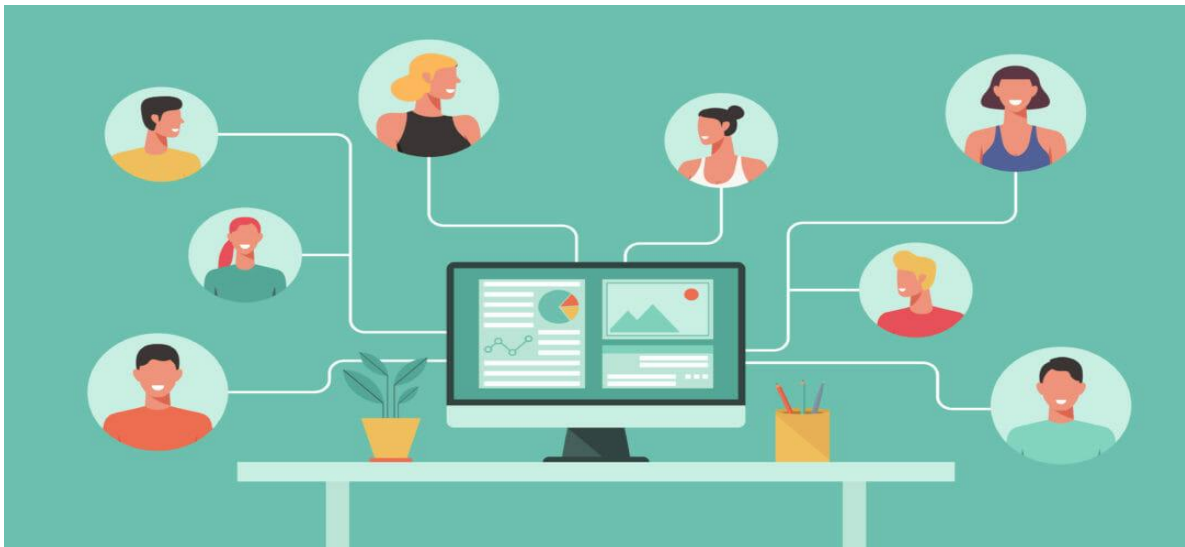


GROUP PROJECT PAPER






ARTIFICIAL INTELLIGENCE FOR REMOTE WORKFORCE MANAGEMENT



INNOVATION & ENTREPRENEURSHIP FOR DIGITAL ECONOMY PROGRAM

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ABSTRACT

The growth of digital hardware and software's tools available to the general public has allowed a significant transformation of artificial intelligence (AI) based systems via growth of augmented intelligence and time-space situation context across: Management, Finance, Health Care, Building and Construction, Agricultural Operations, Production, Agribusiness and business in general. Logistics and Supply Chain fostering autonomy and capacity building of firms, remote/ hybrid working on field-specific monitoring and controls through the engagement of advanced digitized algorithmic governance tools or systems. Artificial Intelligence in remote working via algorithmic management of independent contractors has had various challenges like communication, grid computing, surveillance, and worker scheduling. The project presents various empirical data and models to underscore the Artificial intelligence remote working application and trends in post covid and the fourth industrial revolution era. The study focused on a social-technical perspective geared towards "Algorithmic Management as a Tool for Augmented AI-Based Systems in Today's Business and How That Facilitates Remote Working" in the context of remote working in the digital gig economy. As a result, the group evaluated the overall potential for remote work for various jobs and industries and analyzed over than 2,000 activities in more than 800 occupations using MGI's workforce model, which is based on the Occupational Information Network (O*NET), to determine which occupations offer the most potential for remote employment. We also observed that a hybrid model that combines some remote work with work in an office is possible for occupations with high remote work potential. We learned, for the study that the shift towards remote work is affecting communication negatively, creating an in-person communication gap. It thus brings about the grabbing of many known conventional organizational operations, as well as other limitations to AI tools application. There are innumerable operational and communication opportunities that can be harnessed from the adoption and incorporation of algorithmic management as a tool of augmented AI-based systems economy in the context of today's Digital economy by bringing forth entrepreneurial innovations in Human Labour Resource Management.

Keywords: Remote working, AI, Algorithmic Management, Augmented Intelligence, independent contractors, Communication and Scheduling, Gig economy, Digital Economy

I. INTRODUCTION

Ever since the birth of GPS signals in the late 80s and its availability to the general public, the adoption of artificial intelligence (AI) based systems and/or digital transformation across Management, Health Care, Building and Construction, Agricultural Operations, Production, Agribusiness and business in general, Logistics and Supply Chain is feasible fostering remote working, automated/semi-automated vehicle guidance, on field-specific monitoring and controls. Smart Operations (SO) is a concept of introducing and applying innovation and information and communication technologies in operations and production (IFAMA, 2019), attaining sustainably intensified digital or AI-based systems at production levels can enhance product security and foster economic development. Affirmed by robotics successfully penetrating animal production space, allowing automatic/autonomous feeding, milking, and cleaning (Andreas Gabriell, Markus Gandorfer1, 2022).

It is vital to acknowledge the evolution of algorithmic management in digitized or AI-based economic revolutions. The first generation of reforms started in the 1980s gained accelerated momentum around the early 2000s, focusing mainly on autonomy and capacity building of firms, engaging advanced digitized algorithmic management monitoring tracking systems as a tool (measure) of employee productivity and performance levels, financial system liberalization, managing customer requests at the office level and/or remotely, autonomous/semi-autonomous customer service representatives work assignment and schedules (office level and/or remotely), managing operations and production process(es), managing customer data, assisting in healthcare and diagnostic decision-making, fostering pre-production and/or pre-harvest orders, granting full access on accurate market data and knowledge for managing preferences and consumption trends, while ensuring a timely planning, organizing, grading, packing, storage, processing, distribution and advertising, and warranting higher returns for producers.



Figure 1: The shifting organization roles in an AI-powered algorithms on jobs

When the environment is stable and the track record in algorithmic management tools and governance is sustainable, business in today's AI-based systems economy does well. Nevertheless, taking into account the present vulnerable, and uncertain economic environment, it will be considered majorly inconsiderate to hold such a high level of

expectation from algorithm management adopted by institutions as a monitoring and control tool to attain silk-stocking success(es) holding core regard to context for just the near present changes with the digital or AI-based economy. Hence, we want to discuss and write a paper “*Algorithmic Management as a Tool for Augmented AI-Based Systems in Today’s Business and How That Facilitate Remote Working*” in the context of today’s business.

Moreso, the evolution of artificial intelligence (AI) has rapidly developed from the novel stage of using algorithmic features to write human-like books and/or texts and has been classified as an emanating technology to become a mature and powerful tool such that it has seen a significant industrial impact globally within a decade. This rapid transformation of AI and its industrial adoption increasingly promote a remote or hybrid workforce, thereby ensuring a massive acceleration of daily data creation, consumption, and scrutiny.

Nevertheless, the shift towards remote work is affecting communication negatively, creating an in-person communication gap, and bringing about the grabbing of many known conventional organizational operations. Resulting from workers' heavy reliance on a growing availability of accessible, processed data, organized and networked across all functional organizational units. Even elements such as integrated corporate governance and social responsibility, generally considered as fundamentally not financially motivated or pre-financed, are gradually shifting from such ideologies to output and profit maximization, and performance evaluation instead of methodical unconscious assimilation of management strategies to ensure there is a ground for business continuity. These trends are the very underlying reason that has triggered companies to engage technologies such as AI to aid in unifying the workforce and to assist managers to perform their leadership roles more effectively and efficiently (Keshav Pingali, 2022).

II. LITERATURE REVIEWS

2.1 Definition of Algorithmic Management

Algorithms have been used for centuries to solve problems that can be standardized and encoded, from cooking recipes to bureaucratic procedures. Algorithmic management refers to algorithms that are digitally encoded and implemented by computers to process data. Because of the digital revolution, computers have significantly increased their capacity to process numeric data, making it possible to solve an increasing range of real-world problems using computer algorithms. It has been widely used in the “gig economy” and digital labor platforms, but it is also growing in conventional employment settings such as logistics, retail, manufacturing, marketing, consulting, banking, hotels, call centers, and journalism. Management is one of the problems that can potentially be solved using algorithms, leading to the emergence of the concept of algorithmic management.

Algorithmic management refers to the use of software algorithms in controlling an organization, and it has become increasingly advantageous due to technological advancements that allow for extensive data collection and processing. Algorithmic management is also defined as a range of technological tools and techniques used to organize work conditions and manage remote workforces. These systems differ from traditional management structures by relying less on human supervisors to direct workers. Algorithmic management enables scaling operations by coordinating the activities of large, disaggregated workforces or optimizing for desired outcomes, such as lower labor costs, through data analysis. Algorithmic management usually involves collecting worker data through technology, making real-time decisions based on that data, automating decision-making, transferring performance evaluations to rating systems or other metrics, and using reward or punishment to elicit cooperation and enforce workers' compliance.

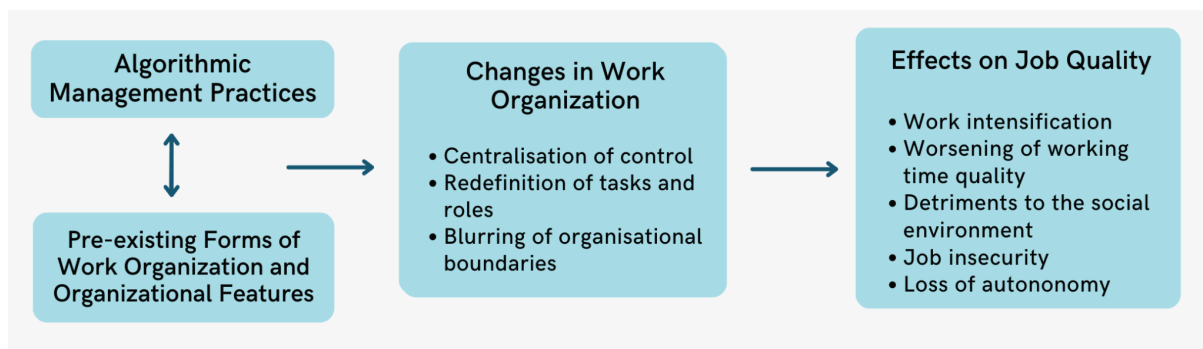


Figure 2: Algorithmic Management and Organization Jobs

In today's AI-based systems economy, algorithmic management as a tool used in business operating contexts is driven by the attentiveness of shareholders and other actors being marshaled majorly on maximizing the financial sustainability of investment scope, social acceptance, governmental and/or institutional manipulative interest, and data and information investment risk management and opportunities. Sobering evidence of this is the witness shown in the Indian banking system, as indicated by Dr. Ishrat Husain (February, 2023) in his article "Framing Policies for a Digital Economy" that, "banks are now more profitable and their contribution as corporate taxes was Rs 200 billion in 2022 ... and causing technology adoption to experience a steep rise in the operations". This indicates that there has been an upward shift in performance indicators, causing the rate of underperforming loans to shrink to single digits. The impact of engaging algorithmic management in the digital economy of the banking sector has shown that there is an upward shift to meet the demand for non-performing loans. The adoption of AI-based systems combined with algorithm management tools in our environmental weather forecast promotes the visibility of warning signals for crises yet to arise. S&P Global in 2020 projected that "at least 40% of the largest companies globally have branches with extreme calamities sprouting from impacts of natural disasters, including wildfires, water stress, heat waves, and hurricanes, just to mention a few, and it is 60% for companies in the USA alone.

To illustrate, the platform Uber manages millions of remote drivers with an app and collects vast amounts of data, such as drivers’ behavior, ratings, and the current traffic situation. This data is then used to “improve learning algorithms that carry out learning and control functions traditionally performed by managers," such as assigning drivers to more jobs or banning them from the platform (Möhlmann et al., 2021, p. 2001). This approach is known as "algorithmic management," which largely automates organizational decision-making in areas such as staffing, performance appraisal, compensation, and workforce planning by relying on machine-readable data and software algorithms. Through a technique called algorithmic management, these approaches can be understood as systems of control that rely on machine-readable data and software algorithms that essentially automate organizational decision-making in areas (Duggan et al., 2020; Leicht-Deobald et al., 2019, Möhlmann et al., 2023). The model below expounds on the algorithmic management design within the digital economy:

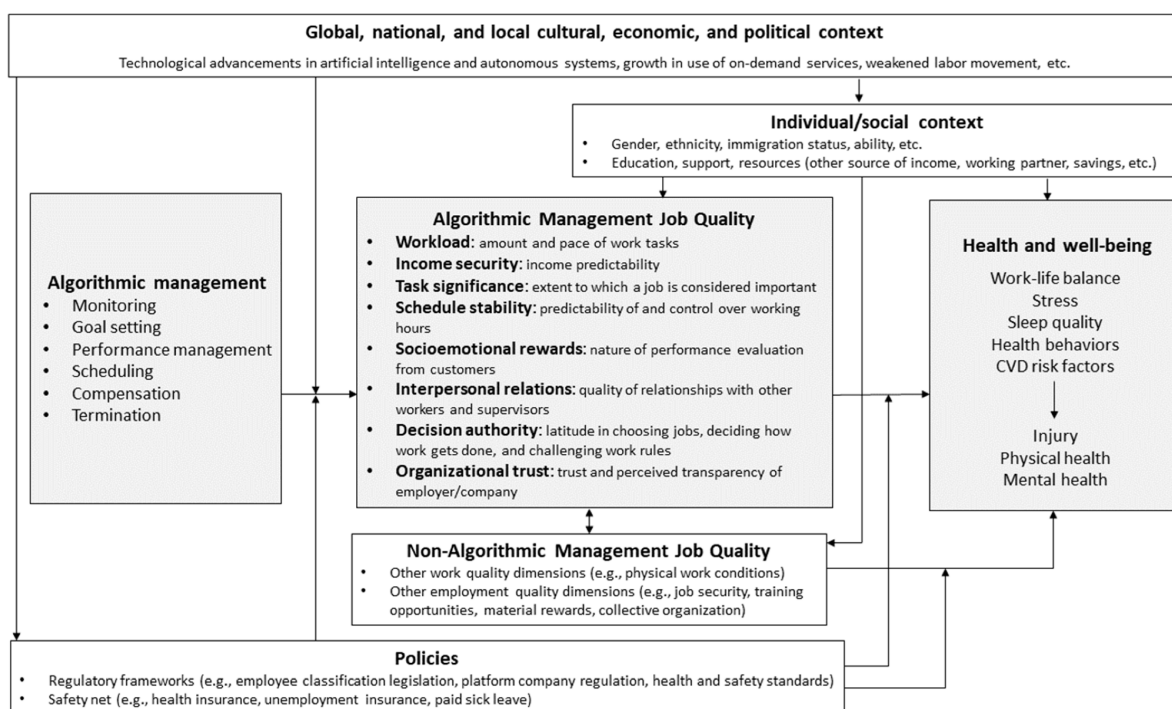


Figure 3: The Algorithmic Management Design Model In Global Economy Effect on Remote Workers

2.2 Definition of Artificial Intelligence

Artificial intelligence (AI) has been around since the late 1940s, when computer pioneers, such as Alan Turing and John von Neumann, began exploring how machines could think. In 1956, a significant milestone in AI was achieved when researchers demonstrated that a machine could solve any problem if it had an unlimited amount of memory, resulting in the innovation of the General Problem Solver (GPS) program.

AI refers to the ability of machines to replicate or enhance human intellect, including reasoning and learning from experience. While AI has been used in computer programs for years, it is now being applied to various products and services. For instance, some digital cameras use AI software to identify objects in an image. There are two main subfields within AI: Machine Learning (ML) and Neural Networks (NN), both with their own methods and algorithms to help solve problems.

Nowadays, AI has evolved, impacting the lives of people in modern society. Artificial intelligence, or AIAI, has assisted in many areas of life, for example, speech recognition, medical diagnosis, autonomous vehicles, and voice-activated assistance getting directions while driving, along with music or movie recommendations (Lomas, 2016). In the area of Twitter, there are customized tweet recommendations that are available along with content that helps to fight racist or inappropriate content. There is also AI for enhancing users' experiences, as Twitter has been supported by this so that they can improve their content (Theodotou and Stassopoulou, 2015).

Experts predict that AI will have many more innovative applications in the future. "Artificial intelligence is shaping the future of humanity across nearly every industry." It is already the main driver of emerging technologies like big data, robotics, and the IoT" (Mike Thomas, 2023). Based on the IBM Global AI Adoption Index 2022, approximately 44% of businesses are seeking to make significant investments in AI and incorporate it into their operations. Additionally, out of the 9,130 patents that were granted to IBM inventors in 2021, approximately 2,300 were related to AI. Furthermore, AI applications are wide, including fully self-driving cars produced by Tesla, forecasting and hedge-fund investment decisions in finance, and diagnosing diseases by analyzing health records and medical images in healthcare systems. Besides, AI can also be applied in the retail industry, such as to manage stock management, product design, and customer service chatbots to improve productivity, efficiency, and accuracy.



2.3 Relationship between Artificial Intelligence and Algorithms

Algorithms play an important role in artificial intelligence because they allow AI to learn and enhance its performance. Additionally, an AI can be programmed to carry out specific tasks without comprehending them by generating more advanced algorithms that enhance decision-making procedures, automate particular duties, and optimize an organization's workflows. In the context of algorithmic management, AI can develop algorithms that analyze data from various sources, including employee performance data, customer feedback, and market trends, to generate recommendations or make decisions, for example, AI-powered algorithms can be used to optimize scheduling and task assignments, identify areas for employee training and development, and improve customer service through personalized recommendations.

However, the use of AI in algorithmic management also raises concerns about the potential for bias and discrimination. For instance: if AI algorithms are trained on biased or incomplete data, they may inadvertently perpetuate existing biases or discrimination in decision-making processes. Therefore, it is important for organizations to ensure that AI algorithms used for algorithmic management are designed and implemented in an ethical and transparent manner, with appropriate oversight and accountability mechanisms in place.

The model below reflects the relationship between algorithmic management and AI applications in the workplace.

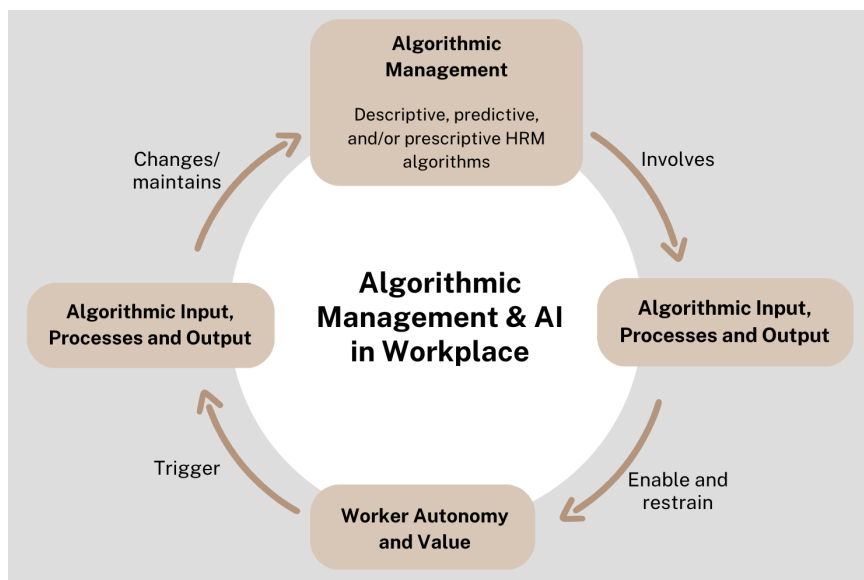


Figure 4: Flow Diagram of Algorithmic Management and AI in the Workplace

The relationship depicts the cycle process where the socio-technical triggers influenced by workers' behaviors influence the designing and dynamic changes, which when supported by AI algorithms, lead to more advanced algorithmic management systems. The

cycle is the true depiction of the much-needed solution to the ever-changing dynamic technological ecosystem.

2.4 Algorithmic Management at Workplace

Algorithmic management can have significant positive consequences for work organization and working conditions. Algorithmic management refers to the use of algorithms to manage and optimize work processes, schedules, and tasks. On the one hand, algorithmic management can improve efficiency and productivity by streamlining processes and reducing errors. This can result in increased job satisfaction for employees who may have more time for high-value tasks, and improved decision-making based on data analysis. “I don’t have someone supervising, telling you: you have not done this, you have not done that” (Wood et al 2019: 9). This statement highlights that the use of traditional managers will never go absolute, the demand for them will always be relatively necessary. Algorithmic management can also lead to negative consequences such as dehumanization, deskilling, and job loss. Employees may have less autonomy and control over their work, with their performance being constantly monitored and evaluated by algorithms. This can lead to feelings of job insecurity and disempowerment (Sara, 2022). Moreover, algorithms may not always reflect the complexities of human work and interactions, leading to biases and inaccuracies. This can result in unfair treatment of employees and a lack of diversity in decision-making (Annarosa, 2022).

Overall, the use of algorithmic management should be carefully considered and implemented in a way that balances the benefits of efficiency with the need to maintain positive working conditions for employees. It is important for companies to ensure that their Algorithms are transparent, accountable, and do not lead to unintended negative consequences for employees. Viewing algorithmic management as a tool within augmented AI-based systems can be beneficial for remote working in several ways: (1) Algorithmic management can optimize remote working by automating and streamlining work processes. Algorithms can be used to manage and prioritize tasks, monitor work progress, and provide feedback to remote employees. This can result in increased productivity and efficiency for remote teams. (2) Augmented AI-based systems can help remote workers access information and resources more easily. With the help of AI-powered assistants, remote workers can get real-time information and support to complete their tasks. This can help reduce the need for extensive communication and increase autonomy for remote employees.

Augmented AI-based systems can facilitate remote collaboration and communication by providing digital tools for online meetings, file sharing, and teleconferencing. AI-based chatbots and virtual assistants can further improve remote communication by providing instant messaging and voice support. It is important to note that algorithmic management and augmented AI-based systems should be used responsibly and with consideration for potential negative consequences. For example, algorithms should not be used to solely evaluate remote workers' performance but instead be used to support and empower remote employees by providing them with resources and feedback to improve their work. It is also important to

ensure that AI-based tools maintain a high level of accuracy and transparency, to avoid any potential biases or discrimination in remote working. To create humanized technology that is rooted in a variety of socioeconomic contexts, cultures, traditions, and other viewpoints, humans and machines must collaborate. Understanding algorithms and artificial intelligence can help you create better solutions and be successful in the unstable and complex world of today.

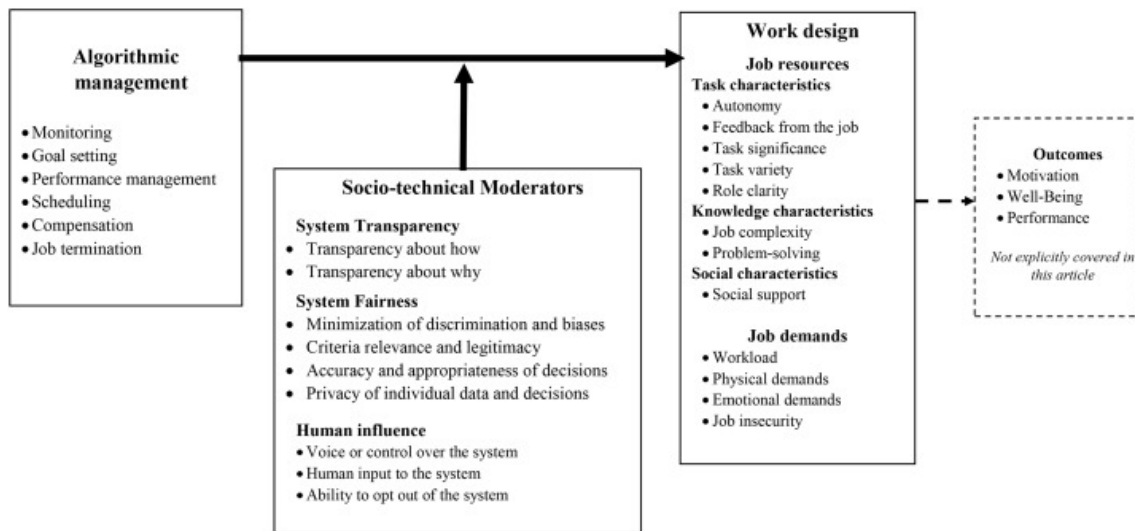


Figure 5: Algorithmic Management Effect on Work and the Socio-technical Factors Influencing the Work Design Transformation

2.5 Example of Taxi Business Using Algorithmic Management

Ridehail companies like Uber and Lyft are some of the most successful examples of algorithmic management. They act as automated dispatchers to coordinate pick-up locations and communicate arrival times to passengers, while also using apps to set rates and take commissions whenever services are provided. This new "gig" economy has seen dramatic growth in the past ten years, largely because algorithms have enabled these companies to classify ride-hail drivers as independent contractors while still exerting considerable control over them. This is achieved through "continuous, soft surveillance," which uses data collection to monitor drivers' movements, acceleration, working hours, and braking habits. As an example, Uber launched a policy in 2018 that tracks driver hours and suspends access after 12 hours; Lyft has since followed suit. Furthermore, ride-hail platforms employ a range of techniques such as surge pricing or notifications sent to drivers' phones in order to influence their behavior. Lastly, these companies often create information asymmetries by withholding valuable details from their drivers - such as how much they will earn from a given trip - and may use penalties like "time outs" or deactivation if drivers do not comply with their policies. The use of algorithmic management is not limited to ride hails; Amazon Flex for example

uses it for delivery and logistics purposes. To gain better insight into how workers interact with algorithmic management, interviews were conducted with Uber drivers in different cities, followed by grounded content analysis based on Klein & Myers' [1999] concept of multiple interpretations.

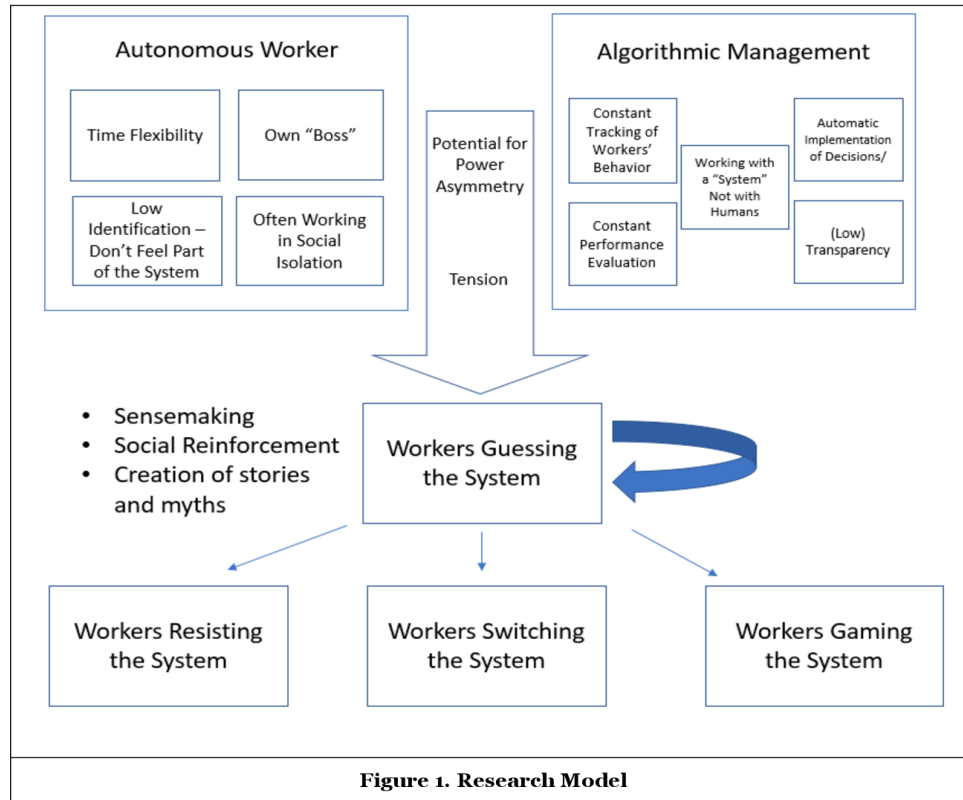


Figure 6: The Taxi Driver Interaction with the Platform Algorithmic Management in Their Taxi Business (Independent Contractors)

2.6 Augmented Intelligence System Using Algorithmic Management Tools

An intelligent system employing augmented intelligence is a system that is propelled by feedback, self-learning, and self-assurance (Pratsri et al., 2021), which shows the collaboration between the machine systems and the human actors. The advent of superior systems involving augmenting human and artificial intelligence has sparked an increased interest in AI. The term "augmented intelligence" alludes to a design-driven collaboration between computers and humans that strives to enhance intelligence. In the pursuit of transforming human labor, companies, and society, intelligence augmentation (IA) can integrate the collective intelligence of computers and human beings (Jain et al., 2021). These phenomena underscore the human desire to have a more symbiotic relationship between computerized machines and human activities and lifestyles.

Automation, robots, and artificial intelligence are "provoking" to replace human work as a consequence of technological advances and digitalization in more specialized and

advanced tasks (Nagibina & Bestuzhev, 2021). The phenomenon is still limited to low-level, human-centered jobs, such as construction work, braiding hair, and child caregiving, among others. To manage and regulate labor, algorithms are purposefully designed and applied in the industrial work process. They are entrenched in the usage of data extraction, tracking, and on-by-data extraction tools, which in turn promote managerial surveillance and facilitate labor optimization per the business's needs (Moore & Woodcock, 2021). These reflect the limitations of collaborative worker-driven intelligence in most platform-based systems, as shown in case studies of taxi-hailing companies. In remote working, the workers, who are denoted as independent contractors, have no obligatory statutory requirements to abide by organizational standards beyond the tasks, which conflict with the business mandate and aspiration in most cases. The design of the relations between the workers and the algorithmic system that manages their work, prompts the discussion of reviewing more human input in the systems to better maximize business performance. We thus need a design that incorporates augmented intelligence into algorithmic management for optimal remote work performance.



Figure 7: The Model Shows the Augmented Intelligence Collaboration with Workers in the Drive Towards More Advanced AI

III. ALGORITHMIC MANAGEMENT CHALLENGES

1. Communication Challenges

AI is becoming more prevalent to assist remote workers in communicating effectively with clients and their office-based coworkers (Arnold, 2021). The relationship has yielded substantial benefits, though AI and remote work have inherent challenges in optimizing the organization's performance. Evidence shows that algorithmic management frequently jeopardizes employee well-being (Lee et al., 2021). The cases studied on the use of algorithms that lack augmented intelligence capability, like in the Uber, Lyft, and China Food Delivery systems, all reflect the challenges of the absence of horizontal communication between workers and the lack of feedback mechanisms from the workers, yet this is provided for the customers in platform systems, resulting in independent contractors seeking social

media platforms to organize and communicate their issues. Research done on post-Brexit workers by (Collins & Atkinson, 2023), calls for the establishment of trade unions and legal frameworks to facilitate the voice of the workers within the algorithmic management gig economy. On-demand labor is engaged in Germany in the case of Lieferando systems; algorithmic management encouraged labor protests because there was a communication gap between the company and the employee (Arnold, 2021). It underscores the vertical communication inbuilt in most platforms that limited workers' engagement, thus resulting in more economic sabotage via workers' strikes in the modern digital economy. This begs the question of whether the system design communication models in existing AI-powered platforms are either by design or by omissions and neglect.

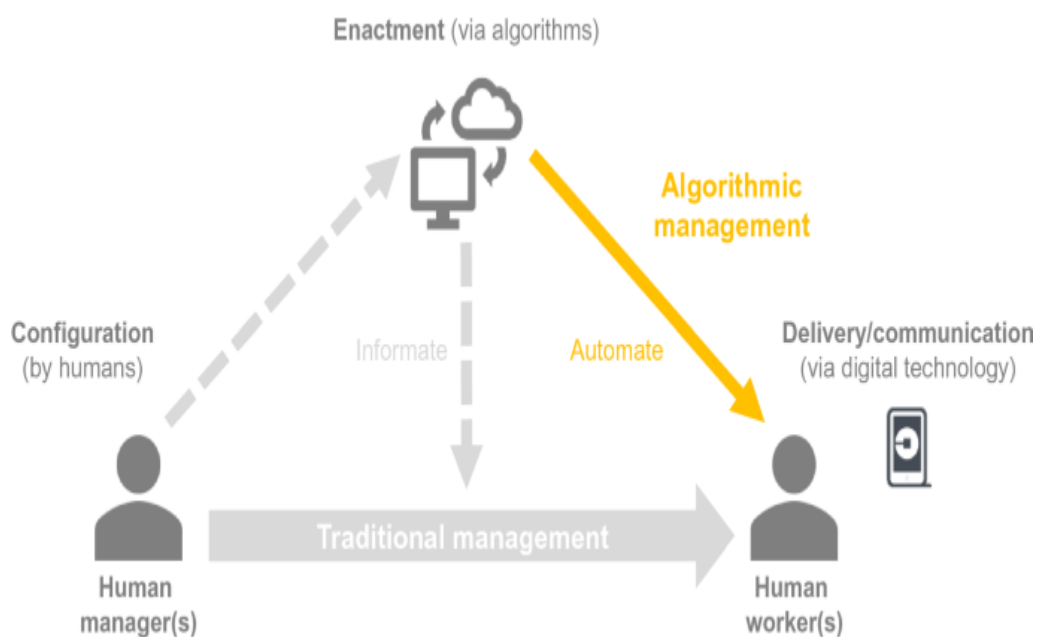


Figure 8: Workers Communication Challenges in an Automated Algorithmic Management Workplace by Elimination or Limitation of Feedback and Peer Communication

In a study done after COVID in more than 350 HR firms, the authors identified communication as a key component ahead of remote working technologies, which shows the greatest challenge within the algorithmic management systems for remote working.

2. Workers Schedule

Workers' inability to incorporate their schedule, passion, desires, aspirations, and personal life variables into the system: the algorithm does not give room to dynamics considerations of personal life. Yet for greater work maximization, worker welfare is of greater concern for the function of the business. This might be the genesis of worker bias. For example, workers do not have the ability to input family schedules, childcare timetables, or

sickness schedules, when they are supposed to take medication. The lack of humanist algorithms that have the balance of a holistic worker's performance. The correct allocation of resources, including time, job disposition, employee capabilities, a day off, and activity expense, makes staff scheduling a challenging problem (Sari & Widianti, 2020). When the AI-enabled algorithms under the algorithmic management application are used, they fail to resolve the dynamic human workers' organization challenges due to their chaos and complexity. Are workers organisms that can best self-organize? and if so, what is the role of AI in determining and ordering the worker's behavior in the digital economy, given the complexity of the worker's attributes.

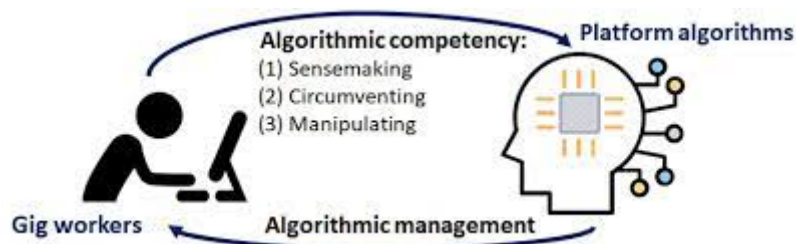


Figure 9: Remote Worker Interaction with Algorithmic Management in Platform Systems

The model is a reflection of remote workers' mannerisms of devising ways to deal with platform algorithms to fit in their schedules by manipulating the system; circumventing the laid out protocols; and trying to make sense of the algorithm's commands. The platform algorithms have the gig workers stuck in the system schedule and timeline, leading to workers seeking device ways to overcome the system's prompt control and coordination.

3. Grid Computing

Grid computing is where AI-based AM and the use of machine learning capability are used, can be improved by having systems interconnected to other systems like social media, the cloud, other ERPs, and business systems like IOTs, CCTVs, among others. The digital economy presents a situation where a combination of networked resources with more computational power is dispersed worldwide. Grid computing involves increased computing and memory capacity due to the expansive computing resources available in the world today. The intra-grid scope of the approaches and algorithms applied in a grid network deals with factors like job scheduling, resource balancing, and network security responsible for controlling computational resources (Sungkar & Kogoya, 2020). We cannot then propagate a more AI-based remote work management system without thinking about the interconnectivity of the workers inside and outside the platform system. In the Uber case study, the worker used social media to air their system frustration. The remote workforce's interconnectivity with other systems, platforms, and online resources is paramount to advancing AI management for remote working.

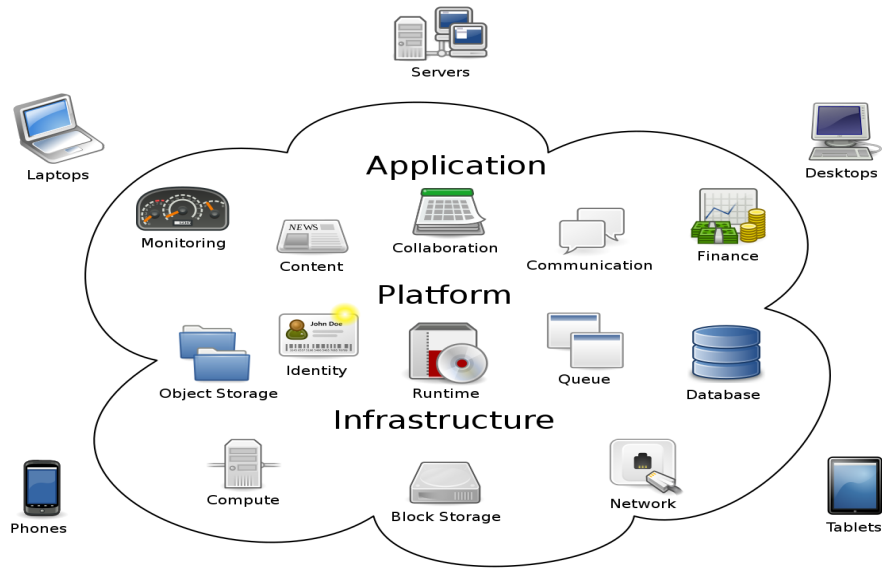


Figure 10: The interconnection of the worker information ecosystem within a grid and the challenges of grid computing

4. Surveillance Challenges

The advancement of AI systems and their integration with IoT have resulted in increased worker surveillance. The smartphone cookies from websites and platforms have increased the extent to which workers' data is gathered, monitored, analyzed, and used in instances of recommendation systems and platform systems. Companies have experimented with algorithmic management systems that survey, reward, educate, and discipline human workers, typically through their smartphones, in order to harness digital data and maximize productivity (Schildt, 2020). The process, in most cases, infringes on workers' privacy without their consent or signed Non-disclosure-agreements (NDAs). Research on Deep Learning Models for Employee Surveillance System Analysis was based on the requirement for a method to track employee performance (Gopal et al., 2022). The tracking goal is to optimize the business performance whatsoever the cost on human resources in most instances. The phenomenon of "Uberization" neglects the workers and supports the platform business. The infusion of AI and IoT wearables like smart watches has only made workers more insecure in planning their schedules. Remote working though having adjustable scheduling, the level of surveillance might gather data that is not prescribed. In most scenarios, employees use personal internet networks that are connected to other personal applications and gadgets, e.g. SIRI, TVs, Home cams, etc, which might result in more unethical surveillance on employees. Thus, we must rethink AI in algorithmic management surveillance to better design and support system workers' relationships.

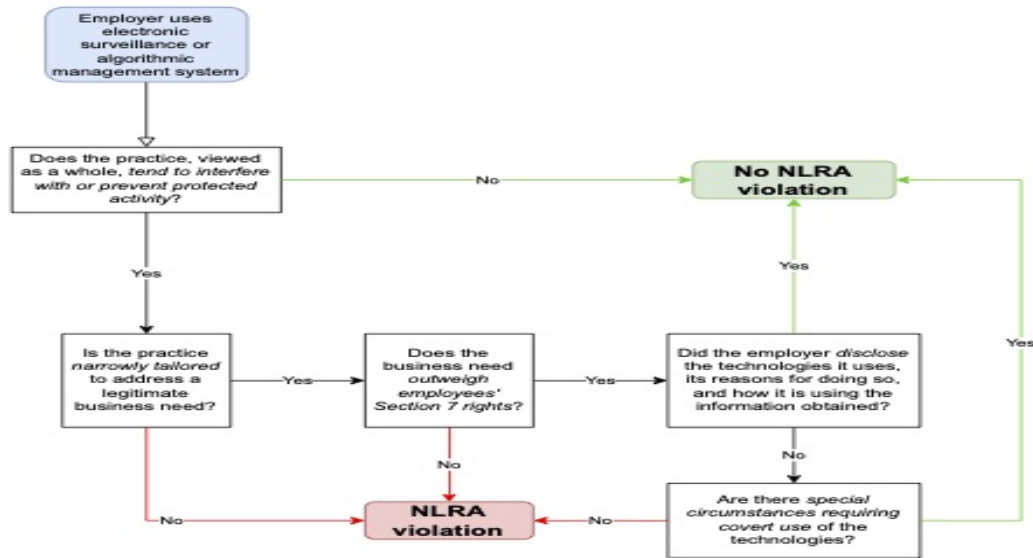


Figure 11: The Surveillance of the Workers by the AI systems and Ethical Concerns

The model is a true depiction of the surveillance challenges faced by the employees in an organization. Which is viewed as centered on creating an authoritarian system of worker control instead of a free self-expression environment.

IV. ALGORITHMIC MANAGEMENT OPPORTUNITIES

It must be acknowledged that augmented AI-based systems with algorithmic management as a tool in today's digital economy mostly focus on output and profit maximization. Nevertheless, there are infinite advantages that can be realized through an augmented AI-based system economy with algorithm management as a tool in today's business. This chapter focuses on these important variables in the direction of how to leverage these emerging technologies to sustainably facilitate a remote or hybrid workforce, taking into account business context framing in today's digital economy. Here are some ways in which using algorithm management as a tool in augmented AI-based systems economy can help facilitate a remote workforce.

1. Improving Workflow and Collaboration

In a recent survey, of 1,000 employees, almost 50 percent struggled with locating documents that were crucial to effectively performing their duties. Also, the Internet Data Center (IDC), a global market intelligence and advisory firm providing useful insights into technology and e-business trends, discovered a five-hour per week looking for documents relevant to the performance of their duties. Arguably, the case has unfortunately seen a significant negative rise as a result of the upward acceleration in the remote and hybrid

workforce, whilst there is also a cry out by remote workers calling for enhanced collaboration and connectivity with their colleagues.

Fortunately, by adopting augmented AI-based systems with algorithm management tools, workflows can be analyzed efficiently and revolutionized with collaborative tools that shall lay out more streamlined procedures such as:

- **Engaging Enterprise-grade Digital Assistant**

This has a conversational AI feature which promotes a zero-touch experience for meetings allowing transmitted teamwork and/or cooperation among workers with framework or structural cognitive than in-person meetings, like making influential material apparent online without having to do any search.

- **Employing Embedded cross-product AI functionality**

This is where augmented AI is able to minute meetings and circulate enabled voice-searchable reports or statements to those who could not attend a meeting.

2. Improving Personnel Training

Results-driven leaders and remote or hybrid workers acknowledge how vital it is to acquire sustainable professional skills and training in order to succeed in today's AI-based systems economy where the job market is extremely competitive. As such, effectively funneling data training is one of the most reliable ways to supervise the remote workforce. There, engaging augmented AI-based systems with algorithm management as a tool can provide extraordinary help in this specific area especially where leadership takes into account to efficiently exploit the power of machine learning. Some organizations have already begun integrating the power of AI into skills training and various personnel development initiatives, which is gradually removing cost expenditure for organizing conventional workshop training, by employing no-code software platforms as a framework to structurally mentor new employees on how to use digitized or AI-based systems. The adoption and incorporation of AI-based systems in personnel skills training have boosted remote and hybrid work output superlatively and more independently.

3. Supporting Business Growth

AI-based systems promote unifying the workforce process toward an established goal. The provision of quality service must do better at orchestrating processes and activities across functions and applications to sustain customer satisfaction through delivering quality business. Quintessentially, employing augmented AI-based systems with algorithm management as a tool can serve as a pivotal element that integrates multiple organizational entities into a unified process that operates seamlessly to bring about a more resilient

operational network, while ensuring quality and timely service delivery to support business growth and improved customer insights. Hence, attain organizational efficiency.

4. Providing Customer Security

Augmented AI-based systems with algorithm management can serve as an insightful financial data forecast and analysis tool within the financial sector, which can further be used to protect customers' assets or interest while registering enhanced customer service. Furthermore, Augmented AI-based systems with algorithm management as a monitoring tool foster a check system that verifies and/or authenticates transactions, and can efficiently flag out fraud in real time. This will safeguard customers' assets and thereby perk up customer satisfaction levels, whilst the transaction data provides organizations with an accurate and better appreciation and management of customer behaviors.

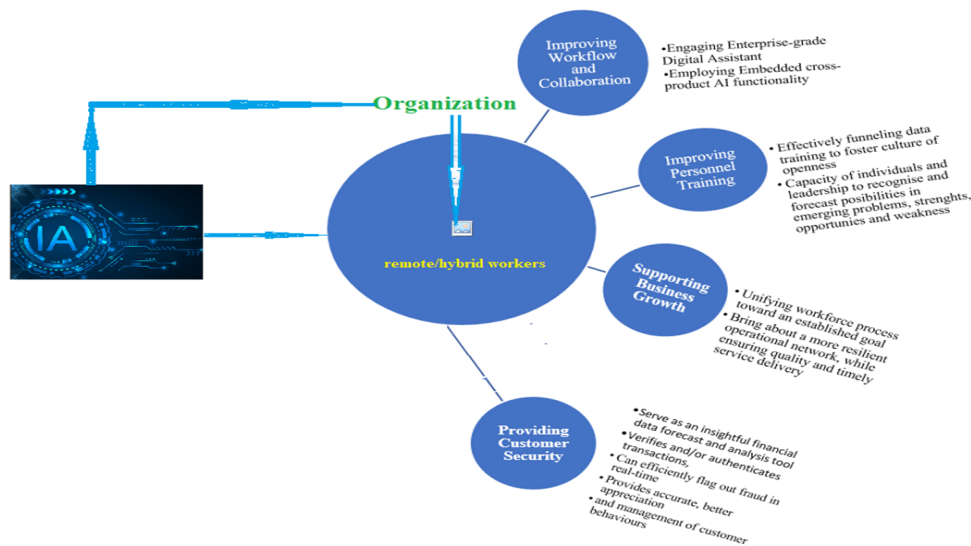


Figure 12 : Using Algorithm Management in AI systems-based Economy in the Context of Facilitating Remote and/or Hybrid Workforce

V. EMPIRICAL ANALYSIS AND DISCUSSION

The models in these sections will better be expounded with the aid of empirical data and case study of AI management for remote working utilizing algorithmic management in organizing, coordinating, controlling and managing remote workforce. 27% of customers worldwide believe AI can provide superior customer care to human workers. By 2025, AI will be used in 95% of customer support interactions. In order to better serve our clients and grow our business, we are investing more in technology. The important question would then be how more AI technology affects workers and whether other external factors would have an

impact on consumer behavior prior to 2025 or 2030 to encourage them to look for other ways to maintain order in society and the economy.

5.1 Post Covid Economy



Figure 13: The Post Covid 19 Analysis of the Remote Working

Source: <https://www.weforum.org/agenda/2020/08/flexible-remote-working-post-covid19-company-predictions/>

The PWC discovered that 69% of respondents anticipate having nearly two-thirds of their staff work remotely once a week in the future among the US tech companies. These are the same sentiments shared among many other developed and developing nations, mostly among the Generation Z worker force clusters. We have experienced a radical shift to workers seeking more fulfilling all-around jobs that accommodate their personal lifestyles to their work schedules.

5.2 Trends in Remote Work Growth of September 2022

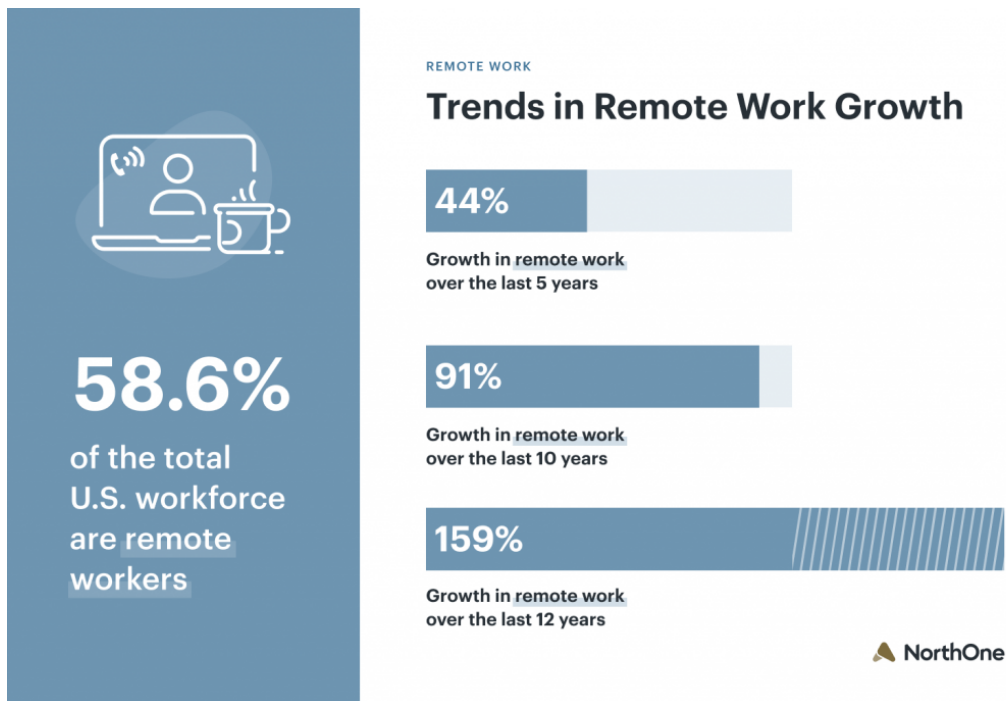


Figure 14: *The Ultimates Remote Working Statistics as of September 2022*
Source: <https://codesubmit.io/blog/remote-work-statistics/>

In recent years, remote work has become increasingly popular on a global scale, in part because of the COVID-19 epidemic but also for a variety of other reasons. 16% of businesses globally operate entirely remotely; 62% of American workers aged 22 to 65 claim to occasionally work from home; 75% of workers worldwide think that working remotely is the new norm. Over the last ten years, remote work has increased by 91%. Since 2005, there has been a 44% growth in remote work. Prior to the epidemic, 52% of employees worked at least once a week from home. 74% of professionals anticipate that remote work will soon become the new standard, and 97% of employees wish to do at least some of their jobs from home in the future. While the feasible benefits globally are: 25% of all professional positions in North America will be remote by the end of 2022. If their employers approved, an estimated 56% of W2 employees could work remotely. Nearly 86% of hiring managers agree that dynamic teams of remote employees are the future; as a result, firms that wish to keep luring the finest people must make adjustments. The world is thus changing in certain profound ways to better cope with the technological trends.

5.3 Remote Work Benefits

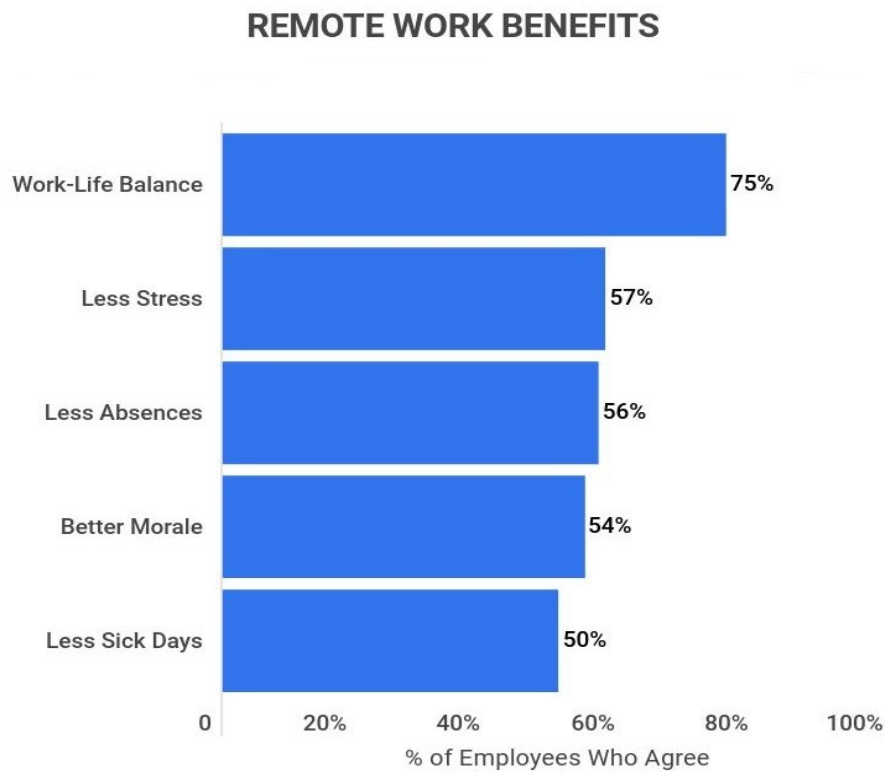


Figure 15: Remote Working Perceived Benefits

Source: <https://www.zipppia.com/advice/remote-work-statistics/>

The employees are choosing to work remotely based on the following perceived benefits: 94% of workers claim that they are as productive as they were before they started working remotely. The majority of managers concur that 32.2% of productivity has grown since the remote work shift in 2020. 62% of workers believe that working remotely improves their involvement at work. When employees have access to remote work options, turnover is reduced by 50%. 21% of workers are open to flexible work arrangements in exchange for lost vacation time; working remotely. According to 75% of employees, this results in better work-life balance, including lower stress levels (57%), fewer absences (56%), higher morale (54%), and fewer sick days (50%). These justify the trend towards more liberalized working conditions of workers in the digital economy where personal preferences are taking precedence in decision-making influence when workers are choosing the work ecosystem to engage in.

5.4 Workers Perception on Algorithmic Management

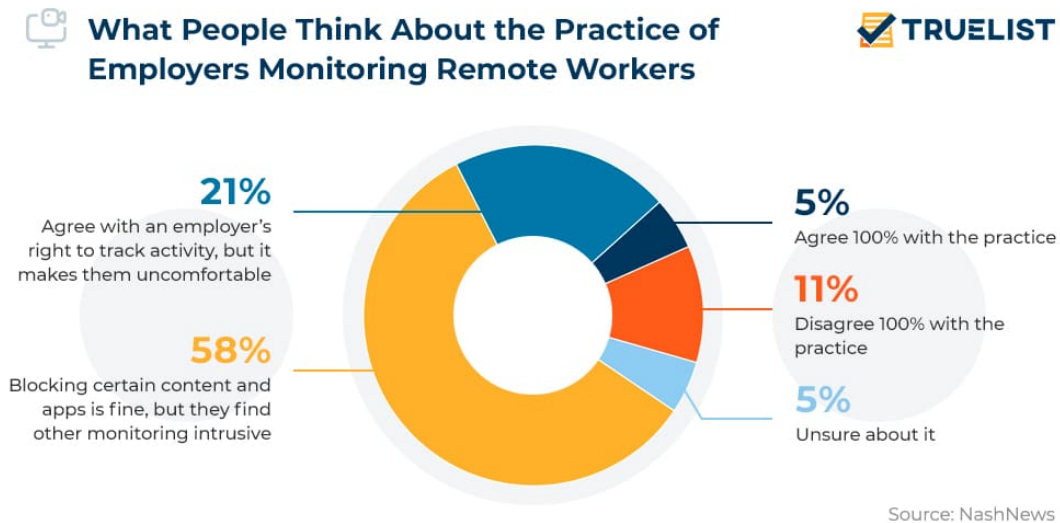


Figure 16: Worker's Perceptions on the Algorithmic Management

Source: <https://truelist.co/blog/remote-work-statistics/>

According to statistics on remote offices, 90% of Canadian "new remote workers" reported being at least as productive at home as they were at their place of employment. 70% of Australian employees who worked from home during the epidemic would like to continue doing so. Statistics on remote workers suggest that just 5% of respondents strongly agree with the practice of companies monitoring employees while the majority do not. Most workers working remotely find the aspect of system monitoring their schedules intrusive to their personal spaces. To lessen the drawbacks, such as the blending of personal and professional lives, a more flexible schedule or a combination of office and remote hours could be used. We would try to conceptualize and design systems that give workers certain leverage to control systems' access to their private spaces and lives.

5.5 Digital Transformation Industry Overview



Figure 17: Digital Transformation Industry Overview

Source: 85+ Digital Transformation Stats from reputable sources

By 2025, platform-driven interactions are anticipated to allow around two-thirds of the \$100 trillion in potential value from digitization. By 2025, at least 90% of brand-new workplace apps will incorporate AI technology into their operations and outputs. 89% of all businesses either use or intend to use a digital-first company approach. 70% of businesses either have or are developing a digital transformation strategy. Only 44% of businesses are ready for possible digital disruption, despite 87% of businesses believing that digital will disrupt their industry. Only 23% of businesses are independent of digital operations or products; The majority of transformation initiatives still center on updating customer touchpoints (54%), as well as supporting infrastructure (45%). The Digital economy will thus continue to expand at the technological systems development but slow in the adoption of the

same, resulting in white elephants of systems that are underutilized or shelved have consumed a substantial amount of resources to develop.

5.6 AI Global Statics

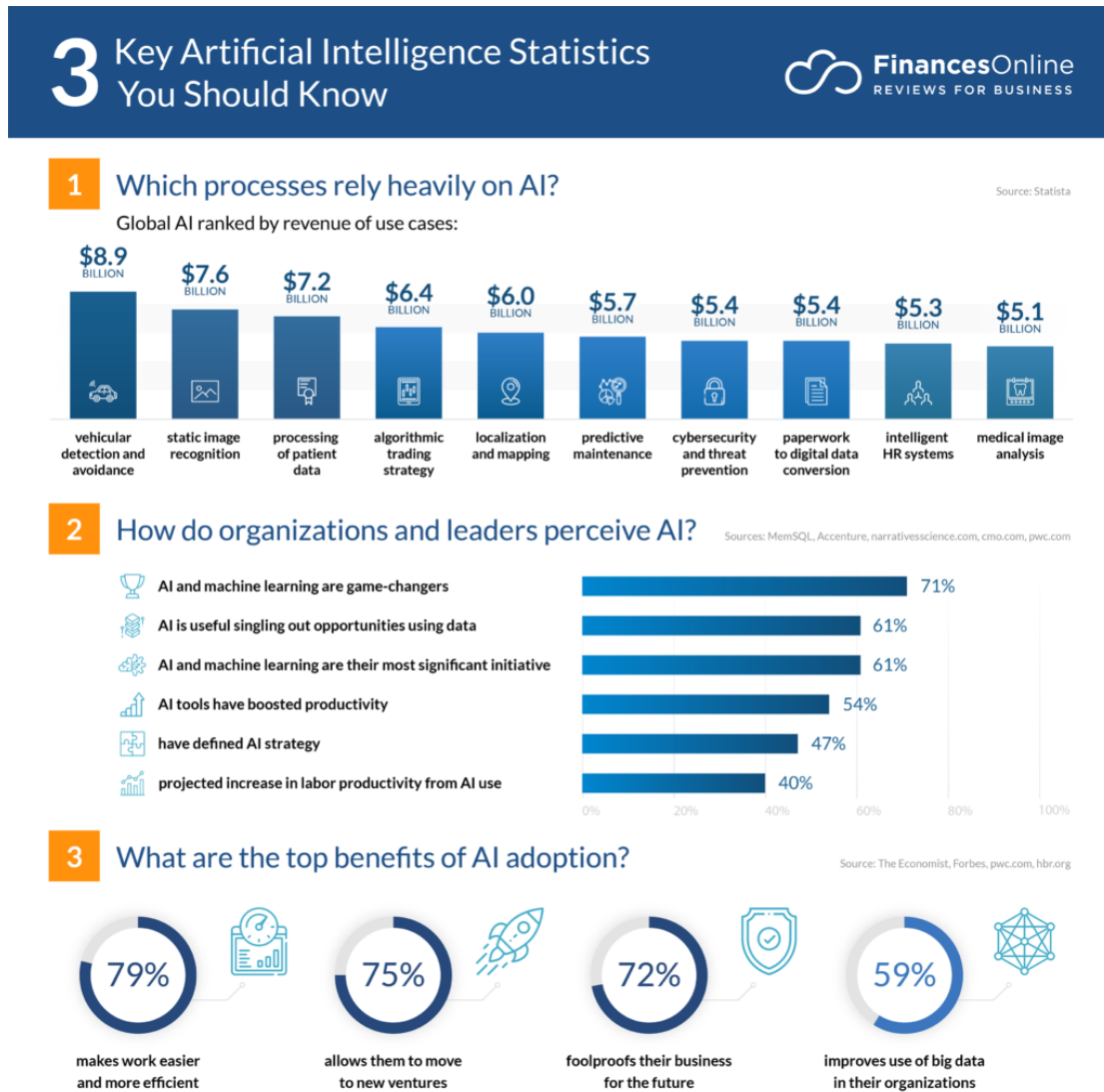


Figure 18: AI Global Statics

Source: <https://financesonline.com/artificial-intelligence-statistics/>

By 2030, AI is expected to contribute \$15.7 trillion to the global economy. For the same time span, this reflects a 26% growth in the global GDP. The predicted compound annual growth rate for the AI market is 33.2% from 2020 to 2027. Revenue from the global AI-driven hardware industry is anticipated to reach \$234.6 billion in 2025. Since 80% of business executives expect their companies to use AI technology between 2020 and 2027, the retail sector is predicted to grow significantly. The use of AI technology for environmental applications could contribute to a higher rate of net employment growth worldwide, primarily

in distant jobs. 54% of business leaders concur that AI significantly enhances the effectiveness of decision-making processes supported by algorithmic management solutions. 27% of customers worldwide believe AI can provide superior customer care to human workers. By 2025, AI will be used in 95% of customer support interactions. In order to better serve our clients and grow our business, we are investing more in technology. The important question would then be how more AI technology affects workers and whether other external factors would impact on consumer behavior prior to 2025 or 2030 to encourage them to look for other ways to maintain order in society and the economy. Based on complexity theory, where human interactions are dynamic and not static or linear, where then will the future of consumers be as far as AI at work is concerned? The discussion helps the systems designers better understand human behavior and provide room of change and adoption to future changes.

5.7 Cybersecurity Concerns in Remote Working

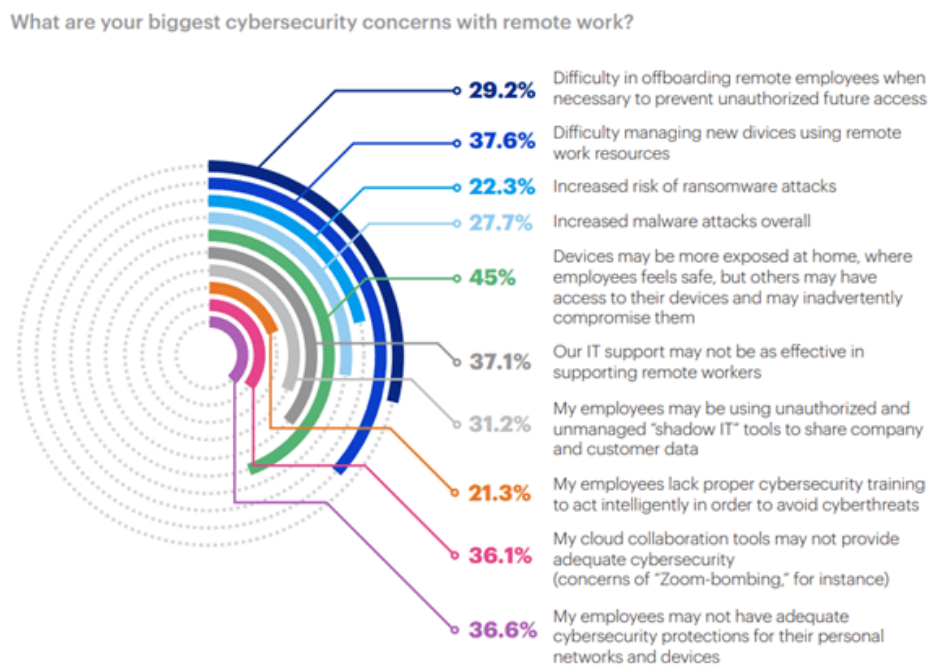


Figure 19: Cyber Security in Relations to Workers Surveillance in Remote Working
 Source: <https://www.indusface.com/blog/maintain-security-remote-workers/>

The study conducted to remote working had the following outcomes. Cybersecurity concerns when working remotely 80% of firms find that remote working increases the risk of security breaches. 79% of businesses concur that remote work has harmed their cybersecurity in the case of the United State. The availability of cybersecurity data in most countries is not available and in states like China which have high levels of surveillance, the same is not

made public. The chart above depicts the various cybersecurity concerns of the workers working remotely or who would be willing to work remotely.

5.8 Remote Jobs time application among minority remote workers

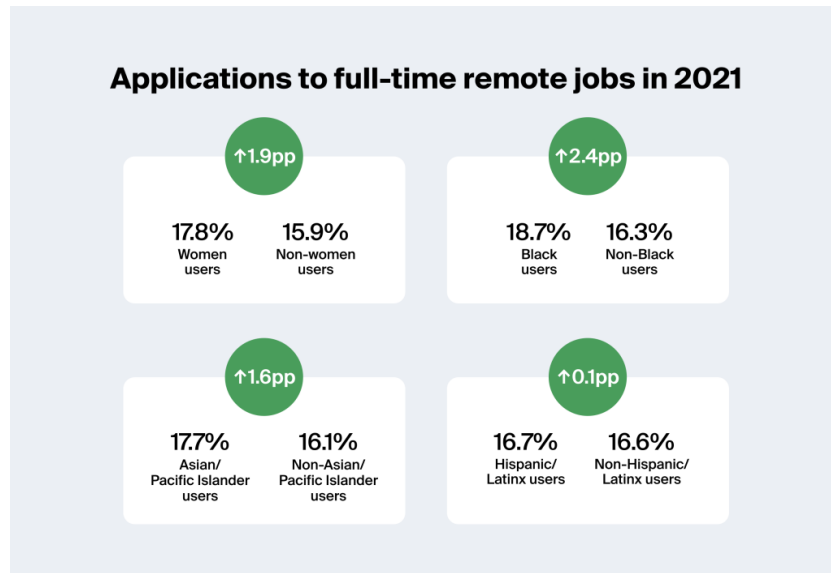


Figure 20: Remote Jobs Time Application among Minority Remote Workers

Source: <https://joinhandshake.com/blog/network-trends/gender-race-and-remote-work/>

Compared to 75% of respondents who are white, 81% of respondents who are Black seek flexible or hybrid work. And the same poll revealed that, in contrast to 79% of men, who now work entirely remotely, 85% of women seek flexible or hybrid employment, with the proportion of women in remote positions in the study being at 1.9%. Black users at the same time period were 2.4% more than non-black users. These percentages correspond to roughly 119,000 more female applications and 12,000 more Black users applications than anticipated.

5.9 Future Sustainability Projects on Remote Working for Climate Change

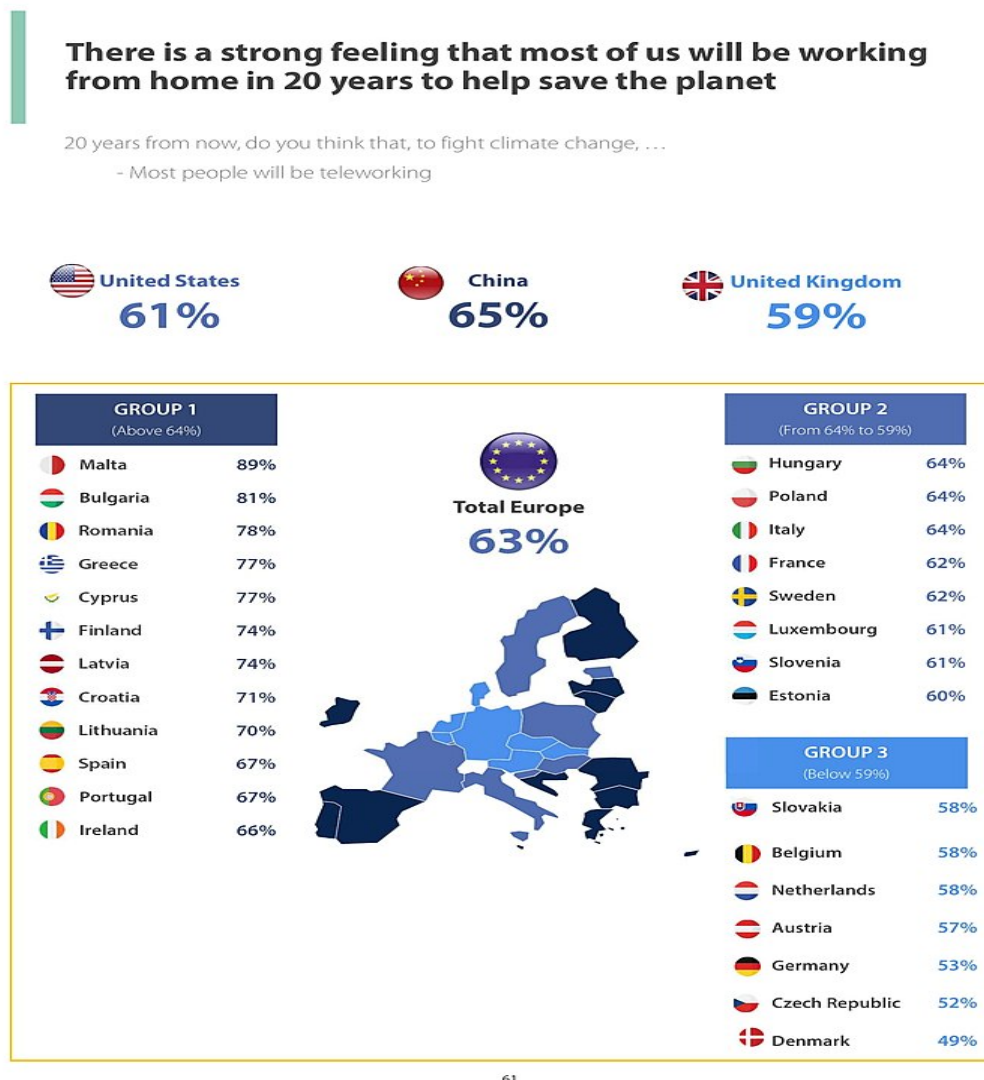


Figure 21: *Future Sustainability Projects on Remote Working for Climate Change*

Source: https://en.wikipedia.org/wiki/Remote_work

In a study conducted in the United States as of November 2022, there were 21% on-site workers, 26% remote workers exclusively, and 53% hybrid workers among remote-capable workers. 91% of those who already work from home stated they would prefer to do so in the future; while 54% of employees stated they thought remote work would not impact the corporate culture; 12% thought it would improve; and 33% thought it would worsen. Aged 15–64 among the working people, 12.3% of employed workers were in the European Union, including 13.2% women and 11.5% men, typically working from home as of the year 2020. In Finland (25.1%), Luxembourg (23.1%), Ireland (21.5%), Austria (18.1%), and the Netherlands (17.8%) had the highest percentage of workers who worked

from home, while Bulgaria (1.2%), Romania (2.5%), Croatia (3.1%), Hungary (3.6%), and Latvia (4.5%) had the lowest rate.

5.10 Employees Transition to Remote Working and Relation to Communication

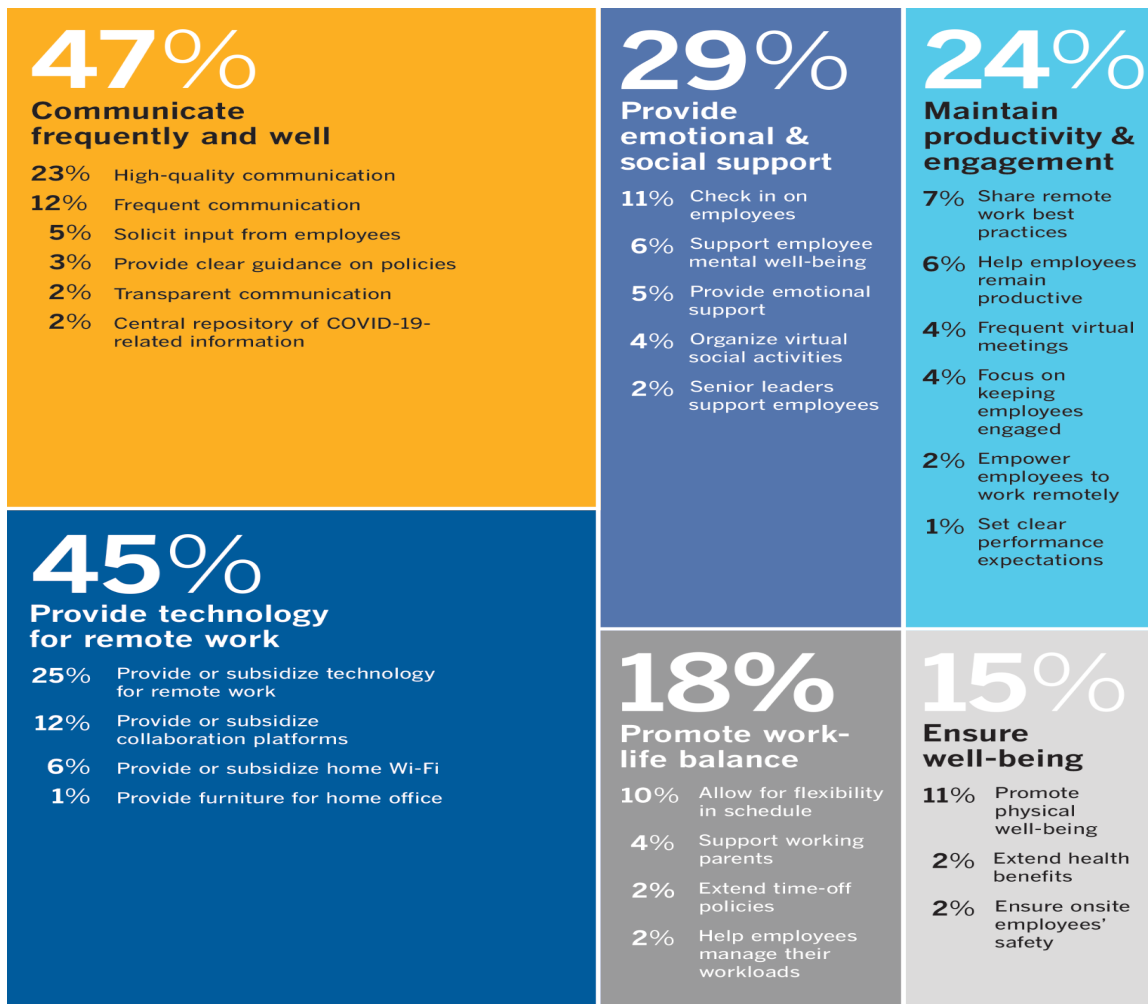


Figure 22: Employees Transition to Remote Work and Relation to Communication
 Source: <https://sloanreview.mit.edu/article/five-ways-leaders-can-support-remote-work/>

Employees that work remotely are connected (5%), engaged (17%), and productive (7%). Effective communication was mentioned by (47%) of survey respondents as being essential to their transition to remote work. An analysis of study using natural language processing revealed five features of the most effective communication: frequent, open, a two-way conversation, simple to follow, and consistent. In order to make the switch to remote work, 45% of respondents cited company-provided and -subsidized technology that included hardware, office furniture, and collaboration tools like Zoom and Microsoft Teams. These

analysis behest of communication at the pinnacle of enabling the attainment of Remote Working objectives using AI driven tools like Algorithmic management.

5.11 Analysis of Remote Work vs On-site Work

- **Tasks and Activities Determine the Possibility of Remote Employment**

To better comprehend the long-term viability of remote work, however, we attempt to identify the activities and professions that can be performed remotely. In several nations, including China, France, Germany, India, Japan, Mexico, Spain, the United Kingdom, and the United States, we have examined the possibilities for remote work—or employment that does not require interpersonal interaction or a physical presence. This analysis examined more than 2,000 activities in more than 800 occupations using MGI's workforce model, AI-driven based on the Occupational Information Network (O*NET), to determine which activities and occupations offer the most potential for remote employment.

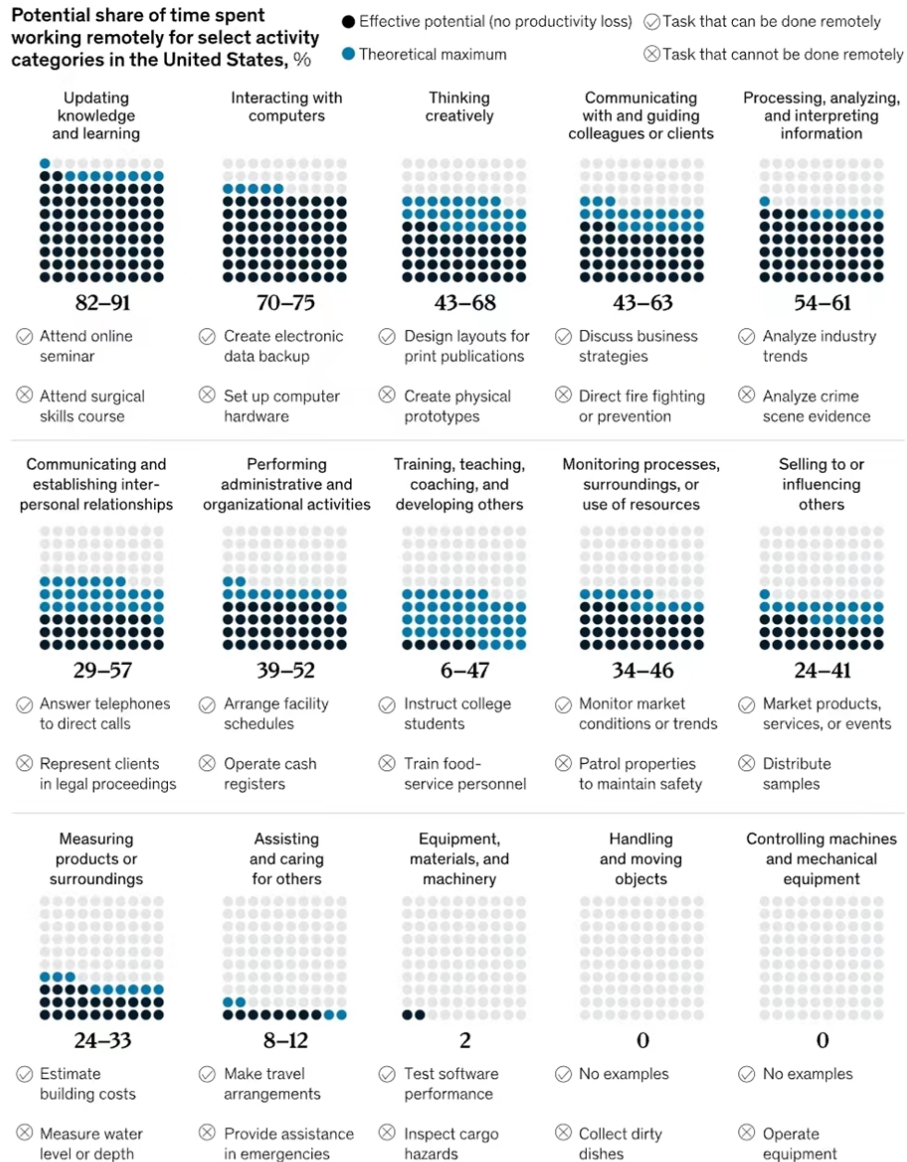
The possibility of working remotely depends on the mix of tasks performed in each occupation as well as the social, physical, and environmental setting. Then, we evaluated how far a task might theoretically be performed remotely. This depends on whether a worker must be physically present on-site to do a task, engage in social interaction, or use machinery or equipment that is special to the place.

Several physically demanding or work-intensive tasks, as well as those requiring the use of stationary equipment, cannot be completed remotely such as caregiving, running machines, using lab equipment, and processing consumer transactions in retail establishments are a few of these. On the other hand, tasks like data coding and processing, communication with others, teaching, and counseling might hypothetically be performed remotely.

For instance, parents and instructors agree that quality has decreased as a result of the pandemic's shift to remote teaching. Similar to how courts have operated remotely, they are not likely to do so going forward due to concerns about legal rights and equity. Some defendants lack adequate connectivity, attorneys worry about missing nonverbal cues in video conferences, and judges worry about missing nonverbal cues in person.

Hence, we have created two metrics for the potential of remote work: the maximum potential, which includes all tasks that might potentially be performed remotely, and a lower bound for the effective potential for remote work, which omits tasks that are obviously better completed in person.

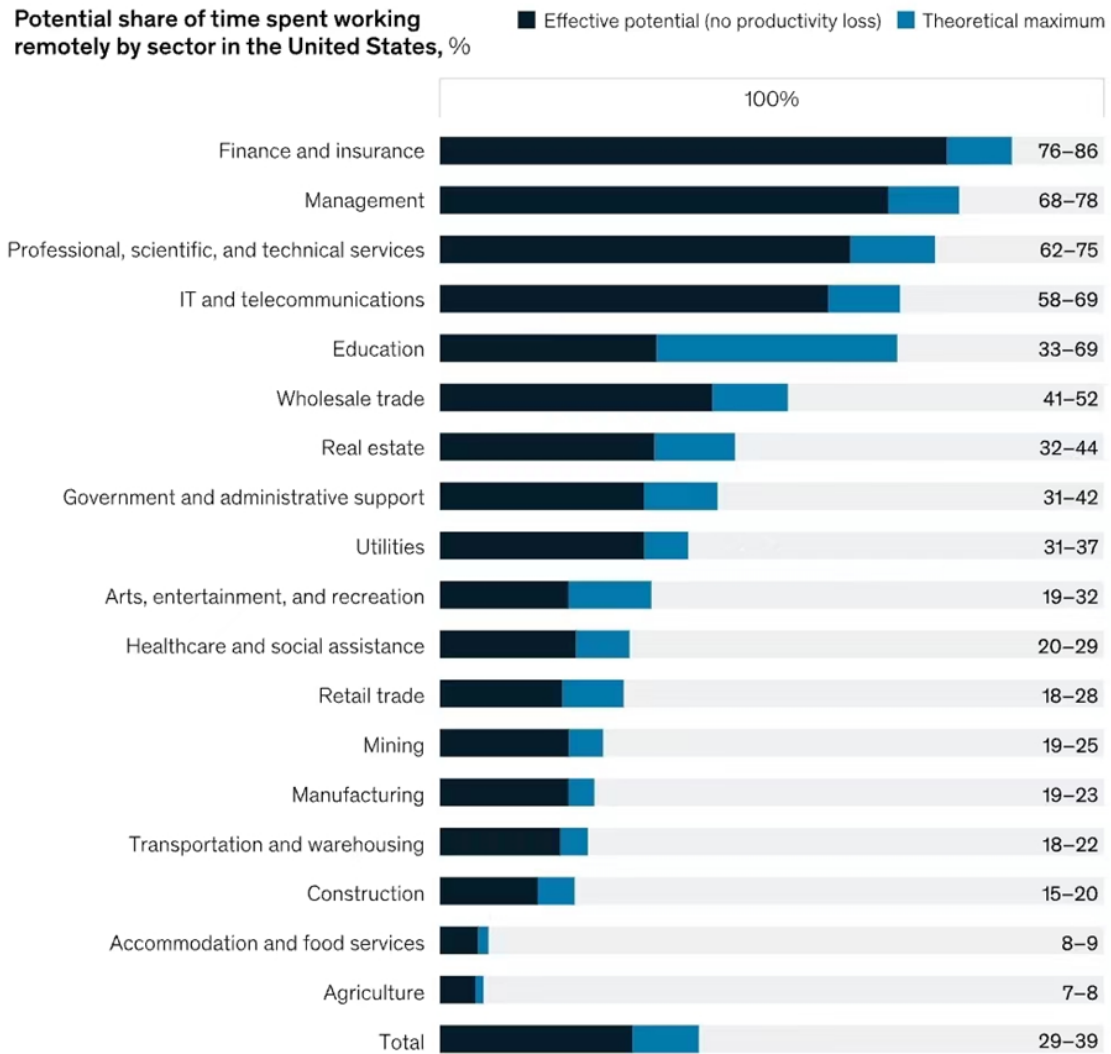
Activities with the highest potential for remote work include updating knowledge and interacting with computers.



Note: The theoretical maximum includes all activities not requiring physical presence on-site; the effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations.

We analyze the amount of time spent on various activities within occupations to estimate the overall potential for remote work for various jobs and industries. We discover that the opportunity for remote work is concentrated in a few industries. With three-quarters of time spent on tasks that may be completed remotely without a loss in productivity, finance and insurance have the biggest potential. The next highest potential fields are management, business services, and information technology, all of which spend more than half of employee time on tasks that could be accomplished remotely. A significant portion of the workforce in these industries has a college degree or higher.

The finance, management, professional services, and information sectors have the highest potential for remote work.



Note: The theoretical maximum includes all activities not requiring physical presence on-site; the effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations.

- **A Hybrid Model that Combines Some Remote Work with Work in an Office is Possible for Occupations with High Remote Work Potential**

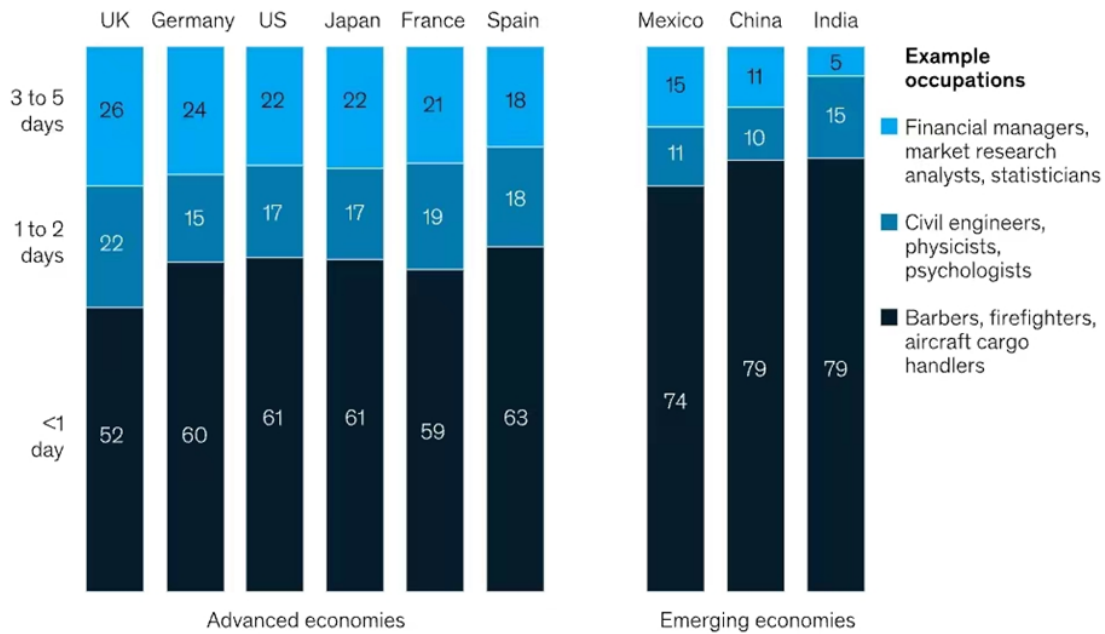
India's 464 million people work in areas like retail services and agriculture that cannot be performed remotely, and the country is well-known for its high-tech and financial services sectors.

For the majority of workers, some activities during a typical day lend themselves to remote work, while the other duties necessitate their physical presence on-site. Only 22% of US workers can work remotely between three and five days a week without having an impact on productivity, compared to only 5% of Indian workers. In contrast, only 61 percent of American workers can work remotely for more than a few hours every week, or not at all.

One to three days a week might be spent working remotely for the remaining 17% of the workforce.

While the majority of the workforce cannot work remotely, up to one quarter in advanced economies can do so three to five days a week.

Workforce with remote-work potential by number of days per week, % of 2018 workforce
 Number of days per week of potential remote work without productivity loss (effective potential)¹



Note: Figures may not sum to 100%, because of rounding.
¹The effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations.

- **Executive Perspective on the Nature of Work in the Future**



The requirement to employ specialized tools has an impact on one's capacity to operate remotely. Our analysis indicates that a chemical technician could only work remotely 25% of the time because most of her job must be completed in a lab with the necessary equipment. Compared to surgeons and x-ray technicians, who require sophisticated instruments and equipment to perform their jobs, general practitioners who can communicate with patients using digital technology have a considerably higher potential for remote employment. Hence, the potential for effective remote work among health professionals as a whole is only 11%.

The environment in which a task is carried out matters, even for the same activity. Consider the task of "analyzing data or information," which a statistician or financial analyst can perform from a distance, but a surveyor cannot. Analysts at crime scenes and those who study consumer trends both gather, process, analyze, record, and interpret information, according to O*NET, but the former must travel to the scene of, say, a murder while the latter can work in front of a computer at home. A grocery clerk calculates prices from behind a counter in a store, whereas a travel agent can do so from a kitchen table.

There are also positions that call for employees to be present on-site or in person more than four days per week. Occupations like transportation, food services, property maintenance, and agriculture do not offer many opportunities for remote employment due to the physical nature of the majority of their tasks. A building or construction site must be visited by building inspectors. Nursing assistants are required to work in a medical setting. Nursing, building maintenance, and garbage collection are just a few examples of the many occupations that governments determined to be necessary during the pandemic.

- **Urban Economies Must Consider the Substantial Effects of Hybrid Remote Work**

In affluent economies, only a small portion of the workforce—typically between 5 and 7 percent—regularly works from home. Urban economies may be significantly impacted if 15 to 20 percent of workers start spending more time at home and less time at work. Fewer people commute daily from their homes to work or travel to various areas for work as a result of more people working remotely. Transportation, gasoline and auto sales, restaurants and shops in urban centers, demand for office space, as well as other consumer habits, may all suffer as a result.

That will have an effect on the stores, services, restaurants, and bars that serve office workers, which will reduce some state and local tax revenues. For instance, before even settling in, REI intends to sell off its new corporate headquarters and start conducting business from satellite locations. Amazon, on the other hand, has agreed to lease 900,000 square feet of office space across six U.S. locations, citing the lack of spontaneity in virtual teamwork.

- **How Working Remotely Affects Productivity**

In the end, the response might influence how well-liked it is, especially in light of the protracted period of declining worker productivity that came before the epidemic. Regarding the productivity impact, there is currently little certainty and lots of disagreement. In the consumer study, 41% of workers stated they were more effective working from home than in the office. Employees' confidence in their productivity has increased as a result of their experience working remotely during the pandemic; from April to May, this confidence increased by 45 percent.

Connectivity could be a barrier to productivity. About 65% of Americans surveyed by a Stanford University researcher reported having fast enough internet to conduct practical video chats, and the connectivity infrastructure is often lacking or nonexistent in many poor nations. Public and private investment will be necessary to develop digital infrastructure.

Remote employment is a good thing, especially for women. More flexibility allows for independent work and more flexible hours. It also increases productivity with less time

wasted commuting. Yet, remote work may also worsen the gender pay gap in the workplace, aggravating COVID-19's regressive consequences. In many economies, there is a higher concentration of women working in fields including healthcare, food services, and customer support, all of which have limited opportunities for remote employment. Because women are disproportionately represented in the industries most adversely impacted by COVID-19, a previous MGI study on gender parity indicated that jobs held by women are 19% more at risk than employment held by males.

After COVID-19 is defeated, some forms of remote work are likely to continue. It will be necessary to make a number of changes, including spending money on digital infrastructure, clearing out office space, and structurally altering cities, food services, commercial real estate, and retail. However, it runs the risk of highlighting disparities and causing new psychological and emotional strains on workers, including loneliness. When employees work outside of the office, most businesses will need to completely rethink many of its procedures and rules.

VII. SOLUTIONS AND EFFECTS ON JOBS

6.1 Go to Market Solutions

There is an appreciable scale of research done with regards to algorithmic management as a tool in today's AI systems-based economy in the context of communication management to foster a remote and/or hybrid workforce (Caputo et al, 2021; Russo-Spena et al, 2021). The continual evolution of AI technology requires that researchers and/or practitioners ought to handle these fast-occurring transformations in operations, strategy development and modification of business frameworks and models, and network systems to enhance communication flow and achieve efficient communication standards for sustainable remote and hybrid work output levels (Langley et al, 2020). Unifying the developing organs of digital communication technologies, new products, development, target customers, and operational units towards maximizing value creation opportunities should be taken into account as part of today's business evolution/transformational process (Climent & Haftor, 2021). Organizations are undertaking (or beginning to undertake) their own digital transformational shifts by reconsidering new models of algorithm management tools for improving communication across all scales of the organizational operationality towards improving customer value creation models, while seizing the advantages of achieving new and unique business operations in today's AI systems-based economy (Russo-Spena et al, 2022).

It is worthy to acknowledge the fact that traditional heritage organizations are specifically opposed by the quick transformation in business activities in the context of

competition, where it is evident that firms that are still operating with traditional models are more likely to struggle or be kicked out of business altogether (Zhao et al, 2020), since the traditional heritage requires a more cumbersome paradigm to submerge multiple scales (Russo-Spena et al, 2021). In a digital economy, algorithmic management as a tool in the context of AI systems-based, data and information are considered more relevant regarding sustainable operations and their resultant ecosystems (Kohtamäki et al, 2020), drawing scholars' attention to research the concept of data-stimulated communications in management, performance, and service delivery (Sjödén et al, 2021). Since companies are mostly giving a lot of attention to data and content creation in their orchestration procedures in order to promote new product and/or service development, and service value, the scale of appreciation paid to the emerging digitized communication technologies becomes considerably significant as compared to that of cultural/traditional resources crucial to achieving organizational aims and objectives (Ghezzi & Cavallo, 2020). Effective and efficient information and communication in management is key to executing within a proposed business model towards realizing organizational goals (Cristofaro, 2020).

As noted by Professor Walter Brenner, University of St. Gallen, Switzerland, "the intensive application of data is modifying business models, fostering the emergence and/or formulation of new products and services, the formulation of new operational methods, bringing about intensive value, and paving the way for new ideas and customs of management." An example can be seen in up-to-date research by TechCrunch (a digital economy news site), where it highlighted something very interesting, namely "Uber, which is the world's largest taxi company, does not own even a single vehicle; Facebook, representing the world's most popular media, creates zero content; Alibaba, considered the world's most treasured retailer, owns zero inventory; and Airbnb, taking the place of the world's greatest accommodation service provider, owns zero real estate. All of this has been possible and successful through the adoption and application of algorithmic tools in management and communication. Now that the COVID-19 pandemic has placed remote and/or hybrid work to the forefront, the engagement of algorithm management tools has allowed people to work normally from different offices, their homes, or a local coffee shop and achieve silk-stocking performance output/ results, while fostering effective communication, work/job scheduling, and connectivity among remote and hybrid workers at a much more efficient scale of compared to the physical office. The engagement of these flexible digital/algorithm management measures in organizational information and communication networks enables managers and supervisors to effectively oversee and track performance scales and give directives to a highly dynamic pool of ecosystem of talents remotely across various places and time zones. Thus, algorithm management is a socio-technical approach evolving as a result of an uninterrupted fraternizing of employees and the algorithm tools that conciliate their work (Jarahi ad Sutherland, 2019).

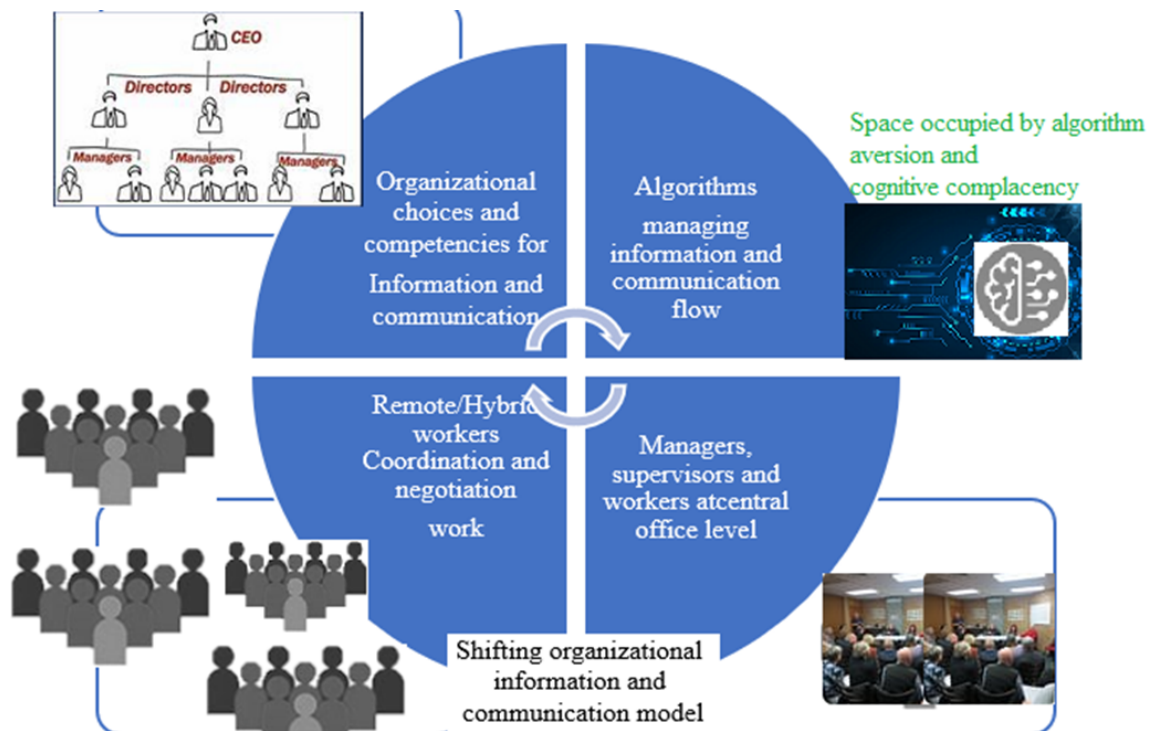


Figure 27: Showing Organizational Shift Towards Algorithmic Management Tools to Engage Remote Workers

In the augmented AI systems-based economy in the context of today’s business, customers-business-to-organization and organization-to-organization interchangeably want to fraternize with businesses whenever and wherever they want and in a manner that ensures maximum levels of convenience. Customers also prefer to interact with trademark labels through exposures that are smooth and continuous, integrate the various forms of shopping available, are simple, easy, straightforward, contextual, and designed to meet personal expectations.

Remote workers' horizontal communication within the working platforms should be paramount. by providing options for workers to communicate among themselves within the system and outside, where they utilize third-party platforms like social media. This leads to the loss of data and the organization's exposure to external factors. The workers should also have the option to schedule their work based on other external confounding factors like family commitment, sickness, grief, personal time (mostly among GenZ workers) and loss, among others. The workers should have the option of also requesting scheduled system duties from fellow workers for emergency issues and yet, tasks allocated in the system must be completed on time. The adoption of worker-driven scheduling and horizontal communication in the digital economy can unlock the AI management potential in remote working that can

be designed and implemented with workers' concerns as stakeholders factored in the system's design.

This made it crucial to engage dynamic and diverse remote and/or hybrid workers/contractors through the application of algorithmic socio-technical management tools for effective communication and scheduling to meet on-time customer order delivery and swift responses to changes in customer order and delivery requirements in a personalized and unique experience right from the very minute they start using a business website, through to completing orders, and beyond.



Figure 28: Algorithm socio-technical management tools for an effective communication and scheduling to meet on-time customer order delivery, and swift responses to changes in customer order and delivery requirements in a personalized and unique experience

6.2 Remote or Hybrid Workforce Communication Implementation Strategies

Once there are is well-set-up organizational communication regulations/standards around stabled internet connect, frequency of information flow, tonality/attitude, and channel, there are various means of AI aided algorithmic management communication tools and/or measures such as emails, prompt text messaging (also termed as instant messaging, IM), audio calls, video-conferencing, as well as other information communication network apps and software through which effective communication can be achieved with remote and/or hybrid workers (contractors).

Collaboration among remote teams is made possible by a blend of synchronous communication (real-time, involving multiple entities, where there is prompt feedback,

almost the same as a live conversation) and asynchronous communication (non-real-time, isolated and discontinuous) processes and applications. Hence, it is paramount to identify an accurate level of equilibrium between these two processes of communication and come up with a matching strategy for developing and harnessing which style works best for your team.

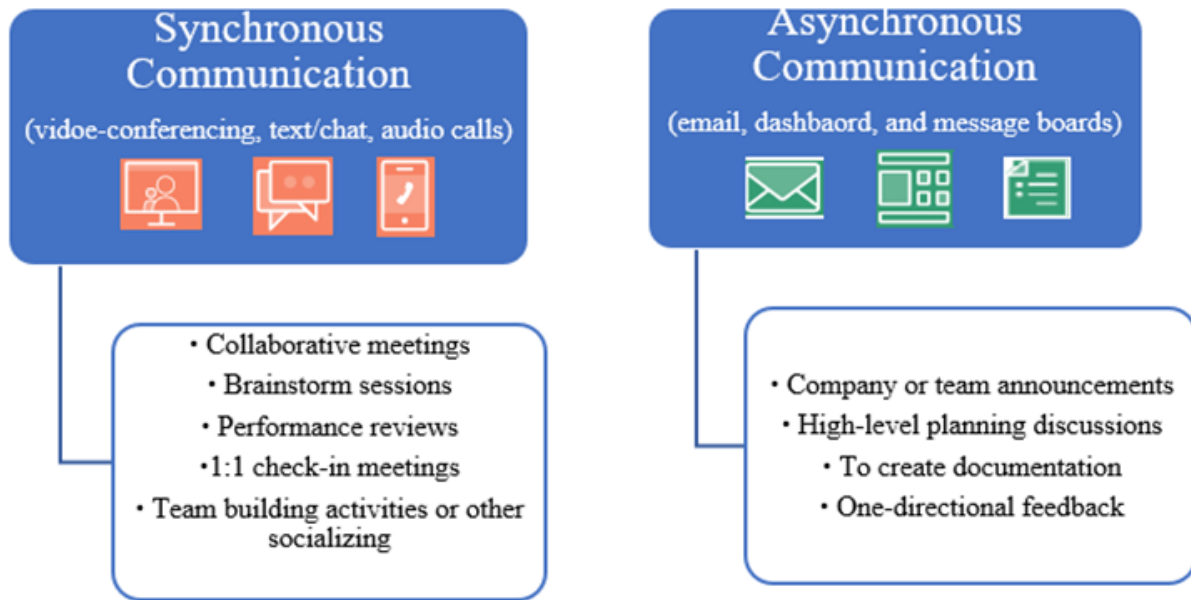


Figure 29: A Presentation of the Difference between Synchronous and Asynchronous Communication Processes

Email

This type of digital communication is the finest and one of the highest procedures that an organization can employ to formally communicate with employees in the context of remote/hybrid workforce, however, it is not suitable for matters that comprises numerous back-and-forth. As noted by Konoplich of Smart IT, “email threads are basically set aside for announcements and events that are of official nature”, and “emails can be used as a system for records keeping and issuing work/service receipts...email threads should be employed for developing paper slipstreams or sequences, identifying who is responsible for executing what and when, and for all sorts of rejoinders and responses that are required to be noted in writing”, Galindo adds.

Prompt Text Messaging (PTM)

This channel of algorithmic management communication tool is most suitable for more casual and informal communication, or any matter that needs rapt attention and swift resolution. According to Galindo, “This is the best communication tool for achieving immediate attention, while fostering the ability to confirm if someone is accessible to handle/resolve a pressing issue at any given time”. Chris Gadek, Head of Growth and Marketing of AdQuick, highlights that “there are some people who will go for text chatting, minus light-weight communication tools...though there is a superfluity of algorithm management communication software and apps, a brisk text message sometimes can help achieve job objective faster”. “Apply those easy to manipulate social messenger apps that promote incorporation and easy means to blend with other networked algorithm management communication software” he added. However, it must be acknowledged that being causal in terms of communication is beneficial, managers and workers must keep in mind that they are still within the workspace or environment, and should do well to keep personal topics separate.

Audio Calls

This form of algorithmic management communication tool is considered an out-of-date channel of communication and less reliable in the context of remote teams. Konoplich highlighted that “audio calls are mostly set aside for communications that are extempore in nature ... and warned that since a greater representation of remote workforce is generally younger and elect text messaging, it is imperative to consider not bore them with voice calls”.

Video Calls

In the context of long-term remote/hybrid contracts, video calls are mostly adopted instead of the culture of in-person meetings for performance reviews, and/or education/training on project development insights. “In the situation where feedback is required, discussions on performance, or brainstorming in real-time, make a video call, ensuring that your camera is turned on” advised by Galindo. However, “privacy issues might arise with the use of video calls ... since some people from their homes, unless video calls involve activities of leisure, they can be shunned”, noted by Konoplich. Therefore, algorithm management communication tools such as Zoom can be employed for video-conferencing as a measure to resolve any form of privacy concerns since the app fosters the selection of a preset background.

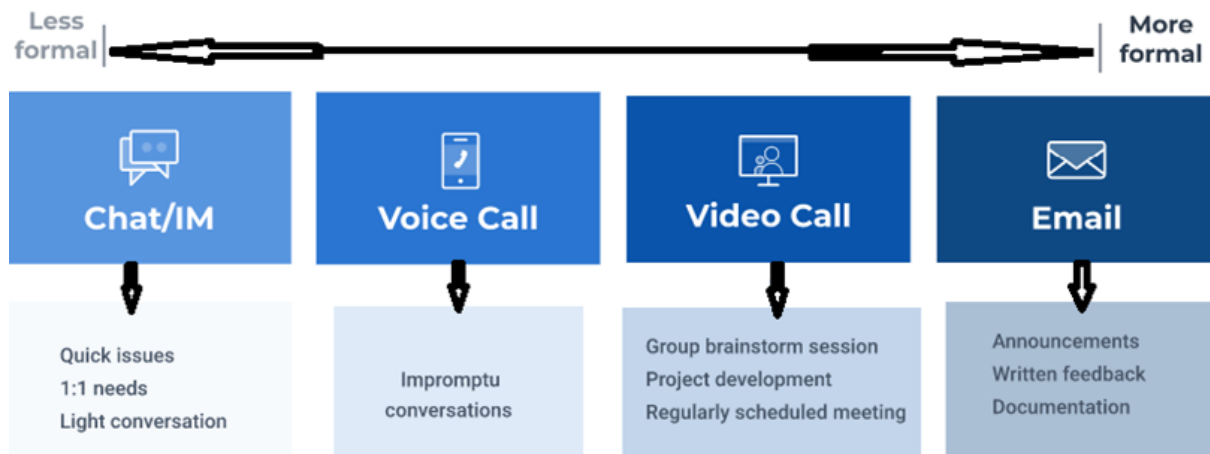


Figure 30: Presenting the Types of Algorithmic Management Communication Strategies in the Context of Remote or Hybrid Workforce

6.3 The Remote Working Effect on Jobs

From the data and models analysis and case reviews, we realized that much of the current and future jobs are shifting to remote working post-covid 19 pandemic. The health issues have catapulted and expedited the process of hybrid working with much of the work carried out remotely. The remote workers by analysis on algorithmic management have been classified as independent contractors in view of the taxi-hailing platforms and engagements. We can therefore classify the overview of the following jobs that are present and future going to be remote in view of AI-powered algorithmic management and machine-human collaboration. The jobs as per industry are:

Computer Technology: Web-based developers, software developers, and cybersecurity experts among others. We have experience in recent days 2022 and 2023 the big tech companies like Google, Facebook, and Twitter, among others globally, cutting down on the in-house workforce and moving to more remote working. Twitter, for instance, Elon Musk believed Twitter does not need that many middle-level managers since AI-powered algorithmic management tools could do and replace the supervisors and line managers. While the manufacturing aspect of computerized devices is currently highly automated by the use of robotics, with limited human inputs in the form of routine system maintenance and logistics aspects. The limitation will be the need to have workers in system hardware maintenance.

Health: With the advent of AI-powered health systems, we are and will experience the shift and sources of most health outpatient services done remotely supported by: AI-powered IoTs like smart watches; smart biomechanical devices; nanotechnologies among others. In medical insurance, for instance, the patient med care services in

most states to date are offered remotely. However, the advanced inpatient and specialized medical services will still be done in-house face-to-face with certain remote capabilities, like specialist support remotely during surgery and consultations.

Agriculture: The activities in this sector are done in touch with the earth, however, for expert consultations, we will have advancements in the use of remote working, while the management of the agricultural workers will advance to the use of algorithmic management in more digitized smart farms. To the global south, remote working for farm workers is limited due to limited levels of mechanization of agriculture. For veterinary services, the same will apply, similar to the human health sector, for remote working.

Education: These sectors post covid have experienced exponential change and a shift to remote work. Open distance learning, online learning, and other digital modes of education with support from e-learning platforms, social media like YouTube, and video conferencing facilities like Zoom, Telecent Meet, Google Teams, and Skype, among others, have promoted remote working in the sector. The extent of the application of algorithmic management in the sector is a case study that can be explored due to the high levels of utilization of AI-powered tools in education. We are however still limited in the delivery of practical learning experiences remotely due to the human experience learning process. In that note, the advancement of augmented AI tools like augmented realities, 3D, and metaverse among others, could better support the growth of remote working in the education sector.

Business Enterprise: The growth of e-commerce enterprises has led to the growth of algorithmic management because of logistics-related aspects of the business supply chains. The Enterprise Resource Planning systems have infused certain remote working disciplines like; communication, project development, accounting, legal services, sales, tendering, product design, data analysis, and system cybersecurity, among others. The phenomenon has been necessitated by the cut down on operation costs due to harsh economic times and the high cost of having in-house dedicated support staff that are expensive and unpredictable to acquire and retain. The business enterprise has led in the acquisition of independent contractors to maximize business performance. The remote working acquisition is limited to the following sectors: human resource experts, product making/manufacturing, chief officers' decision making, and face-to-face customer service due to human preference to more human touch and interaction and not bots.

6.4 Limitations of Remote Working Powered by AI

The remote working phenomenon powered by AI tools will continue to advance in high-level skilled jobs that have available data AI via machine learning that can replicate the same task performance. The more skilled a worker is, the more the skill will be replaced,

where we are having experts within the knowledge models of organizations being replaced by AI examples of generative AI like GPTs. The human working nature and design to a certain extent will relatively remain the same as far as low-level jobs are concerned. The jobs are like: plumbing, hairdressers, real estate construction work since the 3D massive printers that can use available material are not yet developed; child caregivers, and hardware maintenance jobs among others. Manufacturing in a larger extent will not be done remotely, however, it will utilize the use of algorithmic management to manage the workers in collaboration with IoT and robotics at the manufacturing plants. We are thus likely to see more human machines collaboration in the future but not replacement of either in the digital economy. From an augmented intelligence view, humans are not likely to design machines beyond their human capacity unless such machines develop their own intelligence beyond that of humans. Therefore, AI will remain pegged to human limitations and desires and can only go as far as human imagination is feasibly able to imagine and design algorithms.

VIII. CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

Ridehail companies like Uber and Lyft are some of the most successful examples of algorithmic management. They act as automated dispatchers to coordinate pick-up locations and communicate arrival times to passengers, while also using apps to set rates and take commissions whenever services are provided. This new "gig" economy has seen dramatic growth in the past ten years, largely because algorithms have enabled these companies to classify ride-hail drivers as independent contractors while still exerting considerable control over them. This is achieved through "continuous, soft surveillance," which uses data collection to monitor drivers' movements, acceleration, working hours, and braking habits. As an example, Uber launched a policy in 2018 that tracks driver hours and suspends access after 12 hours; Lyft has since followed suit. Furthermore, ride-hail platforms employ a range of techniques, such as surge pricing or notifications sent to drivers' phones in order to influence their behavior. Lastly, these companies often create information asymmetries by withholding valuable details from their drivers - such as how much they will earn from a given trip - and may use penalties like "time outs" or deactivation if drivers do not comply with their policies. The use of algorithmic management is not limited to ride hails; Amazon Flex for example uses it for delivery and logistics purposes. To gain better insight into how workers interact with algorithmic management, interviews were conducted with Uber drivers in different cities, followed by grounded content analysis based on Klein & Myers' [1999] concept of multiple interpretations.

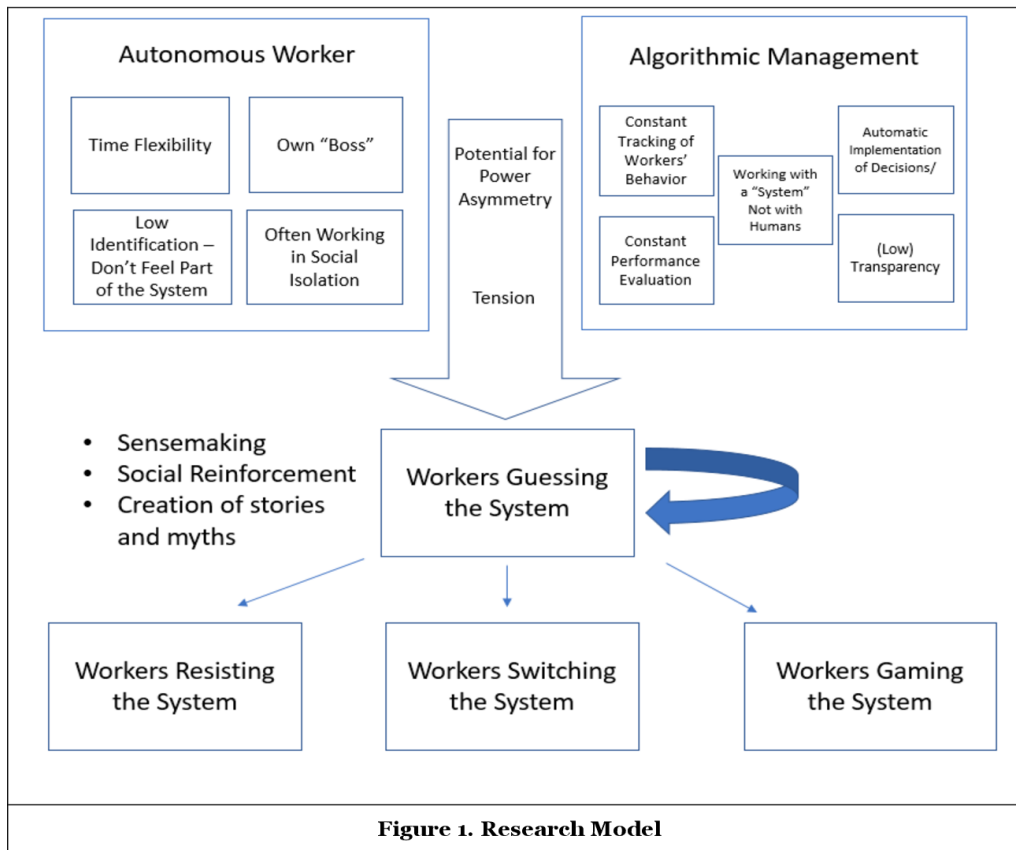


Figure 31: The Taxi Driver Interaction with the Platform Algorithmic Management in Their Taxi Business (Independent Contractors)

Ridehail companies like Uber and Lyft are some of the most successful examples of algorithmic management. The employees are choosing to work remotely based on the following perceived benefits: 94% of workers claim that they are as productive as they were before they started working remotely. The majority of managers concur that 32.2% productivity has grown since the remote work shift in 2020; 62% of workers believe that working remotely improves their involvement at work. When employees have access to remote work options, turnover is reduced by 50%. The 21% of workers are open to flexible work arrangements in exchange for lost vacation time. Working remotely, according to 75% of employees, results in better work-life balance, including lower stress levels (57%), fewer absences (56%), higher morale (54%), and fewer sick days (50%)

These justify the trend towards more liberalized working conditions for workers in the digital economy, where personal preferences are taking precedence in decision making when workers are choosing the work ecosystem to engage in. The remote working acquisition is limited in the following sectors: Human resource experts, product making / manufacturing, Chief Officers decision making, and face-to-face customer service due to human preference to more human touch and interaction and not bots

The 16 percent of businesses globally operate entirely remotely; 62% of American workers aged 22 to 65 claim to occasionally work from home; 75% of workers worldwide think that working remotely is the new norm; Over the last ten years, remote work has increased by 91%. Since 2005, there has been a 44% growth in remote work. Prior to the epidemic, 52% of employees worked at least once a week from home. 74% of professionals anticipate that remote work will soon become the new standard, and 97% of employees wish to do at least some of their home; from home in the future. For the same period, this reflects a 26% growth in the global GDP. Because women are disproportionately represented in the industries most adversely impacted by COVID-19, a previous MGI study on gender parity indicated that jobs held by women are 19% more at risk than employment held by males.

8.2 Recommendation

We could argue that AI has existed for many years, but its potential is only beginning to be tapped into where; AI can aid performance management by tracking employee data and comparing key performance indicators in the blink of an eye. This will look different for different industries, but one can already imagine its usefulness in measuring the effectiveness of sales teams or production lines. Economic pressure: The integration of innovative advanced energy technologies may be the right thing to do, it is not cheap. It takes a long time and money to find a well-established software provider, build and configure software, modify, maintain, and manage it. Thus the deployment of energy technology will involve developing, adapting, and controlling software that needs a great deal of funding and resources. We recommend the following advances in research and development of AI in remote working management:

- Further research and development of mechanisms to manage small teams of remote workers as the workers' movement to the gig economy will help create a close neat team for gig working and short-term projects.
- More research projects need to be undertaken toward the infusion of augmented intelligence in algorithmic management for remote working.
- The development and adoption of hybrid working culture in the technological age to better exploit the fourth industrial revolution potentials.
- That the organization utilizing Algorithmic management can have access to system source codes to scale more context-based processes within the AI-powered platform systems; in order to address most of the ad-hog remote worker challenges and exploit the immediate and foreseeable future opportunities.

REFERENCES

- A., & Nguyen, A (2019, February). *Algorithmic Management in the Workplace*. Data and Society Research Institute.
https://datasociety.net/wp-content/uploads/2019/02/DS_Algorithmic_Management_ExplaMateescuiner.pdf
- Abhishek, K. (2022, May). *Introduction to artificial intelligence*. Redgate Hub.
<https://www.red-gate.com/simple-talk/development/data-science-development/introduction-to-artificial-intelligence/>
- Amitrano, C.C., Russo-Spena, T. and Bifulco, F. (2021), “Digital engagement and customer experience”, in Russo-Spena, T. and Bifulco, F. (Eds), *Digital Transformation in the Cultural Heritage Sector: Challenges to Marketing in the New Digital Era*, pp. 119-136.
- Arnold, Jon. “How Can AI Improve Remote Work Communications,” November 1, 2021.
<https://www.techtarget.com/searchunifiedcommunications/answer/How-can-AI-improve-remote-work-communications>.
- Caputo, A., Pizzi, S., Pellegrini, M.M. and Dabić, M. (2021), “Digitalization and business models: where are we going? A science map of the field”, *Journal of Business Research*, Vol. 123, pp. 489-501.
- Costa Climent, R. and Haftor, D.M. (2021), “Value creation through the evolution of business model themes”, *Journal of Business Research*, Vol. 122, pp. 353-361.
- Collins, Philippa, and Joe Atkinson. “Worker Voice and Algorithmic Management in Post-Brexit Britain.” *Transfer: European Review of Labour and Research*, January 28, 2023, 102425892211430. <https://doi.org/10.1177/10242589221143068>.
- Cristofaro, M. (2020), “E-business evolution: an analysis of mobile applications' business models”, *Technology Analysis and Strategic Management*, Vol. 32 No. 1, pp. 88-103.
- Dharshan, Chandran. “Remote Workforce Management in 2023 +Challenges, Tools”, May 26, 2022,<https://whatfix.com/blog/remote-workforce-management/>.Jain, Hemant, Balaji Padmanabhan, Paul A. Pavlou, and T. S. Raghu. “Editorial for the Special Section on Humans, Algorithms, and Augmented Intelligence: The Future of Work, Organizations, and Society.” *Information Systems Research* 32, no. 3 (September 2021): 675–87. <https://doi.org/10.1287/isre.2021.1046>.
- Dr. Ishrat Husain (February, 2023) “Framing policies for a digital economy.”
- Frenken, Koen. “Technological Innovation and Complexity Theory.” *Economics of Innovation and New Technology* 15, no. 2 (March 2006): 137–55.
<https://doi.org/10.1080/10438590500141453>.
- Ghezzi, A. and Cavallo, A. (2020), “Agile business model innovation in digital entrepreneurship: lean startup approaches”, *Journal of Business Research*, Vol. 110, pp. 519-537.
- Gopal, Pachpande Gaurav, Navale Shubham Subhash, and Raorane Ashwini Anil. “Analysis of Employee Surveillance System Using Deep Learning Models.” In *2022 6th International Conference On Computing, Communication, Control And*

- Automation (ICCUBEA)*, 1–6. Pune, India: IEEE, 2022.
<https://doi.org/10.1109/ICCUBEA54992.2022.10010874>.
- Griswold, Alison. “Uber Is Getting Serious about Keeping Drowsy Drivers off the Road.” Quartz, February 28, 2018,
<https://qz.com/1204615/uber-is-getting-serious-about-keeping-drowsy-drivers-off-the-road/>. Lyft. “Taking Breaks and Time Limits in Driver Mode.” Lyft Help. Accessed August 23, 2018,
<http://help.lyft.com/hc/en-us/articles/115012926787-Taking-breaks-and-time-limits-in-drivermode>.
- Harvard Business Review (2021). “Why Procurement and Supply Chain Functions Need to Converge”
- How AI Can Help Overcome Workforce Management Challenges, 2021 :
<https://www.aeologic.com/blog/how-ai-can-help-overcome-workforce-management-challenges/>. García Vergara, María Elena, Óscar Fernando Castellanos Domínguez, and Sonia Esperanza Monroy Varela. “Implementing Technological Intelligence Systems from the Viewpoint of Complexity Theory.” *Ingeniería e Investigación* 28, no. 2 (May 1, 2008): 108–18. <https://doi.org/10.15446/ing.investig.v28n2.14900>.
- Jorge, Amar, Sohrab Rahimi, Nicolai von Bismarck, and Akshar Wunnava “Smart scheduling: How to solve workforce-planning challenges with AI”, November 1, 2022,
<https://www.mckinsey.com/capabilities/operations/our-insights/smart-scheduling-how-to-solve-workforce-planning-challenges-with-ai>.
- Keshav Pingali, (2022). “Artificial intelligence (AI) tools are taking off across all industries”
- Kohtamäki, M., Parida, V., Patel, P.C. and Gebauer, H. (2020), “The relationship between digitalization and servitization: the role of servitization in capturing the financial potential of digitalization”, *Technological Forecasting and Social Change*, Vol. 151, p. 119804. Langley, D.J., van Doorn, J., Ng, I.C., Stieglitz, S., Lazovik, A. and Boonstra, A. (2020), “The internet of everything: smart things and their impact on business models”, *Journal of Business Research*, Vol. 122, pp. 853-863.
- Lee, Min Kyung, Ishan Nigam, Angie Zhang, J Afriyie, Zhizhen Qin, and Sicun Gao. “Participatory Algorithmic Management for Worker Well-Being.” *SEMATIC SCHOLAR*, 2021.
<https://www.semanticscholar.org/paper/Participatory-Algorithmic-Management-for-Worker-Lee-Nigam/81d23d19a94ec190696af0e0d638cbe64b1d56b0>.
- McAlone, Nathan. “Here’s How Uber Got Its Start and Grew to Become the Most Valuable Startup in the World,” Business Insider, September 13, 2015,
<https://www.businessinsider.com/history-of-uber-and-its-rise-to-become-the-most-valuable-startup-in-the-world-2015-9>.
- Moore, Phoebe V., and Jamie Woodcock, eds. *Augmented Exploitation: Artificial Intelligence, Automation and Work*. Pluto Press, 2021.
<https://doi.org/10.2307/j.ctv1h0nv3d>.
- Nagibina, N., and A. Bestuzhev. “Effective Labor Organization «Remote» Employees: From Functional Tasks to Software.” *Management of the Personnel and Intellectual*

- Resources in Russia* 9, no. 6 (January 28, 2021): 62–69.
<https://doi.org/10.12737/2305-7807-2021-62-69>.
- Pratsri, Sajeewan, Prachyanun Nilsook, and Panita Wannapiroon. “Augmented Intelligence Coaching System.” In *2021 Research, Invention, and Innovation Congress: Innovation Electricals and Electronics (RI2C)*, 176–82. Bangkok, Thailand: IEEE, 2021. <https://doi.org/10.1109/RI2C51727.2021.9559817>.
- Rosenblat, Alex, and Luke Stark. “Algorithmic Labor and Information Asymmetries: A Case Study of Uber’s Drivers.” *International Journal of Communication* 10, no. 0 (July 27, 2016): 27.7.
- Sari, Risna, and Retno Widiarti. “Optimizing Employee Scheduling System with Firefly Algorithm (Case Study: MJ Store).” In *2020 3rd International Conference on Computer and Informatics Engineering (IC2IE)*, 482–87. Yogyakarta, Indonesia: IEEE, 2020. <https://doi.org/10.1109/IC2IE50715.2020.9274615>.
- Schildt, Henri. “Algorithmic Management of Humans.” In *The Data Imperative*, by Henri Schildt, 162–78. Oxford University Press, 2020.
<https://doi.org/10.1093/oso/9780198840817.003.0007>.
- Scheiber, Noam. “How Uber Uses Psychological Tricks to Push Its Drivers’ Buttons.” *The New York Times*, April 2, 2017,
<https://www.nytimes.com/interactive/2017/04/02/technology/uber-drivers-psychological-tricks.html>.
- 9Menegus, Bryan. “Amazon’s Last Mile.” *Gizmodo*, November 16, 2017. <https://gizmodo.com/amazons-last-mile-1820451224>.
- Schreyer, Jasmin. “Algorithmic Work Coordination and Workers’ Voice in the COVID-19 Pandemic: The Case of Foodora/Lieferando.” *Work Organisation, Labour & Globalisation* 15, no. 1 (January 1, 2021).
<https://doi.org/10.13169/workorgalaboglob.15.1.0069>.
- Sjödin, D., Parida, V., Palmié, M. and Wincent, J. (2021), “How AI capabilities enable business model innovation: scaling AI through co-evolutionary processes and feedback loops”, *Journal of Business Research*, Vol. 134, pp. 574-587.
- Sungkar, Armu, and Tena Kogoya. “A REVIEW OF GRID COMPUTING.” *Computer Science & IT Research Journal* 1, no. 1 (April 18, 2020): 1–6.
<https://doi.org/10.51594/csitrj.v1i1.128>.
- Susan Lund, Anu Madgavkar, James Manyika, and Sven Smit “What’s next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries”, November 23, 2020, Steve Hatfield “AI in workforce management Unlocking workforce productivity with the AI-enabled opportunity marketplace”, November 10, 2020,
<https://www2.deloitte.com/us/en/blog/human-capital-blog/2020/ai-workforce-management.html>.
- Tiziana Russo-Spena, Marco Tregua, Anna D’Auria, Francesco Bifulco (2022), “A digital business model: an illustrated framework from the cultural heritage business”, *International Journal of Entrepreneurial Behavior & Research*, ISSN: 1355-2554.
- World Economic Forum (2022), “What is the digital economy and how is it transforming business?”
<https://www.weforum.org/agenda/2022/05/digital-economy-transforming-business/>.