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INDUSTRY 4.0: A STRATEGIC PUBLIC RELATIONS ACTIVITY IN THE IMPLEMENTATION OF A SUSTAINABLE BUSINESS PERFORMANCE AT THE CALABAR GARMENT FACTORY

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Abstract

The implementation of Industry 4.0 technology is a public relations strategy to increase and strengthen production quality by bringing about efficient and economic change in the manufacturing industries. Studies on Industry 4.0 are currently some of the most discussed topics in the array of technology developments and digitalization globally. These technologies, are changing the way we socialise, live, work and provide opportunities for organizations to innovate. Although organizations are acknowledging the emergence of 4.0 and realize the importance of being ready for its impact, better understanding is required of the potential of 4.0 and its holistic impact on organizations. This paper, conducted a systematic research on the technology investment, and workforce management of the Calabar Garment Factory. Thus, the aim of this article is to examine Industry 4.0 as strategic public relations in the implementation of sustainable business performance at the Calabar Garment Factory. The paper is anchored on the Diffusion of innovation theory of communication. Findings of the study indicate that application of Industry 4.0 as strategic public relations as a positive drive for the sustainability of a business is not implemented at Calabar Garment factory. Consequently, the study concludes that unless the Calabar Garment Factory is positioned to benefit from the revolution, the managers may fail to catch up with other similar business ventures. It is also concluded that unless business executives move quickly and join the train to revitalize the manufacturing industry in Nigeria by introducing Industry 4.0 as a strategic public relations strategy, the Nigerian business environment may be missing the link. The paper therefore, recommends that the Cross River State government should introduce Industry 4.0 into her strategic public relations activities for a sustainable business at the Calabar Garment Factory.

Keywords: Industry 4.0, Fourth Industrial Revolution, Public Relations, Implementation, Sustainability

1. Introduction

Industry 4.0 is a means of industrial transformation that introduces new technological prowess by integrating information technologies and automation that communicate among them to achieve optimum performance (Kamble, et al., 2018). Industry 4.0 is the integration of the production system with advanced industrial technologies, thus, allowing them to communicate with others and act in real-time with little effort of human intervention and allows organizations to produce smart products and services (Buer, et al., 2018; Oughton, et al. 2019).

Societies have great concern for achieving sustainable business performance because of the rapidly growing population, resource depletion, environmental pollution, land scarcity, increased

food demand, and waste management (Furstenau, et al., 2020). The challenges call for reviewing sustainability practices, standards measurement methods, and emerging technologies. Such issues are encouraging organizations to develop and implement new ways of production and consumption to ensure sustainability. The organizations are being evaluated based on both economic as well as sustainability performance

In this regard, Industry 4.0 offers a tremendous opportunity for firms to achieve sustainability business (Stock & Seliger, 2016). It is a futuristic and multifaceted process that has many opportunities as well as some challenges.
Accordingly, organisations are rapidly embracing emerging technologies and manufacturing methods to transform, capture, share, and interpret data from production tools and other autonomous systems (Sarvari, et al., 2018). The digital revolution allows organisations to become more efficient by adopting the latest technologies in the production system. Thus, Industry 4.0 provides a competitive advantage by producing quality products at a lower cost (Makris, et al., 2019) and ensures the efficient use of non-renewable resources.

The world is in an era where production is influenced by communicating machines in manufacturing industries. These changes will force organizations and companies to adapt a new approach in manufacturing which includes restructuring, processes, and products. Industry 4.0 is the integration of the production system with advanced industrial technologies, thus, allowing them to communicate with others and act in real-time with little effort of human intervention and allows organizations to produce smart products and services (Buer, et al., 2018; Oughton, et al. (2019). It is vital to strengthen the competitiveness of manufacturing industry by implementing the industry 4.0 which will help improve the efficiency of domestic production in the country economic. Laskin, (2010) affirms the role and impact of public relations on external and internal alignments of a successful business. Nevertheless, while Industry 4.0 has been growing, a limited number of researches have addressed the scopes and barriers that may affect Industry 4.0 and sustainability in business performance (Kiel et al., 2020). Additionally, the concept is at its pre-paradigmatic stage and is rapidly evolving; hence, it requires continuous investigation for ensuring its contribution to the "Triple Bottom Line" (economic, ecological, and societal) perspective (Varela et al., 2019). Thus, scholars illustrate the scarcity of studies in this field and call for additional empirical research (Kipper et al., 2020; Liao et al., 2017). Researchers emphasize the importance of Industry 4.0 to ensuring sustainability (Kamble et al., 2018; Müller et al., 2018). Recent studies by (Gupta et al., 2020) have analyzed the role of strategic Public relations in implementing Industry 4.0 to attain sustainability business performance.

Despite the several benefit of Industry 4.0 to factories there is still no significant attention given to it implementation by manufactures. Research shows that manufacturers are feeling reluctant to adopt and transform it into their current business. However, given the high practical relevance of digital and connected manufacturing technologies, it is essential to understand the strategies of implementation (Díaz-Chao et al., 2020). Organizations need to possess strategies that ensure proper implementation of Industry 4.0. Yet, the literature addressing the key determinants of Industry 4.0 that act as strategies to strengthen sustainability has not articulated the missing links between the determinants and sustainability. However, while technically evident, there have been very little empirical studies regarding the role of Public relations in implementing Industry 4.0 and sustainable practices.

The Calabar Garment factory needs to understand the uniqueness of 4.0 in the factory and consider how strategic Public relations can be used in the implementation for a sustainable business performance. Public relations which is a management function is part of the corporate governance and deals with the all communication activities of internal and external coordination as well as interest pronouncement for stakeholders. The perspective of using effective communication to position business in the society and to create an organization's image through public relations is needed. Considering the above research issues, this study examines how strategic public relations can be used at the Calabar Garment Factory to affect manufacturing in business and Industry 4.0 implementation to achieve the sustainability performance. Hence, this study focused on industry 4.0 as strategic public relations in the implementation for a sustainable business performance at the Calabar garment factory.

2. Statement of problem

The objective of Industry 4.0 is to attain an advanced level of operational effectiveness and productivity, as well as a higher level of automatisation . As Industry 4.0 has a significant role in the production and service sectors, it has a direct relationship with performance.

Industry 4.0 is one of the technical procedures of value addition and elective knowledge management practices. That means for an organization to be successful in this global transformation, the entire production cycles need to be digitalized. In the future, they are expected to transform industrial production, making it possible to automate, gather, analyze and exchange data across machines, enabling faster, flexible and more efficient decision-making processes. Industry 4.0 is in fact the new way to go and global organizations and individuals are embracing this trend to remain competitive and gain an edge in the international business market.

However, despite the extensive literature on Industry 4.0, the implementation of the Industry 4.0 approach faces a lot of challenges within manufacturing industry in terms of implementation and the spread of the technologies which does not seem to have reached the Nigerian industries at the expected speed for a revolution. The main barriers to implementing the industry 4.0 is that most organization believed their company is not fully ready for the Industry 4.0 in terms of IT innovations in production which are considered to be a lack of ability to change within the organization and insufficient technology. The garment factory, food sector and others should have many potential gains from implementing Industry 4.0. If it is true that Industry 4.0 will revolutionize the entire manufacturing industry, diffusion will be crucial for competitiveness.

For instance, one may ask, to what extent can industry 4.0 be applied to achieve it major goals required as a good public relations strategy? How can people who are well versed with these technologies be helped to effectively communicate campaign, to inform the public and investors of the importance of the industry 4.0? It is a truism that some of these new technologies are also invading homes, making it imperative for individuals as well to acquire digital skills in order to be able to engage with them in their everyday lives. The purpose of this study was to attempt to answer the above questions and duly inform those concerned about the influence of Industry 4.0 in business organizations and focus in the Calabaar garment factory.

3. Objectives of study

The following were the objectives set out for this paper:

i. Ascertain the use of strategic public relations in the implementation for a sustainable business performance of the Industry 4.0 at the Calabar Garment Factory.

ii. Determine the effective implementation of industry 4.0 and its contribution to achieving sustainable business performance at the Calabar Garment Factory.
iii. To find out the challenges the Calabar Garment Factory faces with regard to the implementation of Industry 4.0.

4. Research Questions

The following research questions were formulated to direct this study:

i. Does the Calabar Garment factory use strategic public relations in the implementation for a sustainable business performance of industry 4.0?
ii. How does the effective implementation of industry 4.0 contribute to achieving Sustainable business performance at the Calabar Garment Factory?
iii. What are the challenges the Calabar Garment Factory faces with regard to the implementation of Industry 4.0?

5. The Concept of Industry 4.0

The Fourth Industrial Revolution, Industry 4.0, is defined as the convergence of cyber and physical world that computers and human beings are connected with via smart systems fueled by big data and machine learning.

The concept of Industry 4.0 was originally planned for an emerging German economic system in 2011. Xu et al. (2018) mentioned that the first industrial revolution is dated at the end of the 17th century. It was related to the mechanization of the textile industry in Great Britain and the construction of the prototypical factory. The Second Industrial Revolution at the turn of the nineteenth century and the twentieth century, through the development of methods of automation of production in the plants of Henry Ford, led to the mass production and development of the automotive industry. The third industrial revolution (also named Industry 3.0) erupted in the 1970s and concerned automation processes, thanks to the use of new computer technologies. The Fourth Digital Revolution, also called Industry 4.0, which has been observed for about 5-6 years, is about building interdisciplinary systems by integrating their physical and digital layers (Reiner, 2014). The fourth industrial revolution, namely; Industry 4.0, was introduced with the features of Cyber Physical System (CPS) production, grounded in diverse data as well as knowledge combination (Lu, 2017). unlike the previous industrial revolutions, the fourth one, Industry 4.0, is acknowledged as different from the previous revolutions according to experts and academic scholars. The technology advancement brought by Industry 4.0 and many ways the technologies interact with each other can enhance business performance and achieve solutions. Industry 4.0 was conceptualized as the Fourth Revolution which was introduced in the manufacturing industry, which has evolved during the past few years (Xu, et al., 2018, Lin, et al. 2016; Nagy, et al. 2018; Ghobakhloo, 2020).

Industry 4.0 involves the digital transformation of the entirety of industrial and consumer markets, from the advent of smart manufacturing to the digitization of the entire value delivery channels (Schroeder, et al., 2019). This has been unanimously recognized by the industry, academia, and government (Ghobakhloo, 2020; Casadesus, 2013).

Industry 4.0 facilitates the smart factory (Chen, et al., 2018; Longo, et al., 2017), where physical systems can be connected among themselves as well as with human beings in real-time, enabled by the Internet of Things (IoT) (Morrar, et al., 2017). To achieve its underlying design principles, the digital revolution of Industry 4.0 relies on the implementation and integration of technologies like IoT, big data, cloud computing, and so on (Castelo-Branco, et al., 2019; Frank, et

al., 2019; Sreenivasan, et al., 2019). Many of these technologies were available to Industrialists during the past four decades (Chen, et al., 2018; Gilchrist, 2016).

However, they are very recently coming to maturity in terms of inerrability which is necessary for digitization (Ghobakhloo, 2020, Wang, et al., 2016). Industry 4.0 facilitates partnership between organizations, especially in the value chain (Foidl & Felderer, 2015; Perez-Lara, et al., 2020). Through digitization, a new resourceful, adjustable, and self-advancing ecosystem is created (Sony, 2018). The Industry system is active and resourceful in manufacturing system (Perez-Lara, et al., 2020; Vaidya, et al., 2018). The end-to-end integration in the value chain facilitates the formation of tailor-made products (Stock &Seliger, 2016). Product and safety data-like routine problems, enhanced quality systems, as well as solutions and auto regulating and monitoring of already defined quality attributes through the implementation of the Industry 4.0 (Jayashree, et al., 2021; Li &Lau, 2017; Sony &Naik, 2019).

Bagheri, and Lee, (2015).noted some key objective of industry 4.0 they posit that it is faster and improved operational efficiency and productivity to drive manufacturing to be more efficient. This could be achieved through features such as cyber-physical system (CPS). CPS is considered a Key Enabling Technology (KET) in the fourth industrial revolution. CPS is a set of different enabling technologies, which generates a stand-alone, intercom, and intelligent system and, therefore, can facilitate integration between different and physically distant subject. Schwab (2016) characterized this term by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries in play. Under this innovative way of operating, the Industry 4.0 opens a whole new world of possibilities for the fields of operations management and supply chain management (Bag & Pretorius, 2020; Kumar, et al., 2022).

6. Key Enabling Technologies in Industry 4.0

6.1 Cyber-physical System (CPS)

Cyber-Physical Systems (CPS) is the combination of computational and physical processes, which are essential components of Industry 4.0 implementations. They integrate imaging and control capabilities into the relevant systems. The ability of these systems to respond to any input generated is a key feature. They provide rapid control and verification of process feedback in order to generate predicted outputs. Kumar, et al., (2022) defined cyber-physical sensor systems as part of cyberspace, special types of embedded systems, based on powerful software systems, enable integration in digital networks, and generate whole new system features.

6.2 Cloud systems (CS)

The term “cloud” is utilized for applications, for instance, remote services, colour management, and performance benchmarking applications. It has taken remarkable attention from the IT community, and its role in other business areas will continue to grow. Machines, data management, and functionality will continue to transit away from traditional ways and toward cloud-based solutions as technology improves. The cloud enables significantly faster distribution than standalone systems, as well as quick upgrades, current performance models, and other delivery possibilities Perez-Lara, et al., (2020).

6.3 Machine to Machine (M2M) Communication

Machine to machine (M2M), refers to the technology that allows direct communication between devices using any channel, wired or wireless. Machine-to-machine communication can include industrial instrumentation and personal communications (Ghobakhloo, 2020). M2M is also considered to be an essential

component of Industry 4.0. Machine to machine (M2M) is a technology that allows devices to communicate directly with one another over any channel, wired or wireless. Machine-to-Machine Communication can include industrial instrumentation and personal networks.

6.4 Internet of things and Internet of services

The Internet of Things (IoT) is an emerging concept that combines various technologies and techniques, based on the interaction between physical things and the Internet. The advancement of technology in recent decades has enabled the Internet to be expanded into a new level known as "smart objects," which is the foundation of an IoT vision, for this, the novel pattern consists in awarding ordinary things with intelligence, permitting them not only to accumulate information and cooperate with their surroundings, but also to be interrelated with other items, communicating information, and conducted a preliminary via the Internet. (Morrar, et al., 2017).On the other hand, the effectiveness of Industry 4.0 depends upon existing network infrastructure, the intelligence, and human knowledge embedded into the system. .

6.5 Smart Factories or Smart Manufacturing

Smart factories or Smart manufacturing according to (Morrar, et al. 2017) is a type of manufacturing that aims to improve concept creation, production, and product interactions by moving away from traditional methods toward automated and digitized systems. It aims to take advantage of advanced information and manufacturing technologies in order to operate and produce fully flexible production at the highest speed required "Dark factories," "lights off factories," and "unmanned factories" are all terms used to describe smart factories, this system is integrated with the small intervention of human beings. The concept known as Lights out (dark) or unmanned factories nowadays is automation and autonomy enhanced methodologies including equipment used in factories that actively operate the production. According to (Morrar, et al. 2017) the most famous characteristic of dark factories is that they need no human power. There are many challenges that determine the formation of smart factories, such as the availability of energy and its supply, the efficiency of the labor, and the availability of the technological infrastructure necessary to shift toward smart factories.

6.6 The Big data

Big data according to (Geißler, et al.2019). Is being generated continuously by everything in environments. Every digital process and social media exchange produce data. Systems, sensors, and mobile devices transmit those. Big data is arriving from multiple sources at an alarming velocity, volume, and variety. To extract meaningful value from big data, there is a need for optimal processing power, analytics capabilities, in addition to information management skills

6.7 Intelligent Robotics

Every day, new goods and systems emerge as a result of technological advancements. Flying automobiles, holographic television, and hundreds of electrical devices to be implanted into the human body are all possibilities. Humanoid robots according to (Geißler, et al., 2019) will be a part of everyday life in the not-too-distant future. Recent innovations have brought about skills that empower robots to control their environment. According to (Columbus, 2018) Artificial intelligence will contribute to the development of having robot teams cooperating and collaborating in achieving certain tasks defined for a specific purpose.

7. The Concept of Public Relations

There are many definitions of public relations which had created some form of misconception, but nonetheless, some basic parameters always help avail us with a frame with which we can conceptualize the concept. First, every organization that operates in a particular market or industry is generally never isolated from environmental elements that can affect its

survival. Those elements of the environment that is very relevant to its operational processes, such as suppliers, consumers, and intermediaries, can be categorized as stakeholders or publics whose influence is no less important. Thus, there is the need for effective strategic public relations and communication as an approach to manage these elements in order to have development. (Asemah, 2011).

Public relations is a great tool for the organization to use in developing its strategies, products or services in order to build a good reputation. Management has a responsibility towards the public and people give positive and negative response to the organization according to their progress and performance. The term public relations according to (Cutlip, et al, 2010)has a very broad application which is informed by rather different sets of assumptions, values, and worldviews that have been subject of intense academic debate (Fitch &L'Etang, 2017; Russell &Lamme, 2016).Scholars in the field of public relations, identify some key variables which include distinctive management function; establishment of mutual lines of communication among various stakeholders; and understanding, acceptance and cooperation between an organization and its publics. Others are management of problems or issues; informing on and responsiveness to public opinion; emphasizes the responsibility of management to serve the public interest; help management keep abreast of and effectively utilize change; serving as an early warning system to help anticipate trends, and uses research and sound and ethical communication as its principal tools (Cutlip, et al, 2010).

The approach above gives foundation to Kotler and Keller (2006, p.496) position of public relations as "a variety of programs designed to promote or protect a company's image or its individual products". The ultimate objective of public relations as proposed by (Cutlip, et al, 2010) is to obtain an impression or image positive about the offer of the following organizations in the eyes or minds of the public, consumers and other stakeholders. In this case, gaining a positive impression in the public mind is the goal of the management problems or issues. It also expands the frame of an earlier definition proposed by Cutlip, et al (2010, p.6) that" public relations is a management functions that establishes and maintains mutually beneficial relationships between an organization and the public on their success or failure depends".

The British Institute of Public Relations qualifies public relations as a "management of reputation" and for purpose of gaining understanding, supports and influence of public opinion and behavior for the organization (Petrovici, 2011). The Canadian Public Relations Society adopted the works of Fran Gregory and Jean Valin, and contends that the profession involves the use of strategic management of relationships between an organization and its diverse publics, in a bid to achieve mutual understanding, Other key aspects of this definition according to Rickey, (2012, p.34) is that public relations "captures the core essence of what public relations professionals do" It is strategic communication and management between an organization and its publics (Grunig, 2013), and sometimes viewed as a descriptive collection of communication techniques and activity that is part of societal dynamics (Gregory, 2012). It is the deliberate, planned performance to elicit positive public interest along the Franklin transfer process. Others view it as a two-way communication (Cameron, et al, 2008) that reflects a dominant functional normative paradigm of excellence (Wilcox & Cameron 2012; L'Etang, 2013).

Strategic public relations is a management form of communication, which focuses on obtaining the public's understanding and acceptance regarding the process of establishing a good relations between an organization and the public, especially in terms of shaping reputation and communicating information (Gaither, 2008).

Through the communication and promotion strategies which they develop, public relations facilitate the building of confidence-based connections between the various organizations and the many categories of public, creating interactive relationships between the various levels of society and mobilizing them for development (Okoi, et al 2021).

Sévigny and Flynn (2011) emphasized that the field of strategic public relations is in an unstoppable process of merger with several other fields of professional communication which include engineering, marketing, advertising, broadcasting, and accountancy. Public relations strategy is developed within the context of the organization's vision, mission, corporate culture, policies and strategies (the internal), but focuses on an assessment of the external (Gregory, 2012).Effective strategic public relations will be essential in ensuring continued reassurance and confidence to secure the trust of stakeholders.Public relations as a distinctive management function which helps to establish and maintain mutual lines of communication, understanding, acceptance and cooperation between an organisation and its publics by keeping management informed on public opinion and emphasises the responsibility of management on how to serve public interest. It is worthy to note that, strategic public relations management cannot exist in isolation in the sustainability of business performance in any organization activities. It needs a well-designed public relations packages as a catalyst for development. Therefore, the role of public relations in Industry 4.0 is to carry out research, feedback, evolution and plan on various subset of the organisation.

8. Theoretical Framework

There are so many theories that can be used in explaining Industry 4.0 and Public relations. This study is anchored on two theories which include:

i. Diffusion of Innovations theory

ii. General Systems theory

9. Diffusion of Innovations Theory

Diffusion of Innovations describes the way that new technology can influence people's thoughts and actions towards adopting a new technology or idea. As Ryan and Gross, (1996)states that people go through a five-step process when adopting new ideals or innovations. The process by which a new idea or practice is communicated through certain channels over time among members of a social system.

An important aspect in Rogers (1983) theory is the Innovation-Decision Process, which deals with the process from first hearing about an innovation until having it implemented and seeking confirmation. The five steps of this process include: knowledge, persuasion, decision, implementation and confirmation.

The rate of adoption is with what relative speed the innovation is adopted by the members of a certain social system Innovations can be adopted or rejected by individual units, or by the entire social system by a collective or authority decision, according to Rogers (1983).

Innovations can be adopted or rejected by individual units, or by the entire social system by a collective or authority decision, according to Rogers (1983).

The Innovation-Decision Process can only begin when *knowledge* is attained (Rogers, 1983). Throughout the Innovation-Decision Process, information is sought and processed in order to decrease experienced uncertainty about an innovation. In the first step, knowledge about what the innovation is, how it works and why it works is sought, while the decision-making unit looks for information to establish the cause-effect relationships involved when using the innovation, and if it will create benefits or solve a problem (Rogers, 1983).

Persuasion is the second step of Rogers' (1983) model and happens when a decision-making unit starts attaining a favourable or unfavourable

attitude toward the innovation, and seeks information to evaluate the innovation. The social system's view on consequences and the changes that will occur to the entirety or members of the system when adopting or rejecting an innovation are strong influences (Rogers, 1983).

Even though many units know about innovations, they have not chosen to adopt them. This might be because they do not view it as relevant or useful to their specific situation. Consideration does not start if the information seems irrelevant or if sufficient knowledge is not obtained (Rogers, 1983).

Implementation happens when a decision-making unit starts using an innovation. Confirmation is established when a decision-making unit reinforces an innovation decision it has already made. The decision can be reversed; for example, through discontinuance - a decision to reject it after having adopted it, due to dissatisfaction or replacement with an improved idea. Vice versa, innovations can be adopted after a first rejection, through later adoption (Rogers, 1983).

As mentioned, Rogers' theory is mainly focused on end customers and it is of importance to remember that the adoption of innovations in organizations is very important as people want to know more on new product this is the valueit adds to the production process.

10. The General Systems Theory

The General Systems theory, also known as "Cybernetics" was founded by a biologist Ludwig Von Bertalanffy in (1928)as cited by Ogbuoshi (2020). Bertalanffy developed the theory to show how the systems work in different fields of knowledge, science, engineering, economics, sociology, agriculture, psychology, and technology. He sees the human social systems as a system an automobile. Today, the General Systems theory has gained popularity, wide acceptance and application in different works of life.

The General Systems theory posits that all system have objects and attributes. Objects constitute the components of a system. In other words, a system is made up of interrelated parts, which must work together for a proper functioning of the whole. In an organisational setting, for instance, organizations are made up of other related parts which are interrelated for the growth of the organisation they operate. For example, Calabar garment factorywhich is the focus of this study can be considered as a system made up of different parts that need to function together. For any system to work perfectly, public relations strategies need to be encouraged. These will help build a mutual relationship between stakeholders for good transition of innovation by helping stakeholders, the business executive, employees and customers to understand the new innovation.

To successfully implement the industry 4.0, the Calabar Garment Factory must on regular basis have an effective communication to keep the system going on how the new technology must be maintained, and training of staff members in order to allow them adapt to the change.

11. Methodology

This study aim is to examine Industry 4.0 as strategic public relations in the implementation for a sustainable business performance at the Calabar Garment Factory. This was achieved by examining three research objectives through the quantitative method.

The survey method was employed in this study. Interviews and questionnaire were used as instruments of data collection. The area of study consisted of 3 operating departments by the Cross River State Garment Factory to find out about the implementation of industry 4.0 systems in the factory. The Calabar Garment Factory is a product of the Cross River State Governor between 2015 and 2023, Prof. Benedict Ayade. The factory was established in 2016 and became fully functional in 2017.The Calabar Garment

Factory is located at Good luck Jonathan bypass on a 2000 square meters of land in the Cross River State capital.it contains more than 2000 electric powered garment production machines. The factory is a property of the Cross River State Government, so it is not owned by any sole individual, company or group of companies. The factory is managed by a private organization while the government continues ownership of the company and directly involved in the marketing and advertisement of the factory.

The garment factory is a very innovative investment in Cross River State for it is the only largest factory built to factory standard and it demands lots of manpower and is expected to create more than 3,000 jobs in shifts for Cross Riverians, especially women, and reduce importation of garments by promoting local production. The factory is expected to also promote economic development in Nigeria and add to the growth of the Gross Domestic Product.

The factory produces quality finished goods ranging from uniforms for customs and police, as well as t-shirts for National Youth Service Corps (NYSC) among others, the governor urged civil servants as well as the public to patronize the factory that he himself would not be wearing clothes not made from the firm.

The population of this study comprised of staff and top management staff of the factory. The sample for the study was 200. This sample was selected using the Census Technique since the entire staff and management staff of the three departments was involved. This sampling technique was adopted because the population size was small enough to be studied. The responses from the survey were analyzed using quantitative tools; while the responses from the interview were analyzed using the explanation building technique. Quantitative data analysis involves the interpretation of the responses of the respondents by the researcher, using the evidence from the data collected. Data collected using the questionnaire instruments were presented in tables using the simple percentage method to calculate the frequency of responses. The table below (Table 1) shows the breakdown of the number of the respondents.

1. Data Presentation and Analysis

Table 1: Number of Respondents from Three Departments

Departments	Number of respondents		Total
	Male	Female	
Mechanical	40	30	70
Designers	25	40	65
Manufacturers	40	25	65
Total	120	80	200

Source: *Field Research, 2023*

Table 1 revealed that a total of 200 staff both male and female are employed at the factory.

Table 2: Respondents assessments on use of strategic public relations in the implementation for sustainable business performance at the garment factory

S/N	Statement	SA	A	D	SD	TOTAL
1	Public relations are a key factor in Implementing the Industry 4.0 in the Cross River State Garment Factory.	50 (35.5)	45 (30.5)	30 (19.5)	25 (14.5)	150 (100)
2	Public relations strategy used for implementation of 4.0 systems	35 (17.5)	30 (20)	40 (29.5)	45 (33)	150 (100)
3	The adoption of public relations is effective in implementation of 4.0	50 (35.5)	45 (30.5)	35 (18.5)	20 (15.5)	150 (100)

Source: *Field Research, 2023*

Table 2, revealed that majority of the respondents accepted the role of public relations in 4.0 systems is below average. Adoption for effective implementation, which most of the respondents rated high.

Table 3: Does the effective implementation of industry 4.0 contribute to achieving sustainable business performance at the Calabar Garment Factory?

Response	Frequency	Percentage
Yes	55	33.5%
No	95	66.5%
Total	150	100%

Source: *Field Research, 2023*

Table 3, majority of the respondents, 95(66.5%), expressed the opinion that there is no effective implementation of Industry 4.0 in the Calabar Garment Factory; while 55(33.5) acknowledged the awareness of the Industrial 4.0.

Table 4: Respondents on the challenges of industry 4.0 implementation for sustainable business performance at the garment factory

Response	Frequency	Percentage
Social impact	25	15.5%
Strategy	30	18.5%
Workforce	40	25.5%
Technology challenge	55	40.5%
Total	150	100%

Source: *Field Research, 2023*

Data presented on table 4, shows that over 55 percent of the respondents affirms they do not know the technology of industry 4.0 thereby, the challenges of it implementation in the factory.

12. Discussion of Findings

Research Question One: Does the Calabar Garment Factory use strategic public relations in the implementation for a sustainable business performance of industry 4.0 at the Calabar Garment Factory?

Data from table 2 show that 35.5% of the respondents affirmed the role public relations has played in the implementation of industry 4.0 in organizations. Public relations are a relevant tool for the implementation of 4.0 systems in Nigeria.

Similarly, in table 4 (40.5) respondents were asked if public relations strategy has influenced or impacted the way their organizations operates and manage the new technology, how they have communicated to external audiences and how they have communicated to internal audiences. It strongly agreed that public relations is a strategy for the implementation of Fourth Industrial Revolution system in Cross River garment factory.

The sole aim and objectives of every firm and commercial organization is to satisfy the consumers or buyers and to make profit. Every available effort must be made to see a conducive environment, a good mutual relationship and friendly ones, is firmly established in the organization, and the general public.

Industry 4.0 alters conventional methods, procedures, and strategic objectives so a whole organizational culture shift is required. The implementation of 4.0 necessitates detailed knowledge, economic ability, skill upgrades, and the creation of an interactive, flexible culture inside the organization. Top management must also be involved in appropriate planning, collaboration with external stakeholders, data processing, information protection, and a flexible organizational structure for 4.0 adoption and implementation.

However, the challenges of implementation can be addressed with public relations strategies to

promotes cooperate culture for the organization to help staff and top management understand that the Industry 4.0 is a decentralized and simpler framework for business operations, focusing on simple, easily interconnected components with lower degrees of sophistication (Grunig, 2009. Balmer & Greyse 2006) noted that, "IT competencies of all industrial job descriptions will increase, and in combination with an overall process understanding are necessary factors of success. Hence, public relations are a very important tool the industry 4.0 need as an implementing process in Calabar Garment Factory. Flynn (2014, p.381) asserted that "Public relations is the strategic management of relationships between an organization and its diverse publics, through the use of communication, to achieve mutual understanding, realize organizational goals and serve the public interest"

As public relations has a significant role in the production and service sectors, it has a direct relationship with the implementation of industry 4.0 which is highly connected with internet technologies as well as progressive algorithms. Flynn (2014) asserted that Industry 4.0 is one of the technical procedures of value addition and effective knowledge management practices. (Slusarczyk, 2018) stated that the objective of Industry 4.0 is to attain an advanced level of operational effectiveness and productivity, as well as a higher level of automatization.

Research Question Two: How does the effective implementation of industry 4.0 contribute to achieving sustainable business performance at the Calabar Garment Factory?

Industry 4.0 has developed a profound impact on society. In the era of industrial digitalization, factories, household, public sector, economies, etc are already preparing for and adopting strategies regarding Industry 4.0. Yong et al., (2020) posited that the new technologies will have a huge impact on working pattern to increase investing in tools and solutions that allow their processes, machines, employees, and even the products itself to be integrated into a single integrated network for data collection, data analysis, the evaluation of company development, and performance improvement (Bai et al., 2020). There will be new types of robots that can interact with humans. This technology will complement human activity, in particular cognition, combined with other emerging technologies to give us completely new computer models. Thus, new skills are needed to bridge the gap between engineering and computer science, automatic learning, and artificial intelligence.

Industry 4.0 technologies are popular organizational trends that are vital contribution in increasing sustainable in business performance (Bai et al., 2020, Reza et al., 2020). Industry 4.0 technologies include substantial contributions to organizational and social sustainable development (Stock and Seliger, 2016). From the Economic aspects it enhances organizational profit (Bai et al., 2020; Frank et al., 2019; Yong et al., 2020). From the environmental perspective, these technologies help to minimize energy consumption, minimize waste, increase energy savings (Yadav et al., 2020), and encourage re-use and recycling (Kumar et al., 2020). From a social sustainability perspective, digital and smart technologies protect the health and safety of workers by minimizing boredom and repetitive tasks, which motivates employees and increases their job satisfaction (Müller et al., 2018; Yong et al., 2020).

Yadav et al., (2020), explains that, in the dawn of covid-19 we saw machines and robots used to administer drugs and attend to infected persons at the hospitals in some countries. There is no sector in any industry that has been left untouched by digitization. Logistics is no exception, and the fourth industrial revolution has brought a tremendous increase in efficiency in this area, as well. What investors need to understand is that they need equipment, software, and specific

platform, which provides the development, function verification, and compatibility of new solutions in semi-industrial conditions and within actual technologies. The Industry 4.0 is not to under use employees, the importance of industry 4.0 is to enhance production and make the workforce easier for both the investors and employee. Management will become more important but not necessarily more direct.

The correct implementation of a 4.0 system within a company depends on its ability to respond to change and innovation management. Which includes:

i. Create an awareness of the importance of the innovation.
ii. Educate the innovation management.
iii. Identify potential improvements.

Industry 4.0 offers opportunities of the circular economy and more sustainable patterns of production and consumption. Therefore, the adoption of public relations strategies in the implementation of Industry 4.0 for a sustainable business performance will help the Calabar Garment Factory to be competitive and contribute to development goals for the state.

Research Question Three: What are the challenges the Calabar Garment Factory faces with regard to the implementation of Industry 4.0?

Table 4 shows indifference of the people. While executives see a more stable future with less inequality, they are less confident about the roles they or their organizations can play in influencing society in an Industry 4.0 era. Just 14 percent are highly confident that their organizations are ready to fully harness the changes associated with Industry 4.0.

The garment factory executives are sticking with a focus on traditional domains (i.e., developing products and increasing productivity) instead of shifting their focus toward developing talent and driving competitive disruption that could spur innovation and create value.

More so, 20% of the respondents acknowledge that their current investments in technology is strongly influenced by the desire to create new business models which they believe will have one of the biggest impacts on the factory.

12.1 Focus Group Discussion Analysis

The Discussants

Through the focus groups discussion, the top managers highlighted the role industry 4.0 will play in the Garment Factory if implemented. During the course of discussion, there was a fairly good understanding of the challenges for Industry 4.0 implementation in the factory. All the challenges the discussants highlighted were grouped into themes which included: the implementation process, Industry 4.0 and the Garment factory and the role of public relations strategies in the implementation.

12.1.1 Implementation process

Most of the participants believe the 4.0 system can influence key factors in their organisations in so many ways for sustainability and social mobility. Executives acknowledge they may not be ready to harness the changes associated with Industry 4.0, but these reservations have not compelled them to alter their strategies. The discussion shows that executives are willing for a change for the 4.0 system but they are reluctant to move from their one patter to adopt a new reality. This is where the role of public relations plays an effective role to educate the executives of the importance and effectiveness of the industry 4.0 system to their organization.

12.2Industry 4.0 and the Garment factory

According to some participants during the discussions, executives are not confident they have the right talent to be successful in Industry 4.0. However, 17.5% say they are doing everything they can to create a workforce for Industry 4.0. Only few were highly confident they have the right workforce composition and the skill sets needed for the future. Executives understand they need to invest in technology to drive new business models. However, they have

a hard time making the business case to fully address Industry 4.0 opportunities because of a lack of internal strategic alignment and short-term focus.

12.3 The role of public relations

Twenty five percent (25%) of the overall responses of the discussants during the discussion regarding the role of public relations strategies used believed that implementation can be addressed with public relations strategies to promotes cooperate culture for the organization to help staff and top management understand that the Industry 4.0 is a decentralized and simpler framework for business operations, focusing on simple, easily interconnected components with lower degrees of sophistication.

12.4 Implications of the findings

Based on the objectives of this research outlined earlier, the researcher drew allusion to the following implications:

1. Public relations and effective communication in the implementation of the Industry 4.0 in organisations in Nigeria, deserves a place in priority coverage list because effective communication is central to the nature of society, to its development and to the functioning of economic and social institutions.
2. Thus, the need to emphasize the implementation of strategic public relations in the Industry 4.0 will go a long way to boost economic.
3. To improve the economic benefits of the people regarding the Industry 4.0 in Nigeria.
4. National Institute of Information Technology (NIIT) Information and communication (ICT) scholarship in Digital revolution should be introduced that will help train people and also create many new jobs in Nigeria.

13. Conclusion

The new industrial revolution called Industry 4.0 imposes new challenges to the research community. One of the main challenges in Industry 4.0 is the management of the huge amount of information exchanged among its different integrated systems.

The survey results indicate that while executives in Calabar Garment Factory conceptually understand the changes Industry 4.0 will bring, they are less certain how they should act to benefit from those changes. An overwhelming majority of the respondents, (85) percent believe the Fourth Industrial Revolution will lead to more social and economic equality and stability, and two out of three say business will have much more influence than governments and other entities in shaping this future. While executives see a more stable future with less inequality, they are less confident about the roles they or their organisations can play in influencing society in an Industry 4.0 era.

Several advanced economies are implementing the concept of Industry 4.0, marking the fourth industrial revolution. Increasely, companies are applying innovative solution, including the “Internet of Things” (IoT), cloud computing, 3D printing and 5D technologies which are playing a huge part in the enhancement of the production of goods and services. Covid-19 for instance, has already highlighted the possible uses and benefits of virtual reality. The pandemic also raise the debate as to the growing need for 5G as a key enabler in helping to avoid delays in communication and to help minimize bandwidth issues.

According to (Bai et al., 2020), going forward, some of the manual tasks, which are time consuming, might be eliminated and Industry 4.0 solutions put in place instead. He believes that we will see these challenging times result in organizations growing in confidence when it comes to adapting to digital solutions and hopefully help them realize that the associated

risk can be managed. It is now a call up for business executives in Calabar Garment Factory to use public relations strategy to push the acceleration of the implementation of the Industry 4.0 in Nigeria.

14. Recommendations

The following recommendations have been drawn from the findings made earlier in this paper.

1. It is recommended that the Cross River Garment Factory should implement the big data technology, IoT and smart factory to manage issues. Better implementation of these elements has the ability to manage various challenges. Before implementation of these technologies, the factory must develop a supportive culture and infrastructure to support new technology.
2. Strategies Public relations activities should be applied for the implementation of Industry 4.0 at the Calabar Garment factory for a sustainable business performance.
3. The Cross River State government should make it state related to the National Institute of Information Technology (NIIT) and the Information and communication technology (ICT) scholarship in Digital revolution should be introduced that will help train people and also create many new jobs in Nigeria.

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