Implementation Strategy of AI-Powered Systems and Their Impact (2023)

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Abstract

Artificial Intelligence (AI) has emerged as a driving force in the fourth industrial revolution, automating labor tasks and transforming various economic sectors. Although it presents significant opportunities to enhance efficiency and accuracy, its implementation requires a solid strategy and the management of ethical challenges, such as algorithmic bias. AI is revolutionizing engineering by optimizing designs, identifying maintenance issues, and improving product quality. Furthermore, it fosters data-driven decision-making and business innovation. However, it is essential to balance its adoption with human skills development and ethical considerations to maintain a competitive edge in a constantly changing world.

Keywords: Artificial Intelligence, IA, Fourth Industrial Revolution, Automation, Data-driven, Engineering, Algorithmic bias, Ethical responsibility, Innovation, Skills development

I. INTRODUCTION

Artificial Intelligence (AI) is increasingly prevalent across all sectors of the economy and society, and it is anticipated to be a driving force behind the fourth industrial revolution. According to the World Economic Forum, nearly half of all jobs could be automated in the near future, while 60% of all jobs have at least some tasks that could be automated. However, new technologies will create novel jobs, and workforce engagement in the development, adoption, and implementation of AI can lead to more practical, innovative, and effective systems, resulting in a better balance between work and personal life.
II. Impact on Engineering

Artificial Intelligence has been in development since the 1950s, with its most common forms being algorithms and machine learning. Recent progress, driven by the availability of large amounts of data and the development of deep learning algorithms, has enabled AI systems to see, hear, read, and analyze on a large scale, opening up new applications. AI is widely used in almost every business operation, and its adoption by organizations can improve efficiency, accuracy, and profitability. In human resources, AI is used to automate selection processes, personalize employee onboarding, provide targeted training courses, support compliance monitoring, and assess employee sentiment to predict potential future risks. In finance, AI is used to monitor organizational performance, support e-commerce, and make financing or credit decisions more rigorously through data analysis and predictability models. In business development, marketing decisions, and customer services, AI is used to offer personalized offers based on customer preferences.

The impact on engineering is enormous; it is transforming how engineers design, analyze, and optimize systems. AI can help engineers optimize designs by automatically generating thousands of different options and evaluating them based on specified criteria, significantly reducing the time required to arrive at the optimal design and improve its performance. AI can also be used to analyze data from machine and equipment sensors, identifying potential issues before they occur, known as predictive maintenance, which can also help significantly reduce maintenance costs. The process of monitoring manufacturing processes and detecting defects in real-time using AI can improve product quality and reduce the need for recalls or corrections.

Artificial intelligence techniques can be applied to any type of engineering or other problems. It has been defined as "the task of engineering a technology of thought" by Tennant in 1986. However, this technology has been found to be most useful in problems characterized by large amounts of data, sometimes poorly structured and often incomplete. Such problems are traditionally addressed by experts who, through a long period of focused education and committed experience, have acquired a structured memory capacity that can be used in the deductive process.

The reasoning process in most problem-solving disciplines can be resolved into a set of rules by which large amounts of data can be used to solve problems or achieve goals. For example, feasibility study has components such as "engineering report," "cost breakdown," and "structural design." One of the most important features of systems is their ability to make reasoned decisions about a course of action, object selection, or reasoning path. And one of the most successful methodologies in artificial intelligence is the use of rules to control the reasoning process and direct the acquisition of domain model information. As AI technologies continue to advance, the potential for innovation in engineering is limitless.

III. ARTIFICIAL INTELLIGENCE (AI) STRATEGY

An Artificial Intelligence (AI) strategy is a plan outlining how an organization can utilize artificial intelligence (AI) to support its broader corporate strategy. This includes harnessing data available throughout the organization to enable faster analysis and decision-making, as well as identifying specific areas where AI can be used to enhance efficiency, accuracy, and profitability.

Furthermore, a strategy for implementing Artificial Intelligence can help organizations stay competitive in an ever-evolving environment. With the growing availability of AI-driven tools, organizations that do not embrace this technology risk falling behind compared to competitors who can offer better and more efficient products and services.

Regarding the implementation of an AI strategy, one of the initial steps is to ensure that organizations align their decisions within the overall digital transformation strategy of the company. Cultivating a culture of innovation and change within the company is necessary to successfully incorporate AI into operations. Additionally, future-proofing the organization by defining its desired future state and setting strategic objectives for specific areas is crucial.

Once management is on board, the next step is to establish priorities. To develop their AI plans, organizations...
should take small steps, gradually building capacity and knowledge.

The subsequent step is to identify the specific outcomes that organizations want to achieve through analyzing their available data or acquiring third-party data. The goal is to determine what data is required to achieve these outcomes. Access to relevant and accurate data is fundamental to the success of any AI implementation.

We must remember that AI implementation is a business transformation process that will require our teams to embrace and adapt to change. All changes can be a challenging process. Organizational development has become a key differentiator for successful organizations. Through change and in response to change, organizations learn and grow. Implementing training and skills improvement programs can ensure that all stakeholders affected by the use of AI adapt to new applications. Investing in education and communication to address concerns that may arise internally and externally can reduce anxiety and increase success. The person leading the AI implementation must develop the technical, data science, and project management skills required for AI.

It is essential to monitor the AI implementation process and progress towards stabilization, ensuring that the team focuses on the key value benefits of AI in that process or area. Depending on the current state of the area or process where AI is desired to be implemented, spending and impact will define whether the change is strategic or transformational. Strategic changes focus on specific needs with a reasonable timeframe for change, often concentrating on improving operations. Transformational change occurs rapidly with few opportunities to return to the way it was before, and it could involve broader restructuring throughout the organization.

IV. OVERCOMING CHALLENGES: LEADERSHIP, COMMUNICATION, AND ETHICS

It is essential to monitor the AI implementation process and progress towards stabilization, ensuring that the team focuses on the key benefits of AI value in that process or area. Depending on the current state of the area or process where AI is desired to be implemented, spending and impact will determine whether the change is strategic or transformational. Strategic changes focus on specific needs with a reasonable timeframe for change, often aimed at improving operations. Transformational change happens rapidly with few opportunities to revert to the way it was before; this could, for example, entail broader restructuring throughout the organization. Ensuring that the right people lead the AI implementation process and that human resources and internal marketing teams work closely together to ensure effective and timely communication about the potential value of AI implementation within organizations.

Resistance to change is another challenge organizations face when adopting AI. The Harvard Business Review article, 'Dehumanization is a feature of gig work, not a bug,' states that the reason for the failure of successful AI implementation in business operations is not the lack of adequate resources but the lack of alignment and understanding throughout the organization. Developing a data-driven culture and visualizing data through dashboards and regular reporting mechanisms can help overcome this challenge.

The use of artificial intelligence (AI) in decision-making processes has raised concerns about bias and ethical responsibility. According to Cheng, Varshney, and Liu, one of the elements of the AI Social Responsibility pyramid is Ethical Responsibility, which involves the obligation to prevent harm and do what is right and just. AI algorithms are created by humans and can, therefore, reinforce existing inequalities. To mitigate these risks, AI development teams must be more diverse, and organizations must adopt hiring practices that promote equity and inclusion.

V. Conclusion

While AI can certainly enhance efficiency and accuracy, it cannot replace the importance of interpersonal skills and human judgment. Organizations must invest in developing these skills in their employees to ensure that AI is used effectively and ethically.

In conclusion, AI has provided organizations with the tools to improve efficiency, accuracy, and profitability.
However, it is crucial to balance the promotion of AI development and adoption with the potential risks of underuse, misuse, and abuse. By doing so, organizations can gain a competitive edge in an ever-evolving business environment.

The future is now.

References


Eng. Spomenka Ubavkic de Angelov, MSIE, graduated from the Faculty of Technology at the University of Belgrade in Serbia, former Yugoslavia, in 1970. In 1975, she completed postgraduate studies at the same university, earning the title of Master of Technical Sciences. Her research with the title 'Synthesis and Identification of Copper, Zinc, Cadmium, and Mercury Hexafluoroaluminate Compounds' was presented at the World Congress of Scientific Research in Aviemore, Scotland, Great Britain. From 1970 to 1992, she served as the Executive Deputy Director of Procurement, Distribution, and Quality Control for petroleum and its derivatives for the state network of passenger and freight trains 'Yugoslav Railways.' During this period, she participated in industrial engineering projects and contributed to the creation of ISO standards as part of the European Commission for the railway industry. From 1992 to 2005, she held various commercial and financial management positions in the private sector. Since 1975, she has been involved in teaching and research, working at the Higher School of Chemistry in Belgrade until 1982. From 2005 to the present, she has worked as a subject professor at the School of Engineering at the APEC University. She has taught a variety of subjects, including general physics, chemistry, fluid mechanics, thermodynamics, and materials resistance, in both in-person, semi-presential, and virtual modes.

Spomenka Ubavkic de Angelov has been an active member of the Union of Engineers and Technicians of Serbia, participating in annual scientific congresses from 1970 to 1995. She has also been a presenter on several occasions, known for addressing current topics. She is the author of works such as 'Use of New Additives for Diesel Fuels Used in Locomotives in the Railway Industry.' Throughout her career, she has received various recognitions and awards. She was nominated as a meritorious professor on five occasions. In July 2018, she was recognized as an Excellent Professor by the School of Engineering. In September 2018,
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