

## EMBRACING THE FOURTH INDUSTRIAL REVOLUTION: NAVIGATING CHALLENGES AND LEVERAGING OPPORTUNITIES IN MARKETING AND MANAGEMENT – CASE STUDY NOKIA POLAND

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**Purpose:** The primary objective of this paper is to examine the transformative effects of the Fourth Industrial Revolution (Industry 4.0) on marketing and management practices, using Nokia Poland as a case study. The research aims to understand how Industry 4.0 technologies can be leveraged to navigate challenges and capitalize on new opportunities within the telecommunications sector and beyond.

**Design/methodology/approach:** The research adopts a qualitative case study approach, focusing on Nokia Poland to explore the application and impact of Industry 4.0 technologies in a real-world corporate setting. Data collection methods include semi-structured interviews with key Nokia Poland executives, analysis of company documents, and review of relevant literature on Industry 4.0. The study is framed within the broader theoretical context of digital transformation and innovation management.

**Findings:** The results show that Nokia Poland has effectively incorporated Industry 4.0 technologies to boost effectiveness introduce product solutions and enhance customer interaction. Essential technologies such as the Internet of Things (IoT) artificial intelligence (AI), and digital twins have enabled faster. The study emphasizes the role of embracing a strategy for digital transformation that involves cultural shifts, skill enhancement, and collaboration, within the ecosystem.

**Research limitations/implications:** The study scope is restricted to examining a telecommunications company potentially overlooking the experiences and approaches prevalent in other sectors. To gain an understanding of Industry 4.0 adoption future research should explore comparative analyses spanning various industries and regions. Additionally, the study highlights the importance of exploration in the changing landscape of technologies and their impact on businesses.

**Practical implications:** The findings of this research provide advice for businesses starting their Industry 4.0 transformation. Suggestions involve creating a defined plan allocating resources to skills and technology and fostering collaborations in the innovation network. Additionally, the paper explores the business and marketing framework of Industry 4.0, highlighting opportunities for increased competitiveness and expansion in the market.

**Social implications:** The research suggests that Industry 4.0 has significant implications for workforce development, requiring upskilling and reskilling initiatives to prepare employees for new digital roles. Additionally, the paper considers the potential of Industry 4.0 technologies to drive sustainable business practices and contribute to societal well-being through improved product quality and accessibility.

**Originality/value:** This paper contributes to the existing literature by providing an in-depth case study of Industry 4.0 implementation in a leading multinational company. It offers practical insights and strategies for managing digital transformation, with a particular emphasis on the value of integrating advanced technologies in marketing and management.

**Keywords:** Industry 4.0, Marketing and management practices, Technology Nokia.

## 1. Introduction

The concept of Industry 4.0 or the fourth industrial revolution (4IR) is attracting significant attention, particularly regarding its potential effects on humanity (Schwab, 2015). According to Schwab (2015), 4IR will bring about fundamental changes in various aspects of human life, work, economies, and governance. The industrial revolutions trace back to the 17th century, with Britain leading the way in what is now referred to as the first industrial revolution (Blinov, 2014; Dunga, 2019). The term "industrial revolution" is a significant economic transformation that shifted people's livelihoods from bucolic rural settings to urban areas (Dunga, 2019). Before the first industrial revolution, economic activities were limited, resulting in widespread poverty. People relied on small farms for their sustenance, making life challenging for the average person (Allen, 2006). Moreover, production during that time was primarily for personal use, and people used basic hand tools for production, mostly within their homes (Dunga, 2019, Allen, 2006). The advent of the first industrial revolution marked the replacement of animal power with the steam engine, leading to a shift from agrarian livelihoods to industrialization with the use of specialized machinery (Crafts, 1996). Britain initiated the first industrial revolution, followed by other countries like America (Crafts, 1996). The development of the steam engine around the early 18th century marked the beginning of the first industrial revolution, enabling mechanized production and societal changes as urbanization increased (Schwab, 2017). This revolution brought about the rise of coal, textiles, iron, and railroad industries, while the second industrial revolution saw the extensive expansion of electricity, petroleum, steel, and other scientific advancements that facilitated mass production (Ooi et al., 2018). In the 1950s, the third industrial revolution commenced with the inventions of computers and digital technology. This revolution led to automation in the manufacturing sector and caused disruptions in industries such as banking, energy, and communications (Ooi et al., 2018). However, it also opened doors to advancements in space research and biotechnology. Currently, we find ourselves in the era of the fourth industrial revolution, also known as Industry 4.0 (Ooi et al., 2018). Schwab's scholarly work from 2017 indicates that Industry 4.0 is built upon prior advancements made during previous revolutions including first-hand accounts from

various sectors within society itself. Key components integral to Industry 4.0 include cutting-edge computer science applications such as artificial intelligence and machine learning algorithms together with emerging innovations that hyperlink multiple domains including biological realms in medical breakthroughs or even automotive driving features based on GPS directions using advanced AI algorithms (Schwab, 2017). As a result of this integration across industries, we are seeing unparalleled availability not only today but, in many cases, predictive needs influencing product design. Countries, development organizations, and businesses worldwide are actively planning and preparing for the impact of the fourth industrial revolution on humanity and business. However, the societal impact of this revolution, particularly regarding AI's influence on poverty, remains relatively unexplored in-depth (Mhlanga, 2020; Dunga, 2019; Deloitte, 2018). Each industrial revolution has necessitated society to undergo challenging processes of adaptation, transitioning from predominantly rural, agricultural societies to urban, industrial societies, and eventually to post-industrial societies coping with the loss of traditional industries and employment sources (Blinov, 2014). The impact of the fourth industrial revolution on society will not only involve job losses but also a significant one on the logistics and Marketing of services and goods.

Therefore, this study is investigating the impact of industry 4.0, its challenges and solutions in the marketing and management area of a global company like Nokia Poland.

## **2. Industry 4.0: Impacts and Challenges**

Industry 4.0 also known as the fourth industrial revolution merges digital technologies including artificial intelligence big data analytics to enhance industrial processes. These technologies boost productivity, flexibility, and decision making in industries resulting in intelligent factories (Schwab, 2016). Industry 4.0 is characterized by the integration of the physical and digital realms creating 'smart factories' in which cyber physical systems closely monitor physical processes and communicate with each other and humans in real time (Kagermann, Wahlster, 2022). Industry 4.0 traces its roots back to the German strategic initiative "Industry 4.0", which was introduced in 2011 at the Hannover Fair. Various papers have identified several critical technologies that are the pillars of Industry 4.0, including IoT, AI, big data analytics, and cloud computing. Each technology plays a crucial role in transforming traditional industries into smart industries (Lu, 2017).

Various papers have identified several critical technologies that are the pillars of Industry 4.0, including IoT, AI, and cloud computing (Lee et al., 2014; Hermann et al., 2016; Xu et al., 2018). Each technology plays a crucial role in transforming traditional industries into smart industries. The principles of Industry 4.0 quickly spread beyond Germany, influencing industrial strategies worldwide (Lasi et al., 2014).

In 2012 a similar initiative called the "Advanced Manufacturing Partnership" (AMP) was launched by the U.S while China initiated "Made in China 2025" in 2015. Both these initiatives emphasized the importance of intelligent manufacturing and integration of digital technologies (Zhou et al., 2015).

The development of digital technologies has played a crucial role in driving Industry 4.0 forward. The introduction of new technologies has led to the emergence of cyber physical systems where digital and physical systems interact seamlessly (Zhou et al., 2015; Xu et al., 2018). Today Industry 4.0 is widely recognized as a transformative paradigm for industries across the globe. The integration of physical production and digital technologies has given rise to smart factories that are characterized by adaptability, resource efficiency, and ergonomic design (Geissbauer et al., 2016). The future of Industry 4.0 holds enormous potential with the evolution of technologies such as 5G, quantum computing, and blockchain (Marr, 2018).

The adoption of Industry 4.0 technologies can lead to substantial increases in efficiency and productivity. By harnessing IoT, AI, and big data analytics, companies can automate various processes, thereby reducing operational costs and increasing output (Zhong et al., 2017). Industry 4.0 also facilitates mass customization of products. Advanced technologies like additive manufacturing (3D printing) allow companies to manufacture products according to individual customer preferences at scale (Tao et al., 2018). The ability to analyze large quantities of real-time data significantly improves decision-making processes. This capability can lead to improved demand forecasting, inventory management, and predictive maintenance (Lu, 2017).

The increased interconnectivity of systems in Industry 4.0 raises significant cybersecurity risks. Protecting sensitive data and maintaining system integrity are paramount as cyber-attacks can have devastating impacts (Romanosky, 2016). Industry 4.0 demands a workforce with new skills, particularly in areas such as data analysis, programming, and systems integration. A significant challenge is the existing skill gap, requiring substantial effort in education and training (Maqbool et al., 2023). The transition to Industry 4.0 requires substantial upfront investment. This can be particularly challenging for small and medium-sized enterprises (SMEs) that lack the necessary financial resources (Frank et al., 2019). With the rise of AI and machine learning, several regulatory and ethical issues have emerged. Concerns about data privacy, transparency, and AI bias require careful consideration and regulatory interventions (Dignum, 2018). The implementation of Industry 4.0 holds enormous potential for transforming industrial operations. However, it is essential to address the associated challenges, including cybersecurity, skill gaps, investment requirements, and regulatory and ethical issues, to fully reap the benefits.

### 3. Embracing 4IR in Marketing and Management

The use of big data analytics and artificial intelligence has revolutionized the field of marketing. Making it more focused on data and insights. This allows marketers to deeply understand customer behaviors and preferences allowing for personalized marketing strategies that result in better engagement and conversion rates (Kumar, Reinartz, 2018). Furthermore, the combination of the Internet of Things (IoT) and advanced analytics has made real time marketing possible. Companies can now interact with their customers immediately. Providing offers, services, and support whenever needed. Thereby enhancing the overall customer experience (Rogers, 2016). The rise of social media platforms has also had a profound impact on marketing practices. By leveraging social media marketing techniques along with data analytics businesses can reach a wider audience. Additionally direct engagement with customers becomes possible leading to real time feedback that can be used to improve products or services (Tuten, Solomon, 2017). Industry 4.0 technologies have given rise to "smart factories", which have transformed operations management. The implementation of IoT technology allows for real time monitoring and control of operations within these factories. As a result. Efficiency is improved while errors are reduced (Liao et al., 2017). AI algorithms and machine learning have shown their immense value in examining intricate datasets. Offering crucial insights that assist in the decision making process. The implementation of automated decision making has paved the way for expedited and enhanced decision making capabilities in fields like supply chain management and financial management (Wuest et al., 2016).

In addition to these advancements in technology remote work has become more feasible thanks to cloud computing and advanced communication tools. This shift has significant implications for human resource management practices such as recruitment, employee engagement, and performance management (Bloom et al., 2015).

Undoubtedly Industry 4.0 has brought about profound changes across various aspects of business including marketing approaches as well as operational efficiency improvement methods like real time monitoring and control. The impact also extends to decision making processes aided by AI algorithms. And the transformation of human resource management practices due to the rise in remote work opportunities. In order to remain competitive. It is crucial for companies to adapt to these changes and capitalize on the opportunities that Industry 4.0 presents.

#### **4. Case study: Nokia Poland**

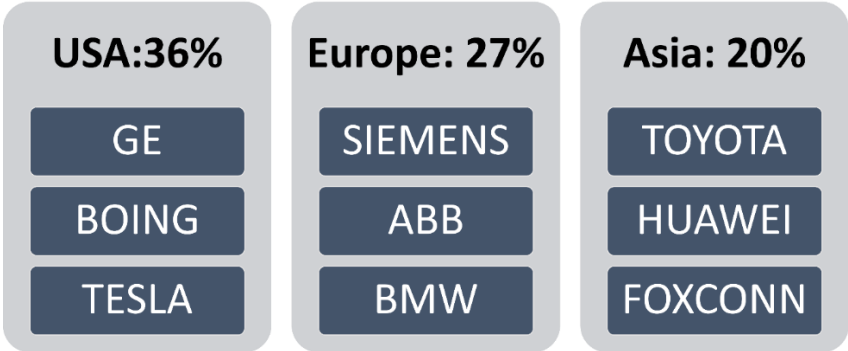
Nokia Poland, specifically the branch in Wroclaw, can indeed serve as an interesting case study for Industry 4.0 due to several reasons. Over the past ten years Nokia's operations in Poland have undergone significant changes. As a leading global telecommunications company Nokia has played a vital role in shaping the development of the telecom industry from second generation (2G) to fifth generation (5G) (Mlot, 2016). In 2000 Nokia established its manufacturing plant in Wroclaw, which primarily caters to the European market. In the years since, Nokia has embraced Industry 4.0 technologies and transformed the Wroclaw factory into a model of smart manufacturing. This transformation journey provides valuable insights into the challenges and successes of integrating Industry 4.0 technologies. Nokia's Wroclaw plant is considered one of the most advanced factories in Europe. It was among the first to implement and showcase the principles of Industry 4.0. The factory has successfully harnessed digital technologies like the Internet of Things (IoT) robotics, artificial intelligence (AI) and machine learning demonstrating their effective deployment and management within a manufacturing context. Nokia's involvement in Wroclaw plays an essential role as a global pioneer in 5G technology propelling the future of connectivity forward. With the rapid advancement and implementation of 5G comes substantial ramifications for Industry 4.0 because its ability to enable fast paced communication with low latency is critical for numerous applications within this field. Studying Nokia's Wroclaw branch can offer insights into the integration of 5G technology within industrial applications. Wroclaw, as a city. Is renowned for being one of Poland's leading tech hubs. It proudly hosts numerous IT companies and startups showcasing its vibrant ecosystem of technology and innovation. Additionally, the city is blessed with a pool of skilled talent. Further enhancing its appeal. Academic institutions and government bodies provide robust support to this flourishing hub. Making it an exciting place to explore the influence and application of Industry 4.0 principles. In recent years, Nokia has shown commitment to environmental sustainability, and the Wroclaw factory is part of these efforts. The company's endeavors to balance the demands of digital transformation with sustainable practices provide another compelling aspect to examine in the context of Industry 4.0.

#### **Comparative Analysis with Industry 4.0 Leaders (Johnson, Jan. 2024)**

As the Fourth Industrial Revolution (Industry 4.0) continues to reshape the landscape of manufacturing and operations, companies across various sectors are adopting innovative strategies to harness its potential. This section compares Nokia Poland's approach to Industry 4.0 with those of Siemens, General Electric (GE), and Boeing, providing insights into diverse strategies and the outcomes of their digital transformation efforts. Siemens demonstrates a thinking approach, to Industry 4.0 focusing on the development of business models and their

extensive integration within their facilities. Siemens's strategy centers around fostering innovation and harnessing technologies like the Internet of Things (IoT) intelligence (AI) and digital twins, throughout their operations. This strategic approach improves effectiveness and exemplifies the industry's digital transformation journey (Ohr, 2020). General Electric's approach to Industry 4.0 is focused on their thought-out Digital Twin strategy. This demonstrates their ability to integrate replicas of assets to optimize performance and predict maintenance needs. GE emphasizes the importance of innovation and the implementation of cutting-edge solutions such as leveraging digital products and incorporating new technologies in their factories. Their goal is to improve manufacturing processes and enhance product quality (Daecher, Jan. 2024). Boeing stands out for its implementation of Digital Twins as well as its pioneering work in areas like 3D printing and augmented reality (AR). Their strategy highlights the potential of twins in improving the efficiency and effectiveness of manufacturing operations. By exploring and adopting technologies Boeing takes a proactive approach to navigate the challenges and opportunities presented by Industry 4.0 (Boeing, 2018). While Nokia Poland is focusing on leveraging Industry 4.0 to enhance their marketing and management strategies, Siemens, GE and Boeing are demonstrating an application of these technologies, throughout their operations. They emphasize innovation and digital transformation as elements of their business strategies. Siemens and GEs emphasis on twins and AI showcases their shared understanding of the value that these technologies bring. Boeings investigation, into the utilization of 3D printing and augmented reality underscores the applications of Industry 4.0 technologies, within the manufacturing industry. The effective integration of these technologies has enabled these companies to make advancements in their operations resulting in heightened efficiency, waste and improved product and service excellence. These accomplishments underscore the possibilities that Industry 4.0 offers when aligned with business objectives (Nokia, 16.11.2021; Ohr, 2020; Boeing, 2018).

**Industry 4.0 adoption 2020 by region**



**Figure 1.** Industry 4.0 technology adoption by region.

Source: (Wopata, 2020).

It appears that North America is at the forefront of Industry 4.0 integration, with a significant 36% of surveyed entities reporting that these technologies have been "extensively" or "fully" implemented within their operational frameworks (Wopata, 2020). In the context of Industry 4.0 adoption, where North America is seen as leading the charge ahead of Europe and Asia, Nokia Poland's role and comparison with giants like Siemens and Boeing offer a unique perspective on how different regions and companies adapt to the digital transformation. Despite the apparent dominance of North America in adopting Industry 4.0 technologies, Nokia Poland's inclusion in this comparison underscores the nuanced and strategic approaches to digital transformation beyond mere geographical or size-based categorizations. In comparing Nokia Poland with Siemens and Boeing, the aim is to illuminate the diverse paths companies can take towards Industry 4.0, influenced by their industry sector, regional context, and strategic priorities. Nokia Poland's place in this comparison highlights the company's role as a key player in the digital revolution, demonstrating that success in Industry 4.0 is not just about the scale of adoption but also about the strategic alignment of technology with business objectives and regional opportunities (Bumgardner, 2022; Knell, 2021; Nokia, 2020).

## 5. Methodology

This research adopts a qualitative approach to explore the impact of the Fourth Industrial Revolution on marketing and management strategies at Nokia Poland. The study aims to get insight about adoptable marketing framework, focusing on the in-depth analysis of subjective experiences and perspectives.

### Research Design

The study will adopt a qualitative research approach, suitable for exploring the nuanced challenges and opportunities related to Industry 4.0, particularly in the context of marketing and management at Nokia Poland. The purpose is to gain insights from key stakeholders at Nokia Poland, such as executives, managers, engineers, and marketing professionals, regarding their experiences, perceptions, and strategies in embracing Industry 4.0.

Purposeful sampling will be used to select participants who have direct knowledge and experience related to the topic and semi-structured interviews will be conducted, allowing for guided yet flexible conversations. An interview has been designed that includes ended questions to delve into topics such, as how individuals have adapted to advancements the strategies, they have implemented the challenges they have encountered success stories they can share and their thoughts, on prospects.



Prioritizing considerations throughout this study is seen as crucial. It was established that the purpose of the study and their rights were fully understood by all participants. Furthermore, confidentiality will be upheld by us to protect their privacy and sensitive information. Also, in this research document analysis is used to analyze documents relevant to Nokia Poland's marketing and management strategies in embracing Industry 4.0. Sources will include company reports, strategic plans, marketing materials, press releases, and publicly available internal documents and content analysis will be employed to identify recurring themes, strategies, milestones, and evidence of challenges and opportunities in implementing Industry 4.0.

### **Data Collection**

The study involved conducting a series of interviews with selected participants from Nokia Poland. The criteria for participant selection included senior managers in R&D and Marketing. The interviews, which were unstructured, covered key topics such as Marketing process and the impact of industry 4.0. These interviews were instrumental in providing valuable perspectives on understanding the impact of technology and challenges in general in the field of marketing. Alongside the interviews, the research also included an analysis of various documents pertinent to Nokia Poland, such as Nokia embraces the industry 4.0 revolution with its new 'Future X for industries' strategy (Johnson, 8.11.2018; Nokia, 14.10.2020; Johnson, 16.11.2021; Matits, 16.03.2021; Apel, 14.02.2023; Kent, 27.09.2022; website 7.12.2021). These documents were examined to complement and corroborate the findings from the interviews, offering a more comprehensive understanding of Industry 4.0 and its impact.

### **Data Analysis**

The analysis of the data, in relation to the impact of the Fourth Industrial Revolution on marketing and management practices at Nokia Poland was conducted in a comprehensive manner. To begin with, the interview transcripts have been read carefully and relevant documents have been familiarized with the data. This initial stage was crucial as it provided an understanding of the perspectives of the participants and the context within which these documents were produced.

Following this, a coding process has been proceeded. The data was broken down into manageable segments and each segment was labeled with concise codes that captured its essence effectively. This coding process was both inductive allowing themes to emerge naturally from the data itself and deductive, guided by research questions and a theoretical framework focused on how the Fourth Industrial Revolution influences business practices.

Once coding was complete, categorizing these codes into themes has been started. This categorization process involved grouping codes together based on their underlying meanings and connections. These themes were then carefully. Refined to ensure they accurately represented the data while remaining relevant to the research objectives. The topics covered aspects, including the adoption of technologies, in marketing and management the changes that organizations face due to digital transformation the challenges encountered by Nokia Poland in

adapting to the Fourth Industrial Revolution and the strategies implemented to take advantage of new opportunities.

Finally, these themes in light of existing literature on the Fourth Industrial Revolution, marketing and management have been interpreted. This interpretation aimed to provide an understanding of the research findings and their implications, for both theory and practice.

### **5.1. Result**

The result highlights the potential for productivity and value creation in Industry 4.0 for industries that heavily rely on assets. Nokia's concentration on thought leadership campaign aligns with industry trends aiming to engage a customer base through a combination of technological advancements and strategic marketing efforts. The campaign focuses attention on the importance of sustainability and efficiency by showcasing how Industry 4.0 can reduce impacts while also improving worker safety and productivity.

Market projections indicate growth in the industry 4.0 market with an increase in revenues from private wireless solutions expected. This growth is supported by drivers such as hybrid cloud, IoT, edge computing, AI, AR/VR/MR and robotics that collectively create an ideal ecosystem for Industry 4.0.

However, transitioning to Industry 4.0 comes with its set of challenges. The information identifies obstacles including network connectivity issues, data fragmentation, cybersecurity concerns organizational readiness hurdles and difficulties in coordinating suppliers. To address these challenges effectively specific solutions are proposed such as evaluating connectivity options (build vs buy) implementing practices in network design and prioritizing change management initiatives.

Nokia plays a role in overcoming these challenges by offering end-to end solutions including modular private wireless solutions and digital automation cloud platforms. The company places importance on building partnerships and fostering the growth of its ecosystem. This approach aims to enhance Nokia's existing portfolio and open ways for generating revenue by implementing go, to market strategies and collaborating on marketing initiatives.

### **5.2. Discussion**

Based on the information provided, a suggested marketing framework for Nokia and also other similar companies could focus on:

1. Customer Centric Approach: the main goal would be to provide tailored solutions that meet the needs of customers during their transition to Industry 4.0.
2. Thought Leadership; companies should strengthen the campaign to establish the organization as a leading provider of Industry 4.0 solutions showcasing our expertise and innovative approach.

3. Ecosystem Development; Building partnerships will enable the companies to enhance our product offering and address the entire value chain effectively.
4. Digital. Outreach: It is crucial to leverage channels to effectively communicate the benefits of Industry 4.0 and highlight how company's solutions can make a difference.
5. Data Driven Decision Making; By leveraging data and analytics we can tailor our marketing strategies, measure their effectiveness, and make decisions accordingly.



**Figure 2.** Suggested Marketing Framework.

Source: Own elaboration.

Implementing this marketing framework may pose challenges such as aligning with evolving technology trends overcoming market resistance towards technologies maintaining a consistent brand message across different channels and accurately measuring the return, on investment (ROI) of our marketing initiatives.

The proposed marketing framework, for embracing the Fourth Industrial Revolution as demonstrated by Nokia Poland involves an approach that can have an impact on marketing strategies and potentially serve as a universal model in similar situations. This framework revolves around prioritizing the needs of customers being at the forefront of industry knowledge building partnerships and ecosystems utilizing marketing and outreach techniques and making data driven decisions. It offers a dimensional strategy for navigating the challenges and capitalizing on the opportunities brought about by the Fourth Industrial Revolution.

By focusing on customers' evolving needs and expectations in an Industry 4.0 environment a customer centric approach ensures that marketing efforts are directly aligned with their demands. This approach not only leads to higher customer satisfaction and loyalty but also ensures that products and services evolve to meet market demands. This principle is universally applicable since prioritizing customer needs is fundamental to marketing across all industries and markets.

Establishing thought leadership in Industry 4.0 positions a company as an expert in this era enhancing its brand credibility while attracting potential customers and partners alike. By sharing insights and forward thinking perspectives a company can set itself apart in a market. This strategy is particularly powerful in industries experiencing advancements but can be adapted to various market contexts.

Partnerships and the establishment of ecosystems expand a company's capabilities and market reach enabling it to provide integrated solutions. In the context of Industry 4.0 where technologies and expertise are often highly specialized, collaborating with others can give an advantage. This approach is becoming increasingly important in today's interconnected business world. Applies to industries as a means to foster innovation and tackle complex challenges.

Digital marketing and outreach utilize the power of channels to communicate with a wide audience allowing for more targeted and engaging marketing campaigns. This aspect of the framework recognizes the role of having a presence in modern marketing efforts. It is relevant across sectors offering measurable ways to connect with customers.

Lastly making data driven decisions is crucial for optimizing marketing strategies and assessing their effectiveness. In the era of Industry 4.0 where vast amounts of data can be collected and analyzed, using this information to make informed choices can significantly enhance marketing endeavors. This approach holds relevance as it provides a method for tailoring marketing strategies precisely while also enabling real time evaluation of their impact.

The marketing framework suggested for Nokia Poland, which emphasizes customer-centricity, thought leadership, partnership development, digital marketing, and data-driven decision-making, can indeed be adapted for use by other global companies like Nokia. However, implementing this framework universally presents several challenges.

One major challenge is the cultural and regional differences across markets. Different regions have consumer behaviors, cultural differences, and regulatory landscapes. This means that marketing strategies need to be customized. Moreover, the extent to which Industry 4.0 has been embraced can differ greatly depending on the level of market development in each region. Some regions might be more advanced, necessitating different strategies compared to areas where these technologies are still emerging.

Resource allocation and prioritization also pose a challenge. Global companies often operate across multiple sectors with diverse product lines, and effectively allocating resources and prioritizing marketing efforts across these varied sectors is a complex task. This challenge is heightened by the need to synchronize marketing strategies with the company's existing capabilities and future plans considering the rate at which technology evolves and integrates.

The implementation of a data driven marketing strategy becomes more complex due to regulations surrounding data privacy and security. With regulations varying across regions, companies must navigate these complexities to effectively use data in their marketing efforts without breaching legal requirements.

Furthermore, intense competition and market saturation in some regions make it difficult to stand out and capture consumer attention. In such environments, differentiating a brand and its message becomes increasingly challenging. Measuring the success of marketing strategies and evaluating their return on investment (ROI) can be quite challenging, in the changing landscape of Industry 4.0. It is essential to create metrics and analytical tools that can effectively gauge

the influence of marketing initiatives. It is not an easy task.

Finally, implementing a new marketing framework involves substantial change management and requires buy-in from various stakeholders across the organization. Ensuring alignment across different departments and regions while managing this organizational change is a significant challenge.

To navigate these challenges, global companies need to adopt a flexible approach, adapting the framework to local contexts and continuously monitoring market trends and consumer behaviors. Investing in understanding regional differences and maintaining a balance between global consistency and local relevance are key to successfully implementing this marketing framework in a global context.

## **6. Conclusion**

The research aimed to explore how Nokia Poland is navigating the challenges and leveraging the opportunities presented by Industry 4.0, particularly in the fields of marketing and management. It involved a qualitative analysis, utilizing data from interviews and document analysis, including a detailed PowerPoint presentation titled "Industry V4.0". The methodology employed thematic analysis to identify key themes and insights related to Industry 4.0's impact on business practices, challenges faced, and strategies implemented by Nokia Poland. The study was conducted to gain an understanding of the changing landscape of Industry 4.0 and its impact, on global companies like Nokia. Its purpose was to offer insights into how these companies can adjust their marketing and management strategies in response to the evolving environment thus ensuring their competitiveness and fostering innovation. The study employed methods, analyzing interview data and company documents. Through analysis meaningful insights and themes were extracted from the data, which were then examined within the context of existing literature, on Industry 4.0 marketing and management.

A significant outcome of the study was the development of a suggested marketing framework for Nokia Poland. This framework is designed to be flexible and adaptable to the demands and opportunities presented by Industry 4.0. It focuses on areas including prioritizing customer needs establishing thought leadership implementing digital marketing strategies and utilizing data driven decision making. The aim of this marketing framework is to assist Nokia Poland in addressing the challenges that arise from marketing in an Industry 4.0 setting enabling the company to maintain its competitive advantage and achieve sustainable growth.

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