the various viewpoints on the potential benefits and drawbacks of AI in the food and restaurant industry, from the perspectives of employees, managers, and business owners?
3. Are there any other ways your organization is using AI right now, maybe in decision-making or other areas?
4. With AI's progression, have you observed any new job roles emerging in the restaurant industry?
5. How do credentialing programs support workers amid the rise of AI?
6. Do you anticipate changes in credentialing programs to incorporate skills needed for AI-driven activities?

Participant 7

1. Can you give us your definition of AI? How is your organization using AI in its products?
2. Does your organization have a framework or policy for integrating AI into products?
3. How do you believe AI will impact the software manufacturing workforce?
4. How does AI affect people with disabilities and those with low socioeconomic status?
5. Can you share examples of successful AI projects enhancing productivity or customer satisfaction at Oracle?
6. How is AI influencing your organization's employees like yourself?
7. Could you share your thoughts on the need for AI regulations or ethical guidelines in tech?

Participant 8

1. Can you give us your specific definition of AI?
2. What should be the role of federal and state governments in regulating AI?
3. Do private sector organizations need policies and codes of conduct for AI initiatives?
4. Does your organization have a stance on the need for AI regulation policies?
5. Should people working with AI be required to have credentials such as certifications or licenses?
6. Can you discuss any initial or ongoing ethical concerns regarding AI?
7. How do you balance AI-driven efficiency with protecting workers' rights and job security?

Participant 9

1. How do you define AI? How is AI being used by your membership or organization?
2. What concerns do you have about privacy and data security in the context of AI-powered customer service or transactions?
3. Have you noticed any changes in customer experiences due to AI integration?
4. How well-informed do you feel about how AI is used in businesses you interact with?
5. What do you expect from organizations in terms of transparency and accountability with AI utilization in customer interactions?
6. Is your organization involved in the standard setting of AI?

Participant 10

1. Could you describe your past and current involvement with AI?
2. Could you specifically explain the scope and purpose of your startup?
3. Can you explain what you mean by responsible AI?
4. What would you consider harmful AI?
5. What specific standards in AI are you currently working on?
6. How do you personally perceive AI technologies impacting the workforce in general?
7. What do you think are the ethical concerns regarding AI?
8. Would you say the ethics aspect is the main challenge to overcome for the future of AI?
9. Do you think AI will displace a lot of jobs or create new ones?
10. How do you think it will impact marginalized groups?
11. Do you think challenges change depending between countries?
12. Do you think people working with AI should be credentialed for the protection of the public?