Is AI IT fentanyl?

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Abstract

Dichotomy surrounds AI enthusiasm. Generative and Agentive AI within organizations has reached its peak, and experts suggest that improved use cases and more precise outcomes may be necessary to renew interest, as the technology descends further into the unfortunate trough of disillusionment in the Gartner Hype Cycle. Despite the significant potential that AI holds for enterprises, certain expectations have lessened as organizations have encountered challenges regarding its robustness and reliability. The excitement surrounding generative AI has overshadowed the considerable effort required to fully realize its advantages. This paper seeks to develop a conceptual model to address the dichotomy of AI in contemporary organizations within the African context. Qualitative methodology was used in this study. Sixteen expert Chief Information officers (CIO) in academic, ports and harbour, manufacturing and pharmaceutical institutions were used in this study and data was thematically analyzed to develop the conceptual model. The model developed seeks to cure the question, Is AI IT fentanyl? AI, like fentanyl, can be good or bad depending on context, application and level of dependence.

Introduction

A preliminary study provided by the Centers for Disease Control and Prevention (CDC, 2022), which involves approximately 83,000 individuals succumbed to opioid overdoses within the United States, predominantly attributable to fentanyl and various other highly potent synthetic agents of Illicit drug manufacturers are progressively incorporating fentanyl into a diverse array of narcotics, encompassing heroin, cocaine, and methamphetamines. Almost all organization are making use of a particular AI tool or another to solve their current IT problems. But most of these AI tools and applications are not fit for purpose. Like fentanyl abuse, AI is being abused in a way that does not create value for organizations that integrate it inappropriately. AI needs to be used in a more balanced way to harness the full potential and benefits of the technology within organizations. AI is currently affecting staff layoffs. While some organizations are looking at how effectively AI-driven capabilities can be used to bluster the workforce, for others AI has triggered layoffs (Sekar et al., 2022). Big cooperation's like Microsoft, Intel, and Glassdoor are cutting jobs by 9,000, 5,000, and 1,300, respectively, all due to their focus on AI enabled solutions (www.reuters.com). According to layoffs.fyi (2025), over 80,000 jobs have been lost because of AI. World Economic Forum (2025) predicted 92 million jobs would be gone by 2030 because of AI. Over the past five years, there has been an increase in interest in artificial intelligence (weforum.org). Numerous causes have sparked this interest, such as the accessibility of massive amounts of big data, the sharp decline in the price of processing and storing vast amounts of data, and the availability of cloud computing and platforms. Unsurprisingly, governments have begun to allocate large sums of public cash to extensive AI research initiatives.

Literature review

Whether they are bubbles or not, most enterprises' AI programs require a reset to guarantee that proper governance, risk, and compliance are incorporated from the beginning; otherwise, they are only making progress without dealing with the real issues of AI. As businesses transition from specialized Artificial Intelligence/Machine learning (AI/ML) projects to generative AI and finally agentic AI, this is particularly true. As AI gets increasingly automated and autonomous, and the technology permeates more core organizational apps and workflows, the organization's risk profile rises with each step. The more we automate and orchestrate with agentic AI, the greater the risk; and as discussed in the literature, there is the need to oversee AI agents' operations within the organizations. Organizations will be able to scale more

quickly and increase its level of AI maturity in the coming years if they invest time in AI orchestration and governance now and consider how AI agents will affect technology platforms, centers of excellence, and governance strategy.

What type of AI projects does enterprise need?

Given the hype surrounding AI's disruption of the consulting and advisory sector and even its replacement of entire IT teams with simple coding, one may conclude that consultancy, systems integration services, and internal IT teams are no longer required in an AI environment. With lines of code flying across the screen, some AI-enabled website building tools may look amazing at first, but their results are often far less pleasing. What enterprises really need is AI initiatives that are applicable now and can adapt to the ever-challenging environment of contemporary businesses. The business environment is changing rapidly, trying to cope with the incidence of IT advancement. Organizations are left behind when they are not able to cope with the fast pace of these advancements.

Adaptability of AI to increase an organization's performance and create value is a key component of modern organizations. The stern competition among organizations require innovation that brings leverage. Therefore, the AI solution that will prevail is the one that is adaptable, efficient, creates value, secure, humancentric and customer friendly. Enterprises need to understand that customers want their privacy protected, want satisfaction with the tech they use, understand how the tech works and generally feel safe with using it.

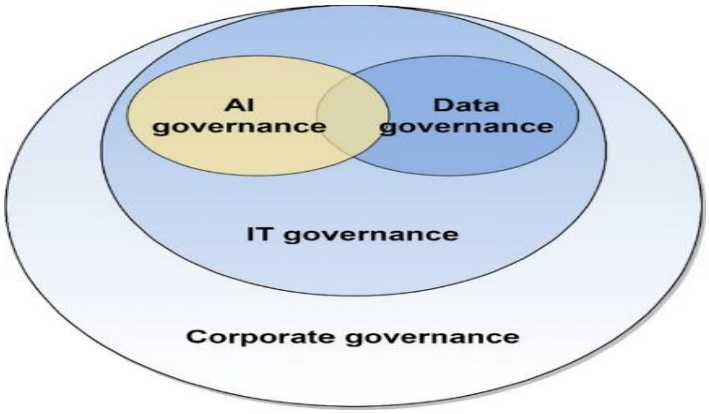
What principles should guide enterprises in using AI ethically?

The disruptive nature of AI is far more reaching than was previously anticipated. It can be an axis for good or evil. Ethical principles and consideration are the right way to check AI tech proliferation. Ethics ensure that AI is humancentric, and ethical principles will be the basis for AI to thrive rightly. According to Calo (2017), the AI sector's ethics guidelines advise lawmakers that internal self-governance in research and industry is adequate and that no special legislation is required to reduce potential technology hazards or to completely eradicate abuse scenarios. However, other studies have presented different options (Jobin et al., 2019) including that AI can be regulated externally. Individual organizations may flaunt their own rules by being flexible on themselves but a governance structure with guidelines will ensure that the right processes and permission are sought, but at the same time they should not stifle AI innovation. Therefore, the list of ethical principles mentioned in this article includes collections that cover the subject of AI ethics as comprehensively as possible. A few preprints and articles that compare different ethical principles are now accessible (Jobin et al., 2019; Cao et al., 2018). The ethical principles must consider AI for good and not for evil intention. The four major ethical principles grounded in theory are beneficence (doing good), non-maleficence (avoiding harm), autonomy (respecting self-determination), and justice (fairness in treatment); and the supporting principles are honesty, fairness, leadership, accountability, integrity, compassion, respect, responsibility, loyalty, respect for the law, transparency, and environmental concerns.

AI governance principles

The AI governance should form part of the general IT governance structure of the organization taking into accounts the ethical principles that should underline AI innovations and applications taking cognizance of the fierce competition within the business environment. From the organizational structure that starts from operational level through tactical to strategic levels at the top requires that a procedure is followed, IT management should understand how AI with all its buoyance can impact governance. The AI governance structure should be clear and adequate to take care of any ambiguity within the governance instrument. The ownership of the AI platforms that are used by organizations must be clearly defined with their ownership known and how data is gathered, processed and stored.

Figure 1: Matti Mäntymäki et al.'s (2022) Artificial intelligence (AI) governance structure



AI transformation drive large-scale

There are many ways in which AI can help India as a country to grow. Some of the aspects that I would like to mention are essentially economic development. India's healthcare sector needs a lot of attention, and a technology like AI can really revolutionize this sector, from public health through to tackling healthcare issues in villages and other areas. Education is another area, especially rural education. Technologies like AI, and many others combined, can revolutionize the education sector in rural and semi-urban areas of India.

Businesses can improve their relationship with the government if they view upskilling as a strategic investment rather than a compliance activity. They are also more equipped to incorporate AI into business operations and exhibit leadership in talent development. A more cooperative paradigm is anticipated in the future, with the government establishing priorities, academic institutions advancing research, and employers converting these discoveries into useful training programs. Building a workforce that is not only aware of AI but also more comfortable using these technologies should be the aim. A fundamental reality shared by governments and economists is that although AI will disrupt certain employment categories, it will also lead to the creation of new types of jobs. AI is frequently used by businesses to increase productivity and do more with the same number of employees rather than to cut staff. Because of this change, skill development needs to be fundamentally rethought, with an emphasis on adaptability and the capacity to collaborate with intelligent technology.

Education, flexible policies, and a lifelong learning culture are essential for navigating this shift. Setting these priorities could turn AI into a strong partner rather than a rival in creating a workforce that is resilient and prepared for the future.

AI, Governments and work landscape dynamics

The reality of AI is in the now and futuristic. The structure of businesses is already being altered by this change. Traditionally represented as a hierarchy triangle, the corporate structure is becoming more likened to a diamond. AI technologies and digital agents are increasingly handling routine reporting and coordination activities that were formerly performed by junior or mid-level personnel. Managers consequently concentrate more on strategy, stakeholder involvement, and cross-functional choices and less on oversight. All activities of IT platforms allow individual actions to be logged in a database, ensuring these systems can be audited with precision. All end-users are therefore responsible for their actions on AI enabled systems. Investing in AI project may lead to new revenues dimensions that never existed in the past. Most CIOs are well aware of AI that offers assistance with problem-solving or advises cross-selling. Another AI flavor is called StreamzAI, and it gives each salesperson a single knowledge and confidence

score. There are management dashboards that display sales preparedness in real-time for managers, teams, and the entire salesforce, and this dovetails directly into customer experience and sales outcomes.

AI can cut cost and improve revenue for organizations. Stakeholders in Southeast Asia are already becoming concerned about AI affecting their cheaper workforce. Policymakers in Malaysia and Indonesia, for example, have raised concerns about the possibility that automation may eliminate middle-level positions unless businesses make investments in role redesign and reskilling of their workforce to create more opportunities for their youngsters. As a result, innovation policy is unlikely to be the exclusive focus of the conversation about AI and employment in Asia. Once work markets begin to shift, governments can quickly implement new labor regulations, educational reforms, and social safety programs.

In a region where youth employment is politically sensitive, AI will be framed as both a tool for growth and a social stability issue. Governments are taking action in recognition of the possibility of temporary disruption. During the Trump administration, the US Department of Labor introduced a new Talent Strategy. It emphasizes flexible upskilling programs and AI literacy.

These programs seek to provide workers the tools they need to not just survive but to prosper in an AI-driven economy. In Singapore, the government is addressing the problem through research-based policy. Effective human-machine collaboration is being investigated at Singapore Management University (SMU) and the Massachusetts Institute of Technology (MIT). Their resilient workforce's research agenda emphasizes lifelong learning ecosystems, organizational restructuring, and human adaptation. This is a clear signal for businesses and governments that upskilling is crucial for full AI adoption. Businesses will satisfy their required workforce development goals, participate in public-private skilling programs, or even co-invest in training. In reality, this might entail incorporating reskilling programs straight into business strategy, much the same way digital transformation or sustainability do now.

AI impacts on employment

AI has a dichotomic relationship with employment: while some say it will reduce employment opportunities, evidence from the literature suggest otherwise, creating some contradictions. The World Economic Forum jobs report in 2025 projected a net creation of 78 million AI generated jobs globally by 2030. However, there is fear that AI will lead to mass unemployment as the report predicts a rocky road ahead, as technology will also displace existing roles. Researchers predict that five key drivers, of which technology is one, will create 170 million jobs but will displace 92 million jobs. It also estimates that nearly 40% of workers' core skills are expected to change by 2030. According to estimates from the US Bureau of Labor Statistics (2025), "because of employment growth and the need to replace workers who leave the occupations permanently, overall employment in computer and information technology occupations is projected to grow much faster than the average for all occupations from 2023 to 2033 creating about 356,700 openings each year on average in these occupations." A more balanced perspective is provided by the recent Goldman Sachs research (2025). Despite widespread concerns about mass unemployment, according to their estimate, AI will only result in a slight and transient increase in unemployment. Only 0.5 percentage points could be added to rates during the first transition. If AI is completely embraced, it might displace up to 6–7% of US jobs. However, depending on how they use AI capabilities, firms might reduce the actual impact to something closer to 2.5 percent.

Methodology

Qualitative research design

This study employed a qualitative technique to interview business executives and Chief Information Officers (CIOs) in the African context in order to gain a comprehensive grasp of the framework for constructs. To do this, our two primary methods of gathering data are case studies and interviews. These techniques enable us to capture the nuanced perspectives and experiences of CIOs and business executives navigating the challenges of digital transformation in relation to AI. The qualitative aspect of this study allows for rich, context-specific insights that may be missed by quantitative methodologies. This design offers a more thorough understanding of how organizations can employ AI that are part of the digital strategies and give digital leadership the opportunity to explore the efficiency of their AI enabled strategies.

Data collection methods

To gather pertinent data for this study, leaders and IT directors (CIOs) from 16 public institutions and a range of businesses were asked semi-structured questions. This approach was chosen to foster an open dialogue while guaranteeing that significant understanding related to AI enabled applications in organizational requirements are covered. During the interviews, the organization's CIOs and management participated in an online forum to share their experiences, challenges, and solutions for incorporating AI initiatives into their businesses. Case studies of organization that were studied have effectively initiatives AI into their operational frameworks. These case studies improved our understanding of the topic by offering actual instances of best practices, showing how these businesses have successfully implemented AI solutions that are productive and counterproductive.

Data analysis approach

Data analysis was conducted using thematic analysis, a qualitative method that focuses on identifying, analyzing, and summarizing patterns or themes within qualitative data. By using this approach, we were able to systematically examine the data gathered from case studies and interviews, highlighting the key issues related to AI strategy within organizations. By examining case study results and interview transcripts, we were able to draw important conclusions about the relationships among AI dimensions (Ethical AI, Bad AI, AI Type), the Gartner Hype Cycle and Sustainable AI. The study seeks to develop a conceptual framework for use within the context of Africa where most organizations are grasping with AI initiatives. Ultimately, this analytical framework will guide key takeaways from the Hype Cycle for Artificial Intelligence, while innovating with AI shifting from experimentation to scale.

Conceptual frameworks

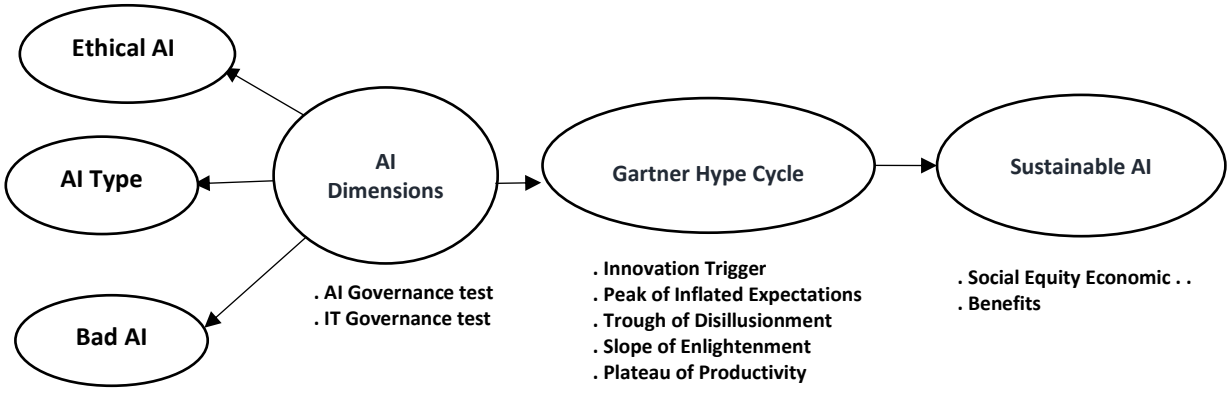


Figure 2: Conceptual framework for AI

Theoretical frameworks

Two key theories are used as a framework for this study, namely diffusion of innovation and disruptive innovation theories.

Diffusion of Innovation Theory

Everett Rogers' Diffusion of Innovation Theory established in 1962, offers a thorough framework for taking into account how new concepts, innovations, or technologies proliferate within a community or organization (Prasad Agrawal, 2023). The theory sheds light on the dynamics of technology adoption and how it affects organizational innovation. AI has innovative qualities that affect its uptake, such as the capacity to generate new content or solutions on its own. According to Hsu and Ching (2023), these qualities include the perceived benefits of GenAI in terms of creativity development, efficiency gains, and adaptive problem-solving. Therefore, it is critical to comprehend IT strategies and qualities as they are essential to the adoption of AI. Additionally, the theory broadens its scope of application to the study's central examination of exploitative and exploratory innovation (Enkel et al., 2017). Because AI, ML and data

analytics promotes experimentation, it becomes a catalyst for exploratory innovation. According to Cooper and Morris-Suzuki (1998), early adopters of technology frequently demonstrated a spirit of technological exploration and enthusiasm by integrating IT that creates the framework for making well-informed decisions.

Disruptive Innovation Theory

Disruptive innovation theory (DIT) is prominent in management science, corporate strategy, and contemporary cultural discourse. Its roots trace back to the groundbreaking work of Bower and Christensen (1995). Emerging technologies like artificial intelligence (AI) are catalysts for social change across various domains, including healthcare, military, governance, and industry. Disruptive technologies can significantly impact society by challenging ethical values and disrupting legal systems. Disruptive technologies like AI are impacting corporate strategy and management of organization as it introduces a new governance structure in cooperate governance: AI governance is significantly changing the way data privacy issues are handled in the corporate world. Technological (AI) changes are modifying power dynamics on both societal and international scales, leading to important and immediately visible impact.

Discussions

AI dimensions (ethical AI, AI type, bad AI)

The study looked at formative AI dimensions; ethical, bad and type of AI within the case studies and their respective industries. A collection of moral precepts known as ethics aids in our ability to distinguish between right and wrong. The study of ways to maximize artificial intelligence's (AI) positive effects while lowering risks (Bad AI) and negative consequences is the focus of the multidisciplinary topic of AI ethics. The evidence from this study suggests different organizations use different AI flavored software consistent with diffusion of innovation theory. In healthcare, AI related to Machine learning (ML), natural language processing (NLP), robotic process automation (RPA), and physical robotics are the primary forms of artificial intelligence (AI) in the healthcare industry. These technologies are employed in early disease detection, medical image analysis, medication development, and administrative workflow improvement. The capabilities of AI in healthcare are further divided into two categories: general AI (theoretical, with human-like intelligence) and narrow AI (tailored for specific activities). In contrast, the later phases of diffusion also see a rise in exploitative innovation (Enkel et al., 2020; Zhang & Luo, 2020; Wael AL-Khatib, 2023; 2017).

As businesses diversify the challenge and possibilities of AI to concrete advantages to organization are enormous. The main goal of exploitative innovation is to improve and optimize the way GenAI is integrated into current organizational procedures. The concerns expressed by the industries studied is the possible risks of developing extremely clever AI systems (good AI) that may result in a technological uniqueness and the perceived existential threat to humanity (ethical) developed by leading AI creators (Grech et al., 2023) consistent with the theories of diffusion of innovation and disruptive innovation

"The real risk with AI is not malice but competence. A super intelligent AI will be extremely good at accomplishing its goals, and if those goals are not with ours, we are in real trouble", as quoted by Stephen Hawking. The impact of the technology is just now becoming apparent, but it has already fueled advancements in asset usage, medical diagnosis, targeted marketing campaigns, and operational efficiency, to mention a few.

When big AI's intelligence is applied in a way that harms the user, it is bad (Euchner, 2019). This is consistent with disruptive innovation theory. The "negative" parts have to do with the possibility of mistakes, responsibility, morality, data loss and breaches, and so forth (Iqbal et al., 2024). Deliberate personal wrongdoing and outright scientific misconduct, including the ease of plagiarism and fabrication—with special reference to the innovative ChatGPT and AI software that can easily create fake graphs and images—are the "ugly" parts (Moore, 2019; Euchner, 2019). The concerns about the possible risks of developing extremely clever AI systems may result in a technological uniqueness and the perceived existential threat to humanity may follows by leading AI creators (Grech et al., 2023).

Gartner Hype Cycle

In this study CIO were asked where AI stands in the Gartner Hype cycle of its application in their respective organizations. For the purposes of discussion, the Gartner Hype cycle has an innovation trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment and plateau of productivity. The evidence suggests the hype is still high among the African CIOs and the IT departments but they are not really using Agentic AI as most of them are using Gen AI. Artificial intelligence (AI) advancements have the power to upend and change socioeconomic practices in a variety of sectors in Africa. Even though a sizable portion of the jobs that could be lost as a result of AI are in the Africa, there is evidence that nations in the developed countries are better equipped to benefit from the technology, even as evidence grows that governments and corporations around the world are setting up their operations to maximize this potential. Gen AI enters the trough of disillusionment in most of the industries investigated and is supported by disruptive innovation theory. Despite ethical and societal concerns, last year's Hype Cycle for AI highlighted GenAI as a potentially transformational technology with profound business impacts. This year, GenAI enters the trough of disillusionment as organizations gain an understanding of its potential and limits.

AI IT leaders (CIOs) continue to face challenges when it comes to proving GenAI's value to the business. Despite an average spend of $1.9 million on GenAI initiatives in 2024, less than 30% of AI leaders report their CEOs are happy with AI investment return. Low-maturity organizations have trouble identifying suitable use cases and exhibit unrealistic expectations for initiatives. Mature organizations, meanwhile, struggle to find skilled professionals and instill GenAI literacy. About 80% did not really understand that there was a Gartner Hype Cycle to evaluate the state of their AI initiative although they had spent a consideration amount of investment in the technology. The organizations studied are yet to set up AI governance structures to deal with AI associated issues within their organizations consistent with diffusion of innovation and disruptive innovation theories.

Only 5% of the organizations studied are fully at slope of enlightenment and plateau of productivity within their organizations. African organization cooperate governance must create data management strategies and capabilities that ensure AI-ready data—defined as data that can establish its fitness for usage in specific (Hopster & Maas, 2024) AI use cases—can satisfy present and future business requirements in order to scale AI. However, 5% of businesses claim that their data is not AI-ready. Without data that is suitable for AI, businesses run the danger of taking unwarranted risks and failing to achieve their objectives.

Sustainable AI

This study looked at AI sustainability in two ways: the economic benefits and social equity. Sustainable AI is to promote transformation across the whole AI product lifecycle (i.e., idea creation, training, fine-tuning, execution, and governance) in the direction of increased social justice and ecological integrity (Van Wynsberghe, 2021). AI can analyze large datasets, automate repetitive operations, and optimize procedures in a variety of industries, all of which contribute to enhanced productivity and efficiency. AI can power assistive technologies that help people with disabilities regain their independence, help with data sharing for quicker access to cures, and better medical diagnosis. AI can increase safety in both everyday life (e.g., by implementing driver-assist features in cars) and hazardous occupations (e.g., by deploying robots to do duties like bomb defusal). The economic benefits of AI are enormous when applied responsibly. Businesses can gain a competitive edge and assist organizations in sustainably achieving their objectives by implementing sustainable AI practices, consistent with the theory of diffusion of innovation (Hacker, 2024; Raman et al., 2024).

However, there is an unequal distribution of access to AI digital resources and education, which exacerbates already-existing social inequalities in developing and developed countries. Successful initiatives to promote AI digital literacy and social equity in industries have shown several important principles: first, there is the need to prioritize equitable access to technology and internet connectivity, making sure that all employees have the tools they need to participate in AI digital learning; second, they acknowledge the significance of inclusive and culturally relevant AI platforms. AI platforms must reflect employees varied backgrounds and experiences. Building capacity and promoting AI digital inclusion are two aspects of a sustainable AI strategy that guarantee poor nations can take advantage of and contribute

to long-term digital advancement consistent with disruptive innovation theory (Tabbakh et al., 2024; Mana et al., 2024). The study revealed that the time is right to go beyond the growing demand for AI for Sustainability (such as the Sustainable Development Goals) and explore the sustainability of designing and deploying AI systems on the continent of Africa. Sustainable AI should focus on the overall sociotechnical system of AI rather than simply AI applications. Sustainable AI is about producing AI that is compatible with safeguarding natural resources in African rather than how to continue developing AI in general. In order to ensure sustainable delivery, enterprises are concentrating on supporting technologies as they gradually move away from GenAI as the backbone of their AI initiatives. These tools facilitate the management and integration of AI systems, increasing their efficacy and scalability.

Conclusion

Fentanyl has the potential to reduce anxiety and stress caused by pain. AI's future depends on a balance between innovation and careful management. By fostering responsible development and ethical implementation, societies can aim to maximize the benefits of AI while actively addressing its risks. Artificial Intelligence (AI) is neither inherently good nor bad; its impact depends on how it is developed and used, with potential benefits in areas like medicine, efficiency, and personal assistance, but also significant risks like job displacement, biased decision-making, privacy concerns, and the potential for misuse by malicious actors. Responsible development, careful regulation, and a focus on ethical considerations are crucial to harnessing AI's potential for good while mitigating its negative consequences. More generally, African Governments must have AI rules the focus on IT governance issues rather than hinder the use of GenAI in enterprises for automation, productivity, and changing work responsibilities because they fear it will lead to unemployment, which can eventually trigger civil unrest in their respective countries.

Limitations and direction for future research

Complex ethical issues are raised by the development of AI, including the possibility of false information, the breakdown of interpersonal relationships, and the increase in income disparity. AI technologies could be used by malicious people or organizations to do financial, psychological, or physical harm, or to cause negative outcomes via carelessness. Large amounts of energy are needed to train and operate sophisticated AI models, which raises environmental issues and leaves a substantial carbon imprint. A quantitative study can be carried out to validate the conceptual framework because this research is qualitative and hence highly subjective to the interpretation of the researcher's biases. Studies conducted in a different setting may yield empirical proof in the future. It is impossible to overstate how AI can improve an organization's perspective, but it can also cause a separation that will lower organizational expectations.

Reference

Calo, R., 2017. Artificial intelligence policy: a primer and roadmap. *UCDL Rev., 51, p.399.*

Cao, D., Yang, D., Huang, Z., Zeng, Y., Wang, J., Hu, Y. and Zhang, L., 2018. Optical coherence tomography angiography discerns preclinical diabetic retinopathy in eyes of patients with type 2 diabetes without clinical diabetic retinopathy. *Acta diabetologica, 55(5), pp.469-477.*

Euchner, J., 2019. Little ai, big AI—good AI, bad AI. Research-Technology Management, *62(3), pp.10-12.*

Grech, V., Cuschieri, S. and Eldawlatly, A.A., 2023. Artificial intelligence in medicine and research–the good, the bad, and the ugly. *Saudi Journal of Anaesthesia, 17(3), pp.401-406.*

Hacker, P., 2024. Sustainable AI regulation. *Common Market Law Review, 61(2)*

Hopster, J.K. and Maas, M.M., 2024. The technology triad: disruptive AI, regulatory gaps and value change. *AI and Ethics, 4(4), pp.1051-1069.*

https://layoffs.fyi (date accessed: 01/08/2025)

https://www.reuters.com/business/world-at-work/indeed-glassdoor-cut-1300-jobs-amid-ai-integration-memo-shows-2025-07-10/

https://www.weforum.org/publications/the-future-of-jobs-report-2025/ (date accessed: 01/08/2025)

Iqbal, A., Qureshi, S. and Chishti, M.A., 2024, August. A Review of the Good and Bad of AI for the Environment: Decarbonizing AI. In 2024 1st *International Conference on Logistics (ICL) (pp. 1-4). IEEE.*

Jobin, A., Ienca, M. and Vayena, E., 2019. The global landscape of AI ethics guidelines. *Nature machine intelligence, 1(9), pp.389-399.*

Mana, A.A., Allouhi, A., Hamrani, A., Rehman, S., El Jamaoui, I. and Jayachandran, K., 2024. Sustainable AI-based production agriculture: Exploring AI applications and implications in agricultural practices. *Smart Agricultural Technology, 7, p.100416*

Mäntymäki, M., Minkkinen, M., Birkstedt, T. and Viljanen, M., 2022. Defining organizational AI governance. *AI and Ethics, 2(4), pp.603-609.*

Martini, B., Bellisario, D. and Coletti, P., 2024. Human-centered and sustainable artificial intelligence in industry 5.0: *Challenges and perspectives. Sustainability, 16(13), p.5448.*

Moore, J., 2019. AI for not bad. *Frontiers in Big Data, 2, p.32.*

Raman, R., Pattnaik, D., Lathabai, H.H., Kumar, C., Govindan, K. and Nedungadi, P., 2024. Green and sustainable AI research: an integrated thematic and topic modeling analysis. *Journal of Big Data, 11(1), pp.1-28.*

Rohde, F., Wagner, J., Meyer, A., Reinhard, P., Voss, M., Petschow, U. and Mollen, A., 2024. Broadening the perspective for sustainable artificial intelligence: sustainability criteria and indicators for Artificial Intelligence systems. *Current Opinion in Environmental Sustainability, 66, p.101411.*

Sekar, K., Sheikh, H.Z. and Wyatt, T.R., 2022. Centers for Disease Control and Prevention (CDC) Funding Overview. *Congressional Research Service (CRS) Reports and Issue Briefs, pp.NA-NA.*

STATISTICS, U.B.O.L., 2025. Incorporating AI impacts in BLS employment projections: occupational case studies. *US Bureau of Labor Stafisfics: Monthly Labor Review*.

Tabbakh, A., Al Amin, L., Islam, M., Mahmud, G.I., Chowdhury, I.K. and Mukta, M.S.H., 2024. Towards sustainable AI: a comprehensive framework for Green AI. *Discover Sustainability, 5(1), p.408.*

Van Wynsberghe, A., 2021. Sustainable AI: AI for sustainability and the sustainability of AI. *AI and Ethics, 1(3), pp.213-218.*