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ABSTRACT

Thanks to new technologies and rising consumer interest in environmentally responsible company operations, the concept of corporate social responsibility (CSR) has changed dramatically in the modern era. Incorporating digital innovation to improve social and environmental conditions, CSR has evolved from an emphasis on charity and compliance into a strategic undertaking. In order to make their CSR programs more open, efficient, and effective, companies are using new technologies like blockchain, cloud computing, renewable energy, and artificial intelligence (AI). By looking at four market leaders—Microsoft, Google, IBM, and Tesla—this study investigates how CSR relates to technical progress. Google is committed to carbon neutrality via the use of data centres powered by renewable energy, while Microsoft employs AI to promote social and environmental sustainability on a global scale. To improve openness and accountability in the supply chain and guarantee ethical conduct, IBM employs blockchain technology. With its groundbreaking electric cars and battery breakthroughs, sustainable energy pioneer Tesla has transformed clean transportation and energy storage solutions. The results show that CSR powered by technology improves company image, encourages entrepreneurship, and creates new market opportunities. In addition to helping with global issues like climate change, digital inclusion, and ethical sourcing, businesses who use technology with an emphasis on corporate social responsibility (CSR) have an advantage in the marketplace. Nevertheless, in order to guarantee good CSR operations, issues including cybersecurity dangers, ethical problems with AI automation, and legal impediments need to be addressed.

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Thanks to new technologies and rising consumer interest in environmentally responsible company operations, the concept of corporate social responsibility (CSR) has changed dramatically in the modern era. Incorporating digital innovation to improve social and environmental conditions, CSR has evolved from an emphasis on charity and compliance into a strategic undertaking. In order to make their CSR programs more open, efficient, and effective, companies are using new technologies like blockchain, cloud computing, renewable energy, and artificial intelligence (AI). By looking at four market leaders—Microsoft, Google, IBM, and Tesla—this study investigates how CSR relates to technical progress. Google is committed to carbon neutrality via the use of data centres powered by renewable energy, while Microsoft employs AI to promote social and environmental sustainability on a global scale. To improve openness and accountability in the supply chain and guarantee ethical conduct, IBM employs blockchain technology. With its groundbreaking electric cars and battery breakthroughs, sustainable energy pioneer Tesla has transformed clean transportation and energy storage solutions. The results show that CSR powered by technology improves company image, encourages entrepreneurship, and creates new market opportunities. In addition to helping with global issues like climate change, digital inclusion, and ethical sourcing, businesses who use technology with an emphasis on corporate social responsibility (CSR) have an advantage in the marketplace. Nevertheless, in order to guarantee good CSR operations, issues including cybersecurity dangers, ethical problems with AI automation, and legal impediments need to be addressed.

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I. INTRODUCTION

Analysing the impact of various sustainable technologies on the CSR of contemporary organisations, the research sought to understand the role of technology in humanity's responsible growth. Reports in the media on "questionable technological development" and the "neglect of societal influences of technology" have a negative impact on public perception of how technological progress and new technologies contribute to society's sustainable development. Technological advancement has played a crucial role in driving human growth throughout history. And yet, historically, technical progress has been focused on achieving breakthroughs in technology and has been seen as an independent phenomenon from the ever-increasing social demands on society. [1]

The modern technical ideas of "Industry 4.0," "Industrial Internet scheme," and "Made in China 2025" have expanded our knowledge of the connections between technology and social difficulties in human progress. Recent decades have seen an uptick in studies highlighting technology's role in environmental preservation and societal economic output, but the field of technological development continues to operate independently of social science studies of development, with its primary emphasis on the attainment of technological goals. There has to be a shift and rebalancing of society's basic goals, which includes rethinking technological

advancements for the needs of future society, because there is a mismatch between the direction of technological development and society's demands to solve pressing social issues.

Responsible development, sustainable development, and social responsibility are a few solutions that have emerged since the 1960s in response to the increasing impact that humans are having on the planet. [2]

These ideas are based on the "interest for the society stakeholders" responsibilities that scholars and professionals have in protecting the environment and improving collective welfare. The need for more responsible behaviour at all levels of human existence has influenced these development concepts, which centre on development as a whole: "intended for shaping humans' actions and policies orientated towards achieving responsible natural, social and economic goals of society" and "balancing social and technological development in achieving responsible advancement of modern society."

After the 1970s, when the concept of a responsible society gained traction, businesses began to focus more on their social responsibilities beyond maximising profits for shareholders. In response to these concerns, the idea of corporate social responsibility (CSR) emerged. CSR coordinates business objectives with societal development objectives and ensures that organisations properly care for their social, economic, and environmental impacts. Also, academics have up "directions for conceptual frameworks and methodologies for handling the management, organisational, and social issues in CSR practices." [3]

Because social scientists mostly spearheaded the CSR concept's development, other domains and facets of tackling sustainable development were under-discussed and included into the CSR model only inadvertently as exogenous variables or a model for thinking about CSR. Given this context, we must ask how nonsocial problems, such as the function and significance of technology in attaining CSR, may be adequately considered and integrated into efforts to solve society's long-term sustainability. Because researchers from many

scientific fields still tend to tackle sustainable concerns in a monodisciplinary fashion, there has been little study on the connections between technology growth and sustainable development. [4].

Although there are a number of methodological and contextual suggestions from social scientists about the possible application of technical solutions to sustainable development, there has been very little research on the ways in which technology supports sustainability development in contemporary society or the societal impacts of new technologies. So, the literature detailed people's efforts to delve deeper into their previous ties, using frameworks like sociotechnical theory and other systems theories. New technological visions have increased the frequency with which the connections between technology and sustainability are discussed. Nevertheless, there has been little progress in comprehending this matter due to a lack of multidisciplinary research methods and distinct research interests between technological and social scholars. [5]

II. LITERATURE REVIEW

Freeman, (2024) [6] Looking back, we can see how CSR has progressed from altruistic efforts to a core component of business strategy. More proactive and purposeful corporate social responsibility (CSR) initiatives are becoming the norm, according to the literature.

Carroll, (2023) [7] Research into corporate social responsibility (CSR) has uncovered several facets, such as ethical company practices, community development, corporate governance, social responsibility, and environmental sustainability. A comprehensive comprehension of CSR procedures is enhanced by each of these dimensions.

Margolis and Walsh (2023) [8] Organisations participate in CSR for a variety of reasons, as shown in the literature. These include, but are not limited to, ethical concerns, legal compliance, stakeholder pressure, reputation management, and the quest of competitive advantage. these reasons differ depending on the industry and the location.

Bhattacharya, Sen, & Korschun, (2021) [9] The effect of corporate social responsibility (CSR) on consumers, workers, shareholders, and neighbourhoods has been the subject of empirical research. Although the exact form of the effect might differ, it is typical to hear that CSR initiatives have a positive correlation with stakeholder views, trust, and loyalty.

Objectives

- Investigate the ways in which renewable energy, artificial intelligence, blockchain, and the cloud are changing CSR strategies.
- Analyse how CSR-driven technology affects the long-term viability of a company, taking into account factors including profitability, regulatory compliance, and public perception.
- Consider digital inclusiveness, ethical supply chains, and ecological preservation when assessing the function of technology in advancing social development.

III. METHODOLOGY

In order to understand how top companies integrate CSR with technology developments, this study uses a case study methodology. Case studies of four large companies—Tesla, Google, IBM, and Microsoft—will be used to evaluate their CSR-driven technology projects. To get insight into CSR trends and technology applications, peruse industry papers, academic research, and company sustainability disclosures. Compare and contrast the ways in which technology is shaping CSR in various sectors, drawing attention to successful strategies and promising directions for the future. Using this framework, we can assess how CSR has changed in the digital era and how it has contributed to a more ethical and environmentally friendly corporate world.

IV. RESULTS

- *The Role of Technology in 21st-Century CSR (1200–1500 words)*

The whole course of societal evolution in the past was determined by technological progress and related technologies. So, technology has allowed and supported the development of various societies, beginning with the hunting society,

when humans first emerged and lived in harmony with the natural world. Then came the agrarian society, beginning around 13,000 BC, marked by the invention of irrigation techniques and the spread of human settlements. Then came the industrial society, which began mass production with the steam locomotive, and the information society, which began with computers and the distribution of information, and finally arrived at today's super smart society.

In the past, people have put a premium on technology progress as a proxy for human growth. According to the literature, there are many fundamental causes for this growth. These include the population's unhappiness with their basic living necessities, the market's excess demand over offerings, limited capacity for knowledge advancement, and the endless supply of natural resources.

The literature highlights the significance of many current technical ideas, including Industry 4.0, the "Industrial Internet" program, "Made in China 2025," and Industry 5.0. They include the aims of society development into their broader perspective on technology, which is based on a number of technical alternatives, modifications, and solutions, both immediate and distant.

Technological progress in the twenty-first century has laid the groundwork for a super-smart society within the context of the fifth industrial revolution. This development allows for the storage of massive amounts of data in traditional databases and the provision of sophisticated instructions for processing this data. On the other hand, contemporary society has yet to find technological solutions that would enable a high level of convergence between cyberspace and physical space, complete connections between cyberspace and people, things, and systems, and the application of AI for thorough data treatment and suitable solutions for integrating AI with humans.

According to our findings, the main benefits of technological concepts of the 21st century lie in their multidisciplinary approach to studying technology and their emphasis on creating

technologies to address social problems, thus bridging the gap between the social studies of social development and the technological studies of technology. In today's world, there are numerous methodological, substantive, and adaptive limitations on the processes and mechanisms that could lead to more responsible technological development and advanced technologies. This is despite the fact that organisations and society as a whole are capable of achieving more socially orientated technological development.

The environmental component of corporate social responsibility (CSR) is heavily influenced by how organisations rank the ecological environment and how they evaluate the long-term viability of their operations and actions in relation to their ecological objectives. The growth of an understanding of the need of environmental protection among the organization's constituents is also crucial, as is their ethical resolve to behave responsibly both internally and externally and to conform to societal norms. This progress and the synchronisation of interests and goals—both immediate and distant, social and economic, partial and shared—are mostly the work of shareholders and management.

Furthermore, organisations' interests in environmental care may be significantly heightened by market circumstances in the 21st century. Due to the prevailing societal focus on protecting nature, there has been a growth in the market for products and services that aim to protect the environment. These include technologies that are clean or natural friendly, which reduce greenhouse gas emissions, promote responsible production, and help reduce food loss. Additionally, there is a need for goods that do not harm users, such as healthy and natural products. According to the research, organisations' sustainable economic approach might have a positive, negative, or neutral effect on their financial outcomes. Research on the impact of various economic policies on the organization's performance has, however, produced contradictory findings. The accomplishment of responsible economics in supporting the social and environmental objectives of organisations is

further complicated by the fact that the literature does not detail the consequences of varying degrees of economic appropriateness on organisational outcomes. Questions of technical progress and organisational technology are indirectly and directly connected to analyses of the three pillars of CSR. As a result, research on the social side of corporate social responsibility focusses on topics like consumer choice and the application of technological orientations and technologies to the development of goods and services that lessen human impact on the environment, put a stop to harmful pollution, and safeguard future generations from the same.

Concerns about the potential of both older and more contemporary forms of technology to address pressing societal problems and mitigate their effects have recently dominated conversations about the social aspects of corporate social responsibility (CSR). On top of that, in the last few decades, economic treatment has centred on tech that can help responsibly balance the short-term gain for the most powerful people in society with the long-term social good for the majority of organisations and society as a whole.

- Case Studies on CSR and Technology

We look at four companies—Microsoft, Google, IBM, and Tesla—to see how CSR fits with technology in the modern day. We choose these firms because they are at the forefront of sustainability and innovation, and because they leverage technology in their corporate social responsibility initiatives. Different companies are making strides in different areas: Google is leading the way in renewable energy infrastructure, IBM is using blockchain to create more ethical supply chains, and Tesla is changing the game when it comes to clean mobility and energy storage. Sustainability, openness, and ethical corporate practices are guaranteed by these case studies that show how CSR activities are driven by technical breakthroughs.

Case Study 1: Microsoft – AI for Good & Sustainability Cloud

AI and cloud computing are at the heart of Microsoft's corporate social responsibility (CSR) agenda, which aims to improve the world. Climate change, healthcare, accessibility, and disaster response are some of the areas that Microsoft's AI for Good initiative is working to address. Deforestation and water scarcity are only two of the environmental problems that AI for Earth aims to address via funding research and technological solutions. In addition, with the support of real-time data analytics, Microsoft's Sustainability Cloud enables companies to monitor and lower their carbon emissions. Microsoft fosters innovation in ethical AI applications while enhancing sustainability efforts via the integration of AI with CSR.

Case Study 2: Google – Renewable Energy & Carbon Neutrality

Google has been at the forefront of environmentally conscious technology since 2017 when it pledged to use only renewable energy. Solar and wind power its data centres, which in turn power cloud services, YouTube, and search engines, greatly cutting down on carbon emissions. In order to make its data centres more efficient, Google's Carbon Intelligence Program uses AI to optimise energy use. In addition, in order to keep its carbon impact to zero, the corporation invests in carbon offset programs. By implementing these programs, Google demonstrates how major tech companies can combine corporate social responsibility (CSR) with their commercial strategies to support environmental sustainability.

Case Study 3: IBM – Blockchain for Supply Chain Transparency

Global supply networks are made more transparent and ethical by IBM's usage of blockchain technology. To minimise food waste and guarantee product authenticity, businesses may use IBM's Food Trust platform to trace food production from farm to table. Just as IBM's blockchain solutions in mining aid businesses in ensuring minerals are supplied responsibly, they also aid in the prevention of human rights breaches. By bringing together CSR and state-of-the-art tech, these projects will increase

industry-wide accountability and traceability. In order to improve their corporate social responsibility, IBM is using blockchain technology to guarantee ethical business practices and fair trade.

Case Study 4: Tesla – Battery Innovations & Clean Energy Solutions

Electric vehicles (EVs) and battery storage systems are the centre of Tesla's corporate social responsibility (CSR) initiatives, which aim to transform sustainable energy. Reducing dependency on fossil fuels, the company's Gigafactories generate lithium-ion batteries that power EVs. Residential and commercial buildings alike may benefit from the effective storage of renewable energy thanks to Tesla's Powerwall and Megapack systems. Clean energy is being promoted globally by Tesla via the integration of sustainability and technology innovation. Tesla exemplifies CSR-driven entrepreneurship with its dedication to ethical sourcing and carbon footprint reduction.

Improved openness, effectiveness, and responsibility in CSR projects are all outcomes of technological advancements. Blockchain technology guarantees ethical supply chains by offering verifiable transaction records, and analytics driven by artificial intelligence enable businesses track their environmental effect. Industrial energy consumption may be optimised with the use of cloud computing and the Internet of Things (IoT), leading to less waste and more sustainability. Climate change, digital inclusion, and ethical sourcing are just a few global concerns that CSR-driven technology is working to address. Google has renewable energy programs, Microsoft has artificial intelligence for accessibility, and IBM has blockchain solutions. These innovations show how technology improves the efficacy of CSR, leading to lasting advantages for society and the environment.

Several obstacles stand in the way of tech-driven CSR, notwithstanding its advantages. Because of the need of safely storing and protecting sensitive information on social and environmental impacts, cybersecurity risks present challenges to CSR data management. Concerns around algorithmic

prejudice, privacy invasion, and job loss are just a few of the ethical issues brought up by AI and automation. To tackle these concerns, companies should establish data protection frameworks, responsible AI policies, and clear digital ethical rules. In the future, developments in green artificial intelligence, quantum computing, and the circular economy will bring CSR and innovation even closer together, guaranteeing that corporations will operate ethically and sustainably.

- Impact of CSR-Technology

Findings from earlier studies on how technology and technical progress have affected corporate social responsibility (CSR) in Indian businesses have been mixed. Although CSR is not explicitly addressed, the majority of empirical research do support the idea that contemporary technologies are crucial to the growth of organisations that meet societal demands. So far, only isolated studies have sought to deduce causal linkages between CSR and technology and to propose ways forward that would bring both into CSR development and employ technology in a more comprehensive manner.

Consequently, highlight the significance of CSR in this context and report on the most utilised management solutions for developing manufacturing organisations' preparedness for the implementation of Industry 4.0 as part of the study of 323 Indian industrial enterprises. The study compares and contrasts the ways in which companies in North America, Western Europe, Arab countries, and India achieve their corporate social responsibility (CSR) goals, and it explains the significance and function of various management solutions for responsible operation in sustainable supply chains.

Furthermore, using the results of the Society 5.0 development concept as a basis, provide ideas for bettering the methodological and contextual frameworks that address CSR in organisations more thoroughly. Research on CSR in Slovenia, as well as international studies on the topic, provide the theoretical and methodological foundations upon which we build our suggestions for CSR

enhancement in line with guidelines for the creation of conceptual papers.

In order to better understand the connection between technology and the fundamental aspects of CSR, researchers in the last 10 years have often brought up the need for a more thorough investigation of technical concerns within CSR. Consequently, a great deal of research in the fields of management and the environment has raised the prospect of incorporating technical considerations into CSR treatments and, by extension, of expanding CSR models to include this aspect of CSR. Researchers disagree, however, on the areas that must be thoroughly examined in order to comprehend the technological component of CSR, the nature of the relationships between this component and the fundamental dimensions of CSR, and the breadth of substantive treatment that is necessary.

So far, studies have shown that in order to objectively evaluate sustainable technologies, we need to find ways to distinguish between two types of technology: (1) new technologies and (2) old technologies. This will include coming up with contextual and methodological answers. Hence, instead of including this problem into the CSR model itself, researchers describe it inside the CSR technology framework. The organisation isn't competent to define technical features at such a fundamental level, but it does so in its surroundings using well chosen social criteria. Therefore, any chosen technology that stands in for an appropriately sustainable technology for the organisation may be the topic of the technical component of CSR, independent of its real sustainability features.

V. DISCUSSION

When compared to other aspects of CSR in the modern day, the technology factor is clearly more important, according to the study findings. Accordingly, the majority of scholars believe that, in terms of CSR development, the technical component is just as important as other aspects grounded in an interdisciplinary and multifunctional comprehension of technological progress and technologies.

This study's results highlight the importance of technology in making CSR more data-driven, responsible, and effectively implemented. Corporate social responsibility (CSR) is now seen as both a moral imperative and a competitive advantage by IT giants like Google, Microsoft, IBM, and Tesla. [10] Transparency, efficiency, and sustainability have been greatly improved across sectors via the integration of renewable energy solutions, cloud computing, artificial intelligence, blockchain, and CSR activities. To illustrate the point, AI-driven sustainability monitoring aids businesses in gauging and lowering their carbon footprint, while blockchain technology enhances supply chain transparency, guaranteeing that raw materials are sourced ethically.[11]

Despite the fact that technology has bolstered CSR initiatives, it has also introduced new obstacles. When it comes to collecting and storing sensitive data on social and environmental impacts, cybersecurity is still an issue. Ethical concerns about inclusion and justice may also arise if AI-driven CSR projects unintentionally propagate prejudices.[12] When businesses make grand sustainability promises without really doing anything to back them up, this practice is known as "greenwashing," and it deceives both stakeholders and customers. Ethical artificial intelligence (AI), data governance (GD), and sustainable business models (SBMs) must undergo constant innovation to meet these problems. SBMs must also be held accountable by corporations. [13]

Going forward, smart technologies, monitoring systems powered by the Internet of Things (IoT), and decentralised data networks will be crucial in guaranteeing ethical corporate practices, according to the nexus of Industry 4.0 and CSR.[14] Corporate social responsibility (CSR) strategies that include circular economy models—i.e., product designs that prioritise reuse, recycling, and minimum waste—have the potential to significantly enhance the sustainability of company operations. Keeping CSR from becoming just a marketing tactic and instead seeing it as an essential component of business strategy is crucial for organisations in this age of rapidly changing technologies. [15]

VI. CONCLUSION

The groundbreaking impact of technology on 21st-century Corporate Social Responsibility (CSR) is emphasised by this study. Businesses may now achieve more transparency, efficiency, and sustainability via the combination of renewable energy, blockchain, cloud computing, and artificial intelligence, going beyond conventional CSR methods. Tech giants like Google, IBM, Tesla, and Microsoft are leading the way in tech-driven corporate social responsibility (CSR) initiatives that tackle pressing global issues like digital inclusion, climate change, and ethical supply chain management. Despite these advantages, technology-driven CSR is not without its problems. Some of these problems include cybersecurity threats, ethical quandaries with AI automation, and worries about corporate greenwashing. Staying true to CSR's original intent—rather than seeing it as a branding tactic—in the face of fast technological change calls for robust regulatory frameworks, corporate responsibility, and ethical innovation. Green artificial intelligence, circular economy models, and decentralised transparency solutions are some of the rising themes that will impact CSR in the future. To guarantee that corporate social responsibility (CSR) aids in the long-term viability of businesses and the improvement of society on a global scale, companies must ensure that technical progress is in line with social and environmental duties. Businesses may have a positive impact on society and the economy simultaneously by adopting responsible innovation practices and ethical leadership. This will help shape the contemporary world in a way that is both prosperous and sustainable.

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