

Corporation's greening strategies: Overlooking the negative implications of AI's contributions?

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Abstract. Artificial Intelligence has immense potential to assist in the fight against climate change however, the increased use of AI technologies in business operations by Corporations have presented significant challenges. The increased carbon footprint, global inequalities, and excessive consumption has severe impact on environmental sustainability. Further, the corporations have also increasingly used AI technologies for nudging consumer behaviour and make unsustainable claims for products and services. These ethical and social issues need to be addressed through different assessment and mitigation strategies adopted by the corporations in their sustainability reports. Additionally, meaningful collaborations between all the stakeholders including corporations, state regulators and policymakers will drive effective and efficient use of AI technologies in business operations for sustainable growth and future.

1 Introduction

Artificial Intelligence aids in understanding complex data that may go beyond human interpretation. Information and data including satellite images, past climate conditions, carbon emissions, allow an insight into weather predictability, causes of climate change and the socio-economic impacts of it. Such AI driven climate informatics on a global scale enable policymakers to further act and incorporate a legal framework that helps in environment conservation. In the recent times, corporate entities are advertising AI as an 'efficient tool' to achieve corporate sustainability and environmental conservation. To pursue these aims, the corporations are projecting their businesses as sustainable in order to not draw scrutiny from state regulators and to win consumer trust. Artificial intelligence and technology in general considered to be a clean revolution because visibly it does not have any adverse environmental effects and therefore, seems a lucrative alternative option. However, there are costs attached to it, and if ignored, can pose potential challenges to a sustainable future for planet.

Recently, COP 28 was held in Dubai, UAE where the global leaders promised to limit the world temperatures below 1.5 degree Celsius to meet the goals set out in the Paris Agreement[13]. However, a recent prediction by PwC, generative AI is expected to contribute around \$15.7 trillion dollars to the world economy by 2030[11]. The intersection of technological advancements & climate change will play a crucial role in the world economy therefore, adequate checks and balances need to be determined for a sustainable future of our planet.

The authors have divided the paper largely in three parts. The first part will begin to look at the positive impact of the role of AI technologies in the business operations of the corporations. The second part of the paper will critically analyse the impact on environment due to ethical and social problems with advancements in AI. The last part will conclude the paper with a few observations and recommendations. The scope of this paper is not to suggest regulations but to examine and highlight the negative implications with a view for the companies to reflect on their strategies and take positive actions.

2 AI Accelerating Efficiencies in Business Operations

Artificial intelligence is being projected as the key solution to environment sustainability. It rightly is so, for instance, efficiency in supply chains can be achieved through Artificial intelligence by deploying smart robotics in warehouses thereby reduces labour costs. Some of the key considerations for corporations is to gain significant advantages from integration of AI in their business and to optimize the use of AI and increase the scalability while reducing the risks, as the right choices will give an edge. Secondly, the corporations would have to work towards building trust as there are potential risks which can dismantle the legitimacy of AI driven business operations. Lastly, Artificial Intelligence will also pave the way for newer categories of products and services which shall be more compatible and engaging and therefore, would require a robust governance and oversight on the part of the corporations[6,12,15].

Similarly, automation of orders and payment by way of machine learning programs reduces transactional costs and predictive analysis through AI can decrease wastage by anticipating the amount of food wastage[3]. AI applications also

allow for improved efficiency in tapping solar and wind energy, optimizing weather forecast predictability, predict consumer preferences for a better personalized experience across platforms[14]. In recent times, AutoHaul by Rio Tinto, the world's first fully functional autonomous heavy-haul long distance railway system is saving 1.5 million km of road travel to transfer the transport drivers and substantially reducing the risk at level crossings and accidents[16]. It also saves up to an hour in each journey by removing the need to transfer drivers while transferring approximately one million tonnes of iron ore a day[16].

3 Developments in Natural Resource Based Industry

According to the Global Data's thematic research report 'Artificial Intelligence (AI) in Mining', the mining companies which are to lead the integration of AI are Goldcorp, Rio Tinto, BHP, Barrick Gold, Tata Steel etc[16]. The mining companies are estimated to spend \$218m in 2024 as compared to \$76m in 2019 on AI technologies, reflecting a compound annual growth rate of 23.4%[16]. The mining industry is seeking deep intervention of artificial intelligence to increase efficiencies since the rising costs of extraction of natural resources from remote and difficult locations. Therefore, AI is being deployed in exploration to identify and locate newer locations of natural resource deposits, predictive maintenance of industrial equipment either to minimize costs to fix them or maximize their life expectancy, and lastly, deploying smart cameras and sensors to monitor the safety and security of workers at the mining locations[3].

The CSR reports of the natural resources-based companies seem to have touted the integration of artificial intelligence in greening the global supply chains. These corporations are also optimistic of the future of AI in protecting biodiversity, sustainable management and supply of clean water, and optimal utilisation of critical natural resources. However, as has been historically observed, as the costs decline, and the companies reinvest their profits. AI is enhancing the capacity of corporations to extract more natural resources and push for excessive and wasteful consumption which have changed the outlook of the global supply chains. This tendency is not just aimed at improving efficiencies in business operations but instead are driving the culture towards hyper-consumerism and disposability by producing and marketing products for rapid consumption. The corporate efficiency achieved gets closely substituted with the rebound effects, therefore, questioning the sustainability goals of the companies[3].

4 Rebound effects of AI Integration

The most significant criticism to deploying AI technologies in the fight against climate sustainability is the rebound effects or Jevons paradox. Jevons paradox or rebound effects is a concept in economics which refers to a situation where gains in efficiency is substituted by increase in overall demand or consumption[8]. For instance, technological automation in vehicles may cause decrease in fossil fuel consumption and lesser carbon emissions however, it may inadvertently also cause people to travel more, thereby, offsetting any efficiency gains and resulting in significant carbon footprint[8].

Corporations may make sustainable claims of improved efficiency and reduced carbon emissions using AI technologies, it also leads to unfettered production and consumption of products which ultimately circles back to the unsustainable growth[3]. Rebound effects is offsetting any gains achieved in reducing carbon emissions. It is making a change to win consumer trust and to avoid regulatory scrutiny by the state. It is like a façade where efficiencies are observed but the consequences in reality are worrisome.

Now to find a balance between the two, it is imperative that companies should be encouraged to do the cost-benefit analysis to find a balance in a way to integrate more AI applications, which does not emit large emissions (low-carbon emitting AI applications) to offset more production and consumption due to the improved efficiency by AI advancements[9].

5 Elusive Carbon footprint in Business operations

Artificial Intelligence is destined to play a crucial dual role in the fight against climate change. It is poised to help in sustainable growth by developing low carbon emission infrastructure, assist in timely weather predictions and suggest optimal usage of natural resources. However, on the contrary, AI has faced criticism for emitting significant carbon dioxide in the air. To a layperson, AI technologies is largely a 'clean revolution' which does not pose any substantial environmental challenge to our world. However, according to the study conducted by researchers at MIT on the energy consumption and carbon emissions in the training of Natural Language Processing (NLP) models, it was found that the training of a single Natural Language Processing model would leave behind a carbon footprint around 300,000 kg of carbon emissions. However, this is only a part of the problem, there is additional carbon footprint added including the infrastructure needed to develop, deploy, and sustain these large AI models[5].

The leading corporations in the world are driving innovation and making heavy investments in AI technologies by big tech players which would significantly bring in efficiencies in their business operations. According to the KPMG and McKinsey survey, 35% of the ENRC leaders and two-thirds of the respondents at all levels of organisation respectively have predicted growing investments in AI[6,12]. Further, Google and Amazon are said to have invested in renewable energy wherein many AI applications derive their cloud computing services. However, it is uncertain whether such investments will minimise the amount of environmental damage that the production of such technologies are generating at a global scale[3].

The AI applications and tools are adding more accuracy and efficiency to the businesses however, it is indisputable that larger business operations these AI models are used for, there will be a larger need for computation and processing of data. The growing need to store large bundles of data and continuous processing will require more resources. This could require more infrastructure and more energy which is directly proportional to the rising carbon footprint. Therefore, when the companies in their sustainability reports claim the efficiency, economic and ecological gains achieved by integrating AI, they should also take responsibility for the costs of carbon footprint that is left behind in training and expanding the use of these AI technologies.

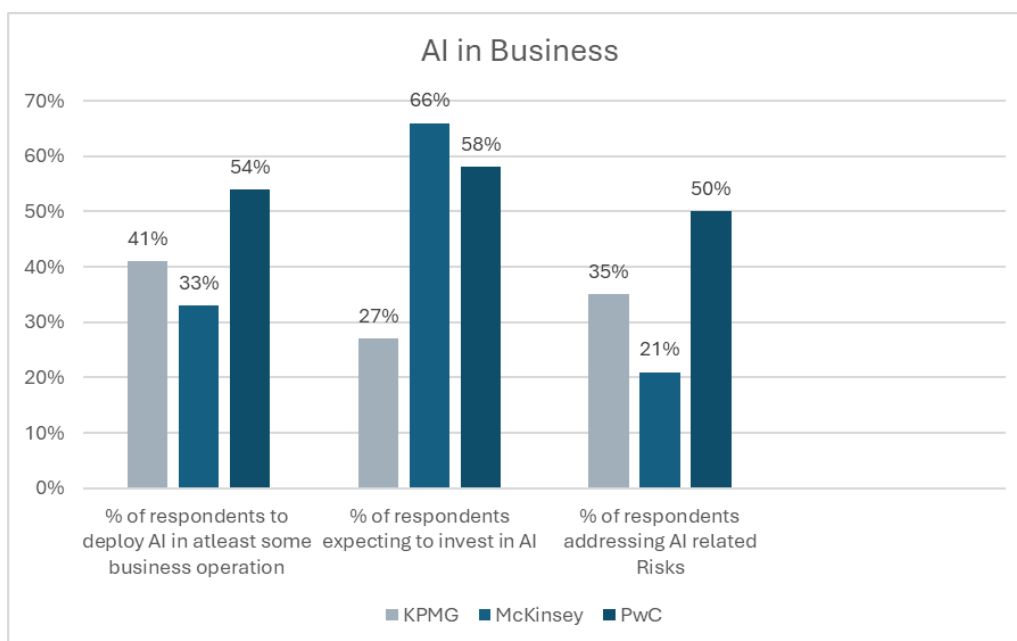
6 Looming Ethical and Social Bias

Artificial intelligence has also faced heavy criticism for the inherent ethical and social biases it exhibits. This is predominantly because most of the data driven AI systems essentially are trained on the already available vast troves of historical data, based on which it processes and gives out the results. This introduces the scope of unwarranted bias into the system as the available data has the potential to be skewed and discriminatory against a particular section of the society. Such ethical principles of justice and beneficence need to be upheld to address climate change issues by AI driven systems[2,8].

For instance, the leading corporations in the developed world and its big tech companies are driving innovation and expertise in developing climate-focused AI systems which can potentially have biased and discriminatory results towards the developing and under-developed nations or even the social minorities within their own countries. This is particularly of concern for natural resource-based industries which are engaging in more extraction of natural resources in eco-sensitive zones without regards to the implications on livelihoods of the local communities[2,8].

Therefore, the corporations have to undertake certain assessments to decipher the quality of the data that is used for their AI tools and application. Such an assessment would not only help to curtail the unwarranted biases which may enter into the systems but also improve efficiencies by channelling the resources in the right direction to gain optimal advantage[14].

Another challenge to climate sustainability is the issue with responsibility. In another words, whether the corporations are doing enough to share the responsibility of ethical and social challenges presented by AI technologies in their business operations[2]. According to the KPMG Survey, 65% of the global ENRC executives had observed that the greater efficiencies will be achieved in multiple business operations using generative AI[6]. However, 0% of the same 300 global ENRC executives have reported to have any mature responsible AI governance tool in place[6]. The big tech and maverick AI startups are heavily funded by global corporations to deepen research and innovation in development of AI technologies which shall enhance their business operations. However, the lack of risk mitigation and responsible AI strategies pose a severe challenge towards inclusive and sustainable growth. Therefore, businesses should be encouraged to develop assessment strategies and disclose more publicly for the academicians and policy makers to examine and limit negative consequences.



(Figure 1) : KPMG: Survey conducted in March 2023 of around 300 executives in the Energy, Natural Resources, and Chemicals (ENRC) industries[6].

McKinsey Global Survey on AI: 1,684 participants at all levels of the organization April 2023[12].

PwC- 2024 AI Business Predictions & 2023 Emerging Technology Survey[15].

7 Potential Increase of Global Inequality by use of AI

Global inequalities are forming part of the significant challenge in the fight against climate change. UNFCCC and other conventions have stressed on the high-income countries to take more accountability based on the polluter pay principle for historical records. Additionally, the big corporates have faced ire for poor track record of human rights violations and environmental degradation in lower income countries. The industrial revolution changed the economic landscape in favour of a few countries, and similarly so, the current AI revolution is majorly benefitting the same set of countries. The leading corporations are based out in the developed economies and are expected to gain significantly in terms of revenues and profit margins from the leading technological advancements[1,3].

According to the 2023 Emerging Technology Survey by PwC, seventy-three percent (73%) of the US companies have integrated Artificial Intelligence in at least some areas of their business operations and 44% of business leaders plan to implement data modernization efforts in 2024 to take better advantage of GenAI[15]. The disproportional effect of technological advancements may further global inequalities and have negative environmental consequences. The corporations in the lower income and developing economies may still continue to rely on traditional modes of energy and business strategies. On the contrary, a particular set of corporations may gain significant expertise therefore, challenging the competitive structure of market[3]. This shall also increase the pressure on environment in the form of depleting natural resources which could be instead substituted AI and tech driven solutions.

Therefore, the policy makers and regulators can encourage these big corporations to share, collaborate and assist in meaningful AI driven solutions and strategies with the industries in lower income and developing economies so that they adapt efficient systems in early stages which would reduce dependency on natural resources[14]. This would also have the dual benefit i.e. reduced carbon emissions and significant economic gains, thereby uplifting millions out of poverty, and reducing global inequalities. Additionally, big corporations can aid in developing renewable energy infrastructure in the underdeveloped and developing economies which may be used to support and train AI models.

8 AI in Consumer Behaviour: AI Nudging

Corporations are indulging in hyper nudging through AI where consumer behaviour is extensively studied and manoeuvred to lead to hyper consumerism and heavy consumption[1,3].

With the use of AI corporations are able to understand consumer likings, disliking and needs. Data from websites, social media, applications, e-commerce platform contribute towards prediction and evaluation of consumer behaviour using AI technologies. It is these AI tools that help corporations market their businesses and get higher conversion rates by making targeted personalised recommendations to consumers[1,3]. According to the McKinsey report, sales and marketing have reported to be the top beneficiary of the Gen AI. The corporations have increasingly used AI technologies to indulge in personal marketing through chatbots, user reviews, special offers[12]. While nudging does render freedom of choice, it influences people's choices and needs disrespecting their own rationality and autonomy. Such tools claim to know better what an individual wants and influences the rational decision making of consumers interacting in a marketplace.

For instance, food companies use AI nudging in influencing consumers into buying unhealthy foods or change the positioning of food items. McDonalds and Coco Cola company have digital menu in place that changes in accordance with weather, time of day [18]. Certain KFC owners in China use facial recognition to change the positioning of food items based on a person's age or sex and to predict consumer's order [17]. Such manipulation with use of AI nudging increases consumerism and influences individuals into consumption of goods and services of corporations. With more demand it increases the extraction of resources that are required to fulfil the supply by such corporations. Which would then further lead to more carbon footprint and use of natural resources by the "Anthropocene" leading to significant environmental impact and damage.

9 AI washing: Exaggerated and Inaccurate Claims of Environmental Sustainability

Lastly, the corporations are increasingly facing tough ethical questions on AI-washing, which constitutes vague claims of sustainable and "environmental-friendly" products and services. These corporations showcase that they are in compliance of the regulatory guidelines by making false and inaccurate claims. It is witnessed that machine-washing under the disguise of lengthy private policies may often not serve the interest of the consumers. Corporations can delude with the use of visuals and graphics and words. This includes the use of deceptive advertisements and show machines, as well as certifications that make unjustified promises. Additionally, what is omitted from being communicated to the public also contribute towards misdirection. Different categories of omission include detailed information masking, selective disclosure, incomplete comparisons, and complete omission of information[10].

The tendency to claim every product and service as ecologically sustainable and eco-friendly has led to increased sales and has benefitted the corporations in their ESG compliances. However, often than not, prefixing words like "eco", "bio", or such "green" terms does not warrant that a particular product or service is ecologically friendly or sustainable.

Additionally, AI may be employed to deceive by mimicking human behaviour, displaying biased information, or concealing responsibilities. As a result, machine-washing practices may go beyond greenwashing in terms of nonmarket activities; however, they possess the fundamental similarity that deceptive assertions and behaviour are dependent upon the perception of the audience, ultimately remaining "in the eye of the beholder"[10]. In recent times, a start-up misrepresented old fashioned "human intelligence" of software intelligence as a "human assisted AI" capable of developing mobile apps and attracted significant investment of nearly \$30 million in funds [19]. Study by MMV Ventures indicate that approximately 40 percent of the European Start-ups claiming to have integrated AI had minimal AI utilisation [19].

10 Conclusion

The environmental costs of Artificial Intelligence in corporations' greening strategies are still elusive in the sustainability reports and regulations by the state. The growing concerns on carbon footprint, global inequalities, ethical and social biases, rebound effects have impactful consequences which need to be discussed and addressed. AI technologies may immensely help advance business operations towards climate sustainability. However, Corporates should adopt mitigation strategies which does not lead to more usage of fossil fuel-based energy than it is assumed to be saving in various other societal domains.

Corporations need to adapt assessment strategies in their sustainability reports to identify and assess the usefulness of the AI tools or software in their business operations. This balancing of cost/benefit analysis will be instrumental in moving in the right direction for sustainable growth and future. To assist the corporates in this assessment, they should undertake the cost-benefit analysis to identify and distinguish between high-leverage long term impact AI technologies and uncertain short-term impact AI technologies[9]. For instance, high-leverage developments would include predictive maintenance of industrial tools and application, carbon neutral infrastructure, and empowering greater use of renewable energy resources. On the contrary, adequate scrutiny should be advised for short-term developments such like personalized products by quicker shipments[9].

Further any development in technology should be made taking in consideration the consequences it might have on a global scale. The developers, engineers, computer scientist, corporations involved in development of AI tools possess a bigger responsibility to ensure that the advanced use of technology is not detrimental to both the climate and global population over the years. Further, the emissions out of development and use of AI should also be attributed to the corporation developing the same and it should be accounted for in their environment compliances. They should also disclose more publicly for academicians and policymakers to advice properly. While steps have been taken in this direction, it is not institutionalized by the legislative bodies. As individuals we also share the responsibility to change our lifestyle by avoiding hyper consumerism and deploy AI policy for climate-friendly use of technology. It is also imperative to have the right ethical and political discussion to integrate technology development with policy considerations.

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