TRANSFORMATIONAL LEADERSHIP AS A KEY DRIVER FOR THE ADOPTION OF THE FOURTH INDUSTRIAL REVOLUTION: A CONCEPTUAL DISCUSSION

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ABSTRACT

This conceptual paper discusses how transformational leadership drives the successful adoption of the Fourth Industrial Revolution (4IR) technologies in modern organisations. The 4IR which is characterised by the integration of technologies such as Artificial Intelligence (AI), robotics, the Internet of Things (IoT), and big data analytics, represents an era of unprecedented technological change. The rapid development and integration of these technologies offer immense potential for efficiency, innovation, and value creation in organisations. However, this also presents significant challenges for organisations, particularly in leading the adaptation to new technological demands and cultivating a workforce capable of engaging with these advanced systems. As organisations transition into this new technological space, transformational leadership plays a critical function in guiding these changes. Those leaders that can inspire and motivate their teams to adopt these new changes, promote a culture of innovation, and proactively implement emerging technologies are well-suited to drive 4IR adoption. Transformational leadership is critical in steering firms through the uncertainties of the 4IR by fostering an innovative culture, enabling experimentation, and empowering workers to take measured risks. As an organisation prepares for the adoption of new technologies, transformational leaders are necessary so that they create a coalition of supporters who push for the adoption of the new technology.

Keywords: Fourth Industrial Revolution; Leadership; Transformational leadership.

1.0 INTRODUCTION

The Fourth Industrial Revolution (4IR), which is characterised by the integration of technologies such as Artificial Intelligence (AI), robotics, the Internet of Things (IoT), and big data analytics (Schwab, 2017), represents an era of unprecedented technological change. Where 4IR is the new era of technology, transformational leadership is viewed as the 'new leadership genre' (Avolio & Yammarino, 2013). Unlike previous industrial revolutions driven by steam, electricity, and digitisation, 4IR blurs the lines between the physical, digital, and biological spheres, fundamentally reshaping how businesses operate and compete (Schwab 2017). This is why there is need for the right leadership to transform organisations into this new era. The rapid development and integration of 4IR technologies offers immense potential for efficiency, innovation, and value creation. However, this also presents significant challenges for organisations, particularly in leading the adaptation to new technological

demands and cultivating a workforce capable of engaging with these advanced systems (Xu, David, and Kim 2018).

Siemens is an example of a technology company focused on industry, infrastructure, transport, and healthcare which has been at the forefront of 4IR adoption. It has transformed its operations by integrating AI, IoT, and robotics into its factories (Lee, Davari, Singh & Pandhare, 2018). Seventy five percent of its production processes are automated, leading to significant reductions in error rates and cost efficiencies (ibid). However, this technological advancement in automation and digitisation required Siemens to rethink its leadership and workforce development strategies. This resulted in the company adopting new styles of leadership that promoted continuous learning, innovation and collaboration.

The implications of 4IR through the widespread integration of AI and automation are profound and can streamline operations, reduce costs, and enable data-driven decision-making. However, 4IR disrupts traditional businesses, changes workforce dynamics, and increases the demand for continuous learning and skill development (Kagermann, Henning, Wahlster, Wolfgang, Helbig & Johannes, 2016). As evidenced by Amazon, where AI-driven logistics and automation have revolutionised the supply chain, there is an increasing need for proactive leadership so that technological adoption does not come at the cost of workforce engagement or ethical considerations (Makridakis, 2017). Without strong leadership, organisations may struggle to enjoy the benefits of these technologies, risking stagnation in an increasingly competitive and technologically evolving marketplace (Parry and Sinha 2005).

This is where transformational leadership becomes crucial. As organisations transition into this new technological space, transformational leadership plays a critical function in guiding these changes. Those leaders that can inspire and motivate their teams to adopt these new changes, promote a culture of innovation, and proactively implement emerging technologies are well-suited to drive 4IR adoption (Bass 1985; García-Morales, Matías-Reche, and Hurtado-Torres 2008).

Research has shown that transformational leaders are critical in enhancing organisational readiness for change and fostering a culture that is both adaptive and innovative. This is an essential combination for success within the 4IR space (Birasnav, 2014). Stone (2013) believed that Jeff Bezos, the founder of Amazon showed transformational leadership in the 4IR landscape by fostering a culture of innovation, agility and customer-centric technological advancement. His leadership style inspired Amazon employees to embrace technological change and promoted a culture of continuous experimentation and risk taking which is relevant for an organisation to remain competitive in the 4IR era.

This conceptual paper discusses how transformational leadership drives the successful adoption of 4IR technologies in modern organisations. The discussion will proceed as follows: Firstly, the two concepts of 4IR and transformational leadership will be discussed followed by a discussion on the role that transformational leadership plays in the adoption of the 4IR technologies.

2.0 FOURTH INDUSTRIAL REVOLUTION (4IR)

The current technological revolution, known as the Fourth Industrial Revolution (4IR), is defined by the convergence of digital, biological, and physical systems. This convergence is made possible by advancements in technologies like Artificial Intelligence (AI), robotics, the Internet of Things (IoT), blockchain, and 5G networks. The 4IR is a fundamental change in the way that economies, society, and individuals interact, spurred by technological advancements that are "blurring the lines between the physical, digital, and biological spheres" (Schwab, 2016, p. 12).

The 4IR is defined by Xu, Min, David and Kim, (2018) as a new era of industrialisation, characterised by the broad acceptance of newly developed technologies such as AI, IoT, and blockchain, which are transforming industries, economies, and societies. This revolution expands on the digital revolution of the Third Industrial Revolution (Manyika, Chui, Bisson, Bughin and Woetzel, 2020), but it has a greater impact since it incorporates technology into every facet of life, changing the way we communicate, work, and live. It is projected that by 2030 the 4IR will boost global GDP by $14.2 trillion thereby unlocking previously unrealised economic value (ibid).

However, significant negative issues such as job displacement, skill obsolescence and social injustice are also brought up by the 4IR (Ford, 2015). Brynjolfsson and McAfee (2014) have pointed out that the 4IR necessitates a fundamental change in the way we think about workforce development, education, and training. 4IR technologies can force existing business models to be outdated, creating the need for organisations to continually innovate to stay competitive. Schwab (2016) asserts that 4IR has the power to revolutionise economies, society, and industries. However, Ford (2015) argued that it also brings up issues with data privacy, cyber security, and employment displacement. As such, the 4IR which is being propelled by technological advancements that are transforming economies, society, and industries, is a seismic upheaval in the world economy.

3.0 TRANSFORMATIONAL LEADERSHIP

Transformational leadership is defined as a leadership approach which seeks to inspire and motivate individuals and teams to achieve increased levels of performance by fostering a culture of innovation, change, and development (Bass, 1985). According to Northouse (2021) transformational leadership is a style of leadership that emphasises motivating and enabling subordinates to realise a common goal. This strategy places a great emphasis on the value of establishing trusting bonds, promoting candid communication, and stimulating teamwork. Certain traits are shared by transformational leaders, such as charm, intellectual stimulation, and personalised attention.

Transformational leaders create a culture of trust, openness, and innovation, which enables organisations to adapt and thrive in rapidly changing environments (Avolio and Gibbons, 2020). This kind of leadership works especially well in the modern, internationalised, fast-paced commercial world. The goal of transformational leadership is to create a stronger feeling of purpose and commitment in staff members by inspiring and encouraging them to put the needs of the business ahead of their own. During periods of transition or innovation, transformational leaders are recognised for their ability to interact with their teams in a way that enhances both individual and group performance. Bass (1985), who popularised this

concept identified four key dimensions that define transformational leadership namely idealised influence, inspirational motivation, intellectual stimulation and individualised consideration.

3.1 Idealized Influence

Transformational leaders serve as role models, upholding high ethical standards and a strong commitment to the organisation's mission (Harter, 2020). They behave in venerable ways that result in followers identifying with them. For example, Tesla's CEO, Elon Musk, is regarded as a visionary leader in the electric vehicle, communications and clean energy sectors. His clear mission to revolutionise transportation and communication has inspired both employees and stakeholders to embrace values of innovation and sustainability (Liu, Zhang and Xu Zhang, 2019).

3.2 Inspirational Motivation

Transformational leaders articulate a credible and inspiring vision that appeals and stimulates followers (Avolio and Gibbons, 2020). These leaders present an inspiring vision of the future, bringing together the workforce around clearly set goals, which is crucial when dealing with the disruptive changes of 4IR technologies. Satya Nadella, CEO of Microsoft, exemplified this by steering Microsoft's transition to cloud computing and AI, aligning the workforce with the goal of empowering people and organisations through technology (Harter 2020).

3.3 Intellectual Stimulation

Transformational leaders champion creativity and innovation by challenging the status quo and encouraging new ideas (Liu et al. 2019). They solicit followers' ideas and are prepared to take risks. In the context of 4IR, intellectual stimulation is vital for adopting new technologies. Jeff Bezos of Amazon has promoted a culture of experimentation and risk-taking, leading to innovations like Amazon Web Services (AWS) and AI-driven logistics (Meneses Alvarez, 2018).

3.4 Individualised Consideration

Transformational leaders listen to the needs and concerns of followers and are quick to attend to those needs (Harter 2020). These leaders offer personalised support and mentorship, aiding employees in transitioning to new roles and acquiring the skills needed in a 4IR-enabled workforce. IBM's leadership has emphasised individualised consideration by providing targeted reskilling programmes for employees moving into roles involving AI and cloud computing (Bellamy, Dey, Hind, Hoffman, Houde, Kannan, Lohia, Martino, Mehta, Mojsilović, Nagar, Ramamurthy and Richards, 2019).

4.0 THE ROLE OF TRANSFORMATIONAL LEADERSHIP IN THE ADOPTION OF THE 4IR TECHNOLOGIES

This paper situates transformational leadership as a catalyst for the successful adoption of 4IR technologies. The ability to inspire innovation, foster a culture of continuous learning, and motivate teams to embrace change are unique characteristics of transformational leaders and

makes them fit and able to guide organisations through the inherent changes introduced by the 4IR. As companies face the complexities of integrating these technologies into their operations, transformational leaders are important in navigating these shifts, ensuring that both the workforce and the organisational structure are aligned with technological advancements (Northouse, 2021).

Transformational leaders inspire their staff to question the status quo, think critically, and look for creative solutions to challenges by providing intellectual stimulation. This is particularly important in the 4IR, where conventional business models are undergoing a rapid transformation. According to Liu et al. (2019), Tesla has been able to integrate advanced technologies like AI and autonomous vehicles because transformational leaders like Elon Musk fostered a culture that emphasised ongoing learning and receptivity to new ideas. Musk's leadership style was marked by inspirational motivation and his bold ambition for the future of transportation and energy motivated staff, and linked them with Tesla's larger mission to promote sustainability and innovation. Musk has created a culture that values creativity and problem-solving which is crucial for success in the 4IR (García-Morales, Matías-Reche, and Hurtado-Torres, 2008).

One of the distinguishing characteristics of transformational leadership is intellectual stimulation, which motivates employees to experiment and take measured risks. This is critical in the context of the 4IR where technology breakthroughs frequently necessitate a trial-and-error approach before they are successfully incorporated into business processes. For example, Amazon's founder, Jeff Bezos, is well-known for cultivating an environment in which innovation was not just encouraged but expected (Stone, 2022). Bezos has frequently emphasised that Amazon's success was due to its ability to take measured risks and learn from failures. This leadership approach has propelled Amazon to the forefront of technology adoption, particularly in the development of AI-driven logistics, cloud computing services, and smart technologies such as Alexa (Jung, Chow, and Wu, 2003).

Calculated risk-taking is critical for accelerating technological adoption in the 4IR. Transformational leaders recognise that, while not all risks may yield instant success, they are frequently important steps toward long-term innovation and growth. Leaders like Bezos and Musk safeguard their firms' competitiveness and adaptability in the face of rapid technological change by assisting teams in making educated and strategic decisions about which technologies to invest in and how to apply them (Samad, 2012).

To reiterate, transformational leadership is critical in steering firms through the uncertainties of the 4IR by fostering an innovative culture, enabling experimentation, and empowering workers to take measured risks. These leadership behaviours not only improve an organisation's ability to adopt new technology, but they also keep employees engaged and motivated throughout the transition process.

As industries continue to be transformed by the 4IR, the workforce must adapt quickly to new technology demands. Reskilling and upskilling are critical tactics for preparing people to interact with emerging technology such as AI, automation, and data analytics. Reskilling entails preparing people for wholly new tasks, whereas upskilling focuses on improving existing abilities to stay up with technology improvements (World Economic Forum, 2020). These

procedures are crucial because many old occupations are being automated, forcing people to adapt to more technologically advanced duties that require greater cognitive, analytical, and digital skills.

Transformational leaders champion equitable solutions to mitigate the adverse social impacts of 4IR technologies, such as job displacement. They can lead initiatives like reskilling and upskilling programmes, ensuring employees are equipped to transition into new roles that utilise emerging technologies rather than being replaced by them (Bersin, 2017). For example, Siemens, aware of automation's impact, invested significantly in reskilling programmes, training its workforce in advanced digital skills to prepare them for Industry 4.0 technologies (Liu and Yeung, 2020).

Siemens provides a real-world example of the necessity of reskilling and upskilling in the 4IR. The company has made major expenditures in staff development to meet the demands of its digitally changed manufacturing processes. The company's 'Future of Automation' strategy focuses on providing employees with new digital skills, allowing them to work in smart factories powered by AI and IoT technology. The corporation has built several training centres to give specialised programmes in robotics, AI, and data analytics, guaranteeing that employees can interact with emerging technologies and promote innovation (Liu and Yeung, 2020). Siemens' investment in reskilling exemplifies how firms may future proof their personnel while improving their ability to innovate and remain competitive in the 4IR world.

However, without such investments in reskilling and upskilling, firms risk experiencing severe skill gaps, decreased productivity, and an inability to properly use emerging technology. According to research, businesses which prioritise staff development outperform their peers in terms of creativity and technological adoption (Bersin, 2017). As technology development accelerates, continuous education becomes a strategic goal for businesses looking to maximise the potential of their human capital. This can only be possible and effective when an organisation is under a transformational leader.

These leaders strongly support staff development initiatives, such as reskilling and upskilling programmes, to ensure that employees have the skills needed to prosper in a technologically driven environment. For example, Amazon's "Upskilling 2025" programme, promises to invest more than $700 million to upskill 100,000 people, demonstrating how transformative leadership can drive large-scale reskilling efforts. This project focuses on preparing people for roles in data analysis, machine learning, and cloud computing, in line with Amazon's overall strategic goals (González, 2020).

Transformational leaders are crucial in creating a learning organisation; one that adapts and evolves over time because of the acquisition and application of new knowledge. Leaders must establish a culture that prioritises learning as a primary organisational focus in the 4IR, where technology advances occur frequently. Transformational leaders achieve this by providing intellectual stimulation, a crucial behaviour that stimulates creative thinking, problem-solving, and receptivity to new ideas. (Bass, 1985).

Furthermore, transformational leaders are critical in fostering a culture of psychological safety in which people feel comfortable taking chances and experimenting with new ideas without fear of failure (Edmondson, 1999). This concept is crucial in a learning organisation,

particularly in the 4IR, where technology advancements can be complex and disruptive. Transformational leaders, such as Sundar Pichai of Google, created an environment that encouraged experimentation, allowing people to explore novel solutions and apply new abilities without the pressure of quick success.

This leadership style not only educates staff for current technological breakthroughs, but also guarantees that they can adapt to future changes, allowing the firm to prosper in the quickly changing digital age. Transformational leaders assist employees in navigating the complex nature of 4IR technologies by fostering an environment conducive to innovation and continual learning.

Transformational leaders are essential in navigating their organisations through the ethical challenges of adopting 4IR technologies. However, some may argue that leadership alone cannot promote 4IR adoption; success is dependent on several elements, including organisational structure, culture, resources, and external market conditions. Critics may argue that, while transformational leadership is crucial, it is only one part of the puzzle, and relying too heavily on leadership may neglect the relevance of other systemic variables in guaranteeing successful technology adoption (Beer and Nohria 2000). However, the capacity of transformational leaders to inspire a collective vision and advocate for responsible innovation uniquely equips them to integrate ethical considerations into technological adoption. By cultivating a culture of ethical awareness and accountability, transformational leaders can ensure that the use of 4IR technologies aligns with societal values and regulatory standards (Tapscott, 2016).

A notable example of transformational leadership in ethical technology adoption is seen at Microsoft, where CEO Satya Nadella has prioritised the ethical use of AI. Under Nadella's guidance, Microsoft has established AI guidelines emphasising fairness, transparency, accountability, and privacy, ensuring that the company's technological advancements adhere to ethical standards. For instance, Microsoft created an AI ethics committee to oversee AI projects and ensure they comply with ethical principles, underscoring the crucial role leaders play in addressing these issues (Marr, 2020).

Transformational leaders can tackle these ethical challenges by fostering transparency and encouraging open dialogue about the implications of new technologies. They can involve diverse stakeholders in discussions about the risks and benefits of adopting these technologies; ensuring that the perspectives of employees, customers, and the broader community are considered. For example, Google introduced AI principles following the controversial Project Maven (an AI project for the U.S. military), which prioritised ethical decision-making frameworks to ensure that AI development aligned with the company's values and societal expectations (Pichai, 2018). Additionally, transformational leaders advocate for the ethical use of AI and data by promoting bias-detection algorithms and ensuring transparency and accountability in machine-driven decisions. For instance, IBM has developed tools like the AI Fairness 360 tool-kit, which helps identify and reduce biases in AI systems, illustrating how organisations can proactively address ethical concerns related to AI (Bellamy et al. 2019).

In cultivating an ethical culture, transformational leaders highlight the importance of Corporate Social Responsibility (CSR), ensuring that technological advancements benefit society and

align with the organisation's values. Marc Benioff, CEO of Salesforce US, exemplifies a leader who integrated CSR into the company's technology strategy. Benioff prioritised ethical technology use, advocating for initiatives focused on data privacy, digital equality, and environmental sustainability within the company's operations (Crane, 2020). By embedding ethics into the core of 4IR adoption strategies, transformational leaders help create a future where technology is used responsibly, minimising potential societal harm.

The adoption of 4IR technologies brings significant ethical challenges, including privacy concerns, algorithmic bias, job displacement, and complex decision-making responsibilities. However, transformational leaders are well-equipped to navigate these complexities. By promoting transparency, fostering ethical awareness, and ensuring that technological innovations benefit both the organisation and society, transformational leaders guide their organisations through the 4IR era in a responsible and sustainable manner.

The Innovation Diffusion Theory explains how new technologies spread through an organisation, highlighting the role of transformational leaders in facilitating the adoption of 4IR technologies (Rogers, 2003). Transformational leaders can be a catalyst in this process by communicating the relative advantage. This involves demonstrating how new technologies improve productivity, efficiency, and competitiveness. For instance, Siemens effectively communicated the benefits of Industry 4.0 technologies, showing employees how smart factories and AI-driven processes enhance productivity and quality control, thereby securing buy-in from workers (Liu and Yeung, 2020).

Secondly, transformational leaders should ensure compatibility by aligning new technologies with the organisation's existing values and practices to increase efficiency and minimise resistance. Walmart successfully integrated AI and automation into its supply chain while ensuring these innovations aligned with the company's mission of cost efficiency and customer satisfaction (Heller, 2020). Another way that transformational leaders can be a catalyst in the adoption of 4IR technologies is by reducing perceived complexity. This includes providing necessary training and support to simplify the integration of new technologies and making sure all employees understand how the technology works. Volkswagen's leadership implemented extensive training programmes to ease the integration of AI and IoT technologies in its factories, ensuring employees felt comfortable with the new systems (Hanelt, Bohnsack, Marz, & Marante, 2021).

By encouraging experimentation, transformational leaders should allow and encourage teams to test new systems before full-scale implementation. Google fosters an experimental culture, particularly in AI and machine learning, encouraging teams to pilot new innovations, such as AI ethics tools, before rolling them out globally (Pichai, 2018). In addition, transformational leaders should enhance observability by making the results of these trials visible to all stakeholders, demonstrating the effectiveness of the technologies in real-world scenarios. Amazon's use of robotics in its warehouses is highly visible to employees, who can see first-hand how automation improves efficiency and reduces repetitive tasks (Stone, 2022).

The Organisational Change Management Theory by Kotter (1996) showed the importance of transformational leaders in generating a sense of urgency for change, assembling a coalition that will lead the way and guaranteeing long-lasting transformation as they lead organisations

to transition to 4IR technologies. They instil in staff members a sense of urgency regarding the adoption of 4IR technologies and the need for change in order to stay competitive. For example, John Flannery, the former CEO of General Electric (GE), emphasised the need for digital transformation by stressing that GE's industrial processes needed to integrate AI and IoT to be competitive in the future (Davies and Fortuna, 2017).

As an organisation prepares for the adoption of new technologies, transformational leaders are necessary so that they create a coalition of supporters who push for the adoption of the new technology. In order to successfully integrate AI and autonomous car technology, Ford Motor Company formed a coalition across its engineering and IT departments (Teece, 2018). Another action that may be taken is creating and sharing a vision that describes how 4IR technologies will help the organisation achieve its strategic objectives. Under Marc Benioff's direction, Salesforce took the lead in outlining a precise plan for integrating AI throughout its CRM platform and demonstrating how AI boosted engagement and success for customers (Crane, 2020).

The leaders have to empower staff members by removing barriers, providing training materials and promoting the culture of continuous improvement. IBM's AI project under the leadership of Watson included offering comprehensive training programmes, fostering a culture of continuous learning, and enabling staff members to use AI tools (Bellamy et al., 2019). Transformational leaders ensure that the improvements brought about by 4IR technologies are perpetuated by securing new approaches in the organisational culture. By building coalitions, instilling a sense of urgency, and securing new technology practices within the company, transformational leaders enable the successful adoption of 4IR technologies (Hanelt et al., 2021).

5.0 CONCLUDING REMARKS

Transformational leaders, like any other leader, face a wide range of complicated obstacles when implementing technology related to the 4IR, which necessitate careful thought and strategic navigation. Leaders must strike a balance between the advantages of technology innovation and the requirements for culture and mentality changes, personnel up skilling, and cyber security risk management as organisations fight to stay competitive in a quickly changing world. In addition to having a thorough awareness of data analytics, global trends, and emerging technologies, effective leaders in the 4IR era must also be able to encourage a culture of experimentation, creativity, and risk-taking. Leaders also need to give social responsibility a top priority and address moral issues like AI bias, data privacy, and employment displacement.

Despite these obstacles, the effective implementation of 4IR technologies presents unmatched chances for expansion, effectiveness, and competitiveness. Organisations may increase revenue streams, enhance consumer experiences, and spur innovation by utilising technology like blockchain, AI, and the IoT. In the end, transformational leaders who are adept at navigating the challenges associated with adopting 4IR will be in the best position to promote long-term growth, strengthen organisational resilience, and enhance the future for their stakeholders. This calls for a dedication to lifelong learning, strategic adaptability, and teamwork, as well as a readiness to question established wisdom and seize new opportunities.

Leaders need to be on the lookout for new trends and technology while maintaining a firm grasp on their organisation's basic principles and objectives as the 4IR landscape develops. By doing this, they will be able to fully utilise 4IR and build a better future for everybody. As such, this paper concludes that transformational leadership is a key driver for the successful adoption of 4IR technologies in contemporary organisations.

6.0 RECOMMENDATIONS FOR FUTURE RESEARCH

Although the paper has discussed how transformational leadership drives the successful adoption of 4IR technologies in modern organisations, there are potential avenues for further study. Firstly, there is need for an empirical study to ascertain the impact of transformational leadership on the adoption of 4IR technologies. Studies may also be carried out to investigate the impact of transformational leadership on institutional learning, employee wellness and continuous innovation in the face of 4IR.

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