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Data Driven Management and Organizational Innovation of Manufacturing Firms in Port Harcourt

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Abstract: *This study investigated the relationship between data driven management and organizational innovation in selected manufacturing firms in Port Harcourt, Rivers state of Nigeria. The sample for this study comprised of 106 staff from the selected manufacturing firms. The data for this study was collected using simple sampling random techniques and source of data collection from quantitative and qualitative research. Spearman's Rank-order correlation coefficient statistical tool with the aid of Statistical Package for Social Science (SPSS version 21.0) was adopted to test the relationships between the variables under evaluation, upon the influence of data driven management on organizational innovation. Findings from the study revealed that there is a positive and significant relationship between all the dimensions of data driven management tested (i.e robust analytical capabilities, data driven culture and technological capabilities) and organizational innovation as it is link with process, product innovation and competitive advantage thus foster innovation. Based on the findings, it was concluded that data driven management influence organizational innovation, hence organizations should integrate data management practices, data democratization and innovative business model to enhance performance and growth.*

Keywords: *Data Management, Data Driven, Organizational Innovation, Analytics, Technological Capabilities, Data Culture, Robust Analytics Culture, Competitiveness*

Introduction

Data has become the marvel of modern day technology that defines organization activities and centered to run organizations efficiently. In today's dynamic and intricate business environment, organizations must be analytic driven and oriented to be innovative, wherefore to enable them sustain developmental growth. Organizational data is recognized as a strategic resource and a catalyst for developing innovation capabilities (Lokuge and Sedera 2020; Sedera and Lokuge 2019a). Data literacy and management aid organizations build, deploy, and maintain customizable performance to communicate outlook and metrics, to make meaningful decision that gears the organization towards achieving its goals. At present, data-driven innovation is considered a key pillar of the business growth (Chatterjee et al. 2022). Today, a lot of organizations have analytical data broad band, set up in their data centers to support business decision-making in various areas, as well employing business analysts to conduct ad hoc queries and analyses on data in data marts created for multi-dimensional analysis using self-service business intelligence tools as other option.

Data management makes it possible for organizations to measure and share key performance metrics for core improvement like increase in sales volume, operations and production strategies,

management of cost effect, purchases, capital and expenditure valuation, market share, large-scale initiatives, digital transformation strategies and future forecast or projections. In this study, data driven management is explained as a strategic initiative of organisations to use data and analytics to develop data-driven insights that help for new product development, process improvements, discover new markets and business models" (OECD 2015; Su et al. 2022).

Organisations have realized the importance of data to innovate and thereby attain a competitive advantage. As a result, firms are more focused on understanding the potential to achieve data-driven organization while improving on their performance and sustainable growth. As technological advancements such as the internet-of-things (IoT), big data capabilities, cloud computing and other technologies have reduced the cost of data collection, storage (Sedera et al. 2022a), and processing (Sedera and Lokuge 2018), increasing the opportunity for organisations to harness the value of data and promote innovation (Chatterjee et al. 2022; Del Giudice et al. 2020).

Previous research have shown that organizations who apply data-driven decision-making are more successful than the ones that do not (McAfee & Brynjolfsson, 2012), thus organizations that are data driven, hence increase productivity, thrive and has competitive advantage since goods and service are no longer generic but tailored towards individual specific needs since preference and perspective defers. Data management enables organization understand business trends, wave and new patterns therein actively integrate and align them to organization business strategy for improved performance. It also aid organizations read, apply, create and transform data into a valuable information that influence decision making processes in the organization. This also aid organization and workers to have sensitivity and high business acumen to understand their business, customer and shareholders to know the problems to solve while positioning the organization to have competitive edge in the business environment.

On other hand, the introduction of something novel (such as an idea, product, service, technology, procedure, or strategy) into an organization is referred to as organizational innovation. Organizational innovation, according to Lam (2006, 115), defines organizational innovation as to the creation or adoption of an idea or behavior new to the organization. In organizations, innovation connote a dynamic capabilities which enable organizations to renew themselves in response to changing external environments and therefore do not face the risk of being outcompeted and stands as a dynamic diagnosis. In essence organizational innovation is essentially the method through which a company creates novel, high-tech goods or services and is successful in putting those goods or services on the market. The capacity of an organization to routinely translate ideas and knowledge into new services, procedures, or products for the benefit of its stakeholders can be described as innovation.

In the same vein, organisations can extend their existing innovation skills, processes, and knowledge to improve innovation competencies or renew their exploration competencies by implementing data-driven strategies (Adikari et al. 2021; Sedera and Lokuge 2017; Visvizi et al. 2021). Organisations have realized the importance of data to innovate and thereby attain a competitive advantage. As a result, manufacturing firms are more focused on understanding the potential to achieve data-driven organization. Hence, organizations are investing extensively in data initiatives to create an environment in which data drives decisions, innovation, creativity and performance. Furthermore, innovative culture must be initiated into organization and is an equivocal construct, various individual, organization and contextual factors affect its adoption base on the differential impact to firms in the ever challenging business environment. As organizational

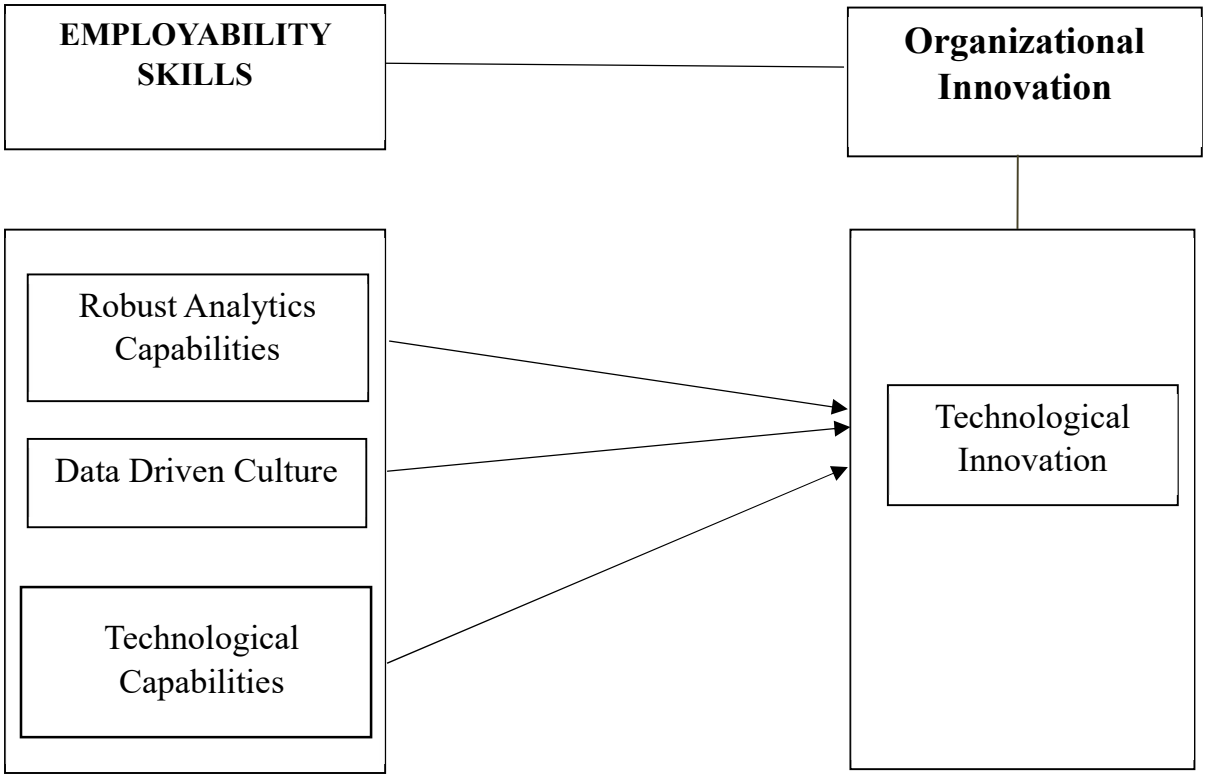
innovation can also be repressed by cultural factors, as shown by Leonard-Barton (1992) who resolved that certain cultures can inhibit innovation and that the capabilities that once led a firm to achievement can become core-rigidities.

Considering the intersections and gaps of the construct in the business and academic environs such as, data literacy, digital skills, analytics, data processing tools and competency, these study critically glanced into data driven management and organizational innovation of selected manufacturing firms in Port Harcourt.

Statement of the problem

Over the years, manufacturing sector has been a major contributor to nations building and economic development, in terms of Gross national Product (GDP) and other indexes. Today business environment is characterized with challenges and entourage with external forces, as most businesses question the emergence of their existence by taking drastic decision, which has become more difficult managing manufacturing firms in Port Harcourt with constants changes in policies, taxes, economics changes and other inherent banes. The Sun newspaper (2016, p; 25) posit that the contribution rate and performance of manufacturing sector to Nigeria economy does not justify its existence and development towards nation building compare to other nations like Japan, Singapore, South Korea and South Africa e.t.c, with similar industrial layout. Hence, one of the main challenges of organizations is data utilization relying on the privacy concern involved in the data collection and aggregation (Ghasemaghaei and Calic 2019), as data driven innovation also requires access to data and the ability to reuse and share data (Shi et al. 2022). In the face of these uncertainties, manufacturing firms and managers have come to realization that business can no longer be sustained by process and product innovation alone but through data driven management and business model innovation, and with these inconsistency wave and dwindling in the sector, various options such as data drive management and innovation to increase growth. This reality has reality has therefore conspicuously placed data driven decision as great insight to improvement profitability and performance. Therefore it is important for manufacturing firms to be data enabling and technological savvy to achieve organizational objective through organizational innovation, firms are investing extensively in data initiatives to create an environment in which data drives decision.

Conceptual Framework of Data driven management and organizational innovation



Source: Conceptualize by researchers

Objective of the study

This study is aimed at achieving the following objectives:

i. To examine the relationship between robust analytics capabilities and technological innovation of manufacturing firms in Port Harcourt.
ii. To ascertain the nexus between data driven culture and technological innovation of manufacturing firms in Port Harcourt.
iii. To determine the relationship between technological capabilities and technological innovation of manufacturing firms in Port Harcourt.

Research question

Based on the bane of the above statement and exact objectives of these study, the following research questions were formulated;

i. What is the relationship between robust analytics capabilities and technological innovation of manufacturing firms in Port Harcourt?
ii. What is the nexus between data driven culture and technological innovation of manufacturing firms in Port Harcourt?

iv. What is the nexus between technological capabilities and technological innovation of manufacturing firms in Port Harcourt?

Research hypothesis

The study hypothesis are:

$H0_1$: There is no significant relationship between robust analytics capabilities and technological innovation of manufacturing firms in Port Harcourt.

HO_2: There is no significant relationship between data driven culture and technological innovation of manufacturing firms in Port Harcourt.

HO_3: There is no significant relationship between technological capabilities and technological innovation of manufacturing firms in Port Harcourt.

Literature review

Conceptual review

Data-driven management and organizational innovation require a strategic and innovation focused approach. Strong analytical skills, a shift to a data-driven culture, technological capabilities, stakeholder involvement, incentives for encouraging innovation, strong data governance, data privacy and access regulations, and stakeholder involvement are some of the factors that can affect the success of the implementation of the data driven innovation process at the organizational level (Babu et al. 2021; Bhatti et al. 2022; Chandy et al. 2017; Janssen et al. 2017).

Resource-based view (RBV)

Given the connection between data driven management and organizational innovation, this theory seems to be the most relevant one. According to RBV discourse, resources like data are among the most important organizational assets, a portion of which allows them to gain a competitive edge and a portion of which results in better long-term performance (Barney, 1986; 1991). According to this hypothesis, businesses need resources like data from their client base, market, and data bank because they are not internally self-sufficient. Thus, in order to expand their data base, the companies become interdependent on one another. It is abundantly obvious from the discussion above that data-driven management and the resource-based vision theory have a direct impact on organizational innovation. The institutional theory, which is founded on reciprocity principles within context interactions, is equivalent with organizational innovation measures. As a result, it contends that top management support, budget allocation, and other innovation tools were seen as crucial (Janssen et al. 2017; Lokuge and Sedera 2014a; Palekar et al. 2013).

Dimensions of Data driven management

Robust analytics capabilities

The next great thing, the technology that will enable corporations to surpass their competitors, has been hailed as having robust analytics capabilities. Because of technology, businesses are now able to collect and retain vast volumes of data without taking into account the risks involved. In order to increase their capacity to gather and analyze data from as many sources as possible in order to

make educated decisions, businesses of all sizes across the majority of industries have made significant investments in analytics. As data patterns are predicted to increase confidence in company decision making to create value and improve productivity and efficiency, research establishing a link between analytics and business performance is still being developed. Additionally, utilizing analytics capabilities is important since it improves reasoned decision-making while being attentive to difficulties in the company environment.

Manufacturing companies should make sure that the managers of robust analytics platforms in their organizations have the managerial knowledge and organizational experience necessary to contextualize statistical results appropriately. By doing so, they will be able to produce value-driven business insights even when stakeholders and decision makers are uncertain. The development of appropriate thresholds for pertinent inquiries, related metrics, associated confidence levels, number of trials, and other variables is required for efficient analytics in order to enable rapid and cost-effective value-creating decision making.

Data driven culture

When an organization lacks a data-driven culture, managers must instead rely on their own judgment, experience, and insights drawn from the data that is available. A data-driven culture has been described as an intangible asset that rival businesses find difficult to replicate, which has led to the argument that data-driven enterprises would be more profitable than their rivals. Here, it is crucial but debatable to assume that businesses can truly create a data-driven culture. Although it would seem like a straightforward, logical decision for enterprises to make, there are significant barriers preventing firms from achieving a data-driven decision-making culture. To guarantee that data collection and analysis efforts serve a clear business purpose, manufacturing companies should adopt a data-driven culture that supports a decision-driven culture.

Technological capabilities

Technology capabilities enable businesses to outperform their rivals in better and quality product. Additionally, a technological skill might be linked to organizational innovation and performance. Better technologically equipped manufacturing firms typically have higher performance levels. Furthermore, only a small number of research come to the conclusion that firms in emerging economies do not have the necessary technological capabilities, leading to long-term failures of those firms because those firms do not rely primarily on developing technology for survival, such as low-tech. Companies must innovate in order to become competitive if they want to survive in these times of fast technological development.

Technological capability and innovation

Organizations need to be able to compete in the global economy, especially when it comes to an essential ability known as absorb capacity, which is the capacity to absorb new information and put it to use for business reasons. That is the capacity of technology. The definition of technological capability is a subject of debate. For the sake of illustration, Ortega (2010) claims that technological capability refers to a company's capacity to carry out technical tasks, create new goods and services, as well as innovative new methods of doing business. It is crucial to stress that the primary objective of technological capabilities is to affect the product and/or process.

More specifically, technological capabilities are the abilities to develop and design new product, new process, and more effectively operate the equipment or resources which are needed to produce

managerial technique revolution, including skills, knowledge, and experiences as well as institutional structures and ties. Numerous studies have demonstrated the significance of technological capability in innovation.

Measures of Organizational Innovation

Technological innovation

Multiple technologies and technical advancements over time have a cumulative effect that leads to technological innovation. This makes technical transformation a concept that applies to the level of a product class, an industry, and an economy rather than only organization. Technology is defined by Tushman and Anderson (1986, p. 440) as the means by which new goods or services are produced (product technology) as well as the knowledge necessary to mediate between inputs and outputs (process technology). Technology has an impact on organizational effectiveness, makes it easier to turn inputs into outputs, and decreases inefficiencies in product development, manufacturing, and service delivery. Physical technologies are those used in the products and processes. The introduction of technologically based product or process innovations may be sped up by new physical technologies. In this sense, technological invention is a lower order concept than technological innovation. Similar to how technical change can be thought of as a lower-order concept than technological innovation. There are several ways to define how technology is affecting business and management. For instance, technological change can be seen in notable improvements in technological performance within a technological regime (Lawless & Anderson, 1996), changes within uniform and differentiated technological systems that result in the technological development of industries (Barnett, 1990), and technological breakthroughs or discontinuities that result in a dominant design (Wade, 1996). Godin's (2015B) research of the conceptual history of technological development provided two broad interpretations of it: a narrower interpretation, a change in the processes and techniques of production; and a wider interpretation, a change in society as a result of technology.

Administrative Innovation

The changes to the organizational structure or administrative procedures are related to the administrative innovations. The development and implementation of organizational activities, such as administrative procedures, organizational structures, and member social systems, are handled by administrative innovation. It consists of guidelines, practices, administrative frameworks, and member training programs. Administrative innovation alludes to the development of new ideas by companies in order to react to environmental changes and realize strategic objectives for sustaining and enhancing performance. In order to increase efficiency, profitability, and market share by using data, organizational innovation focuses on data-driven management. Administrative innovation is closely related to change, according to Nadler and Tushman (1997), a change is a transition from one state (existing before the change) to another state (existing after the change). It is the observation of time differences in any organizational dimension (Van de Ven & Rogers, 1988). Organizational change is the introduction of practices that are different from those that are currently in use (Burke, 2002; Daft & Becker, 1978; Wischnevsky, Damanpour, & Mendez, 2011). It happens when businesses adopt new operating procedures and practices in place of outdated ones. Change and innovation are thus by definition differentiated from one another principally by the freshness or newness of the idea or acts to the target organization.

Importance of Innovation

The organization and the economy both benefit from innovation. As a result, the significance of innovation depends on the fact that it can appear in various rotating forms. When a new or enhanced product or service is introduced or commercialized in contrast to already existing ones, for instance, innovation is crucial. Therefore, it becomes clear that organizational innovation is important since it helps new goods and services reach the market. In a similar vein, innovation helps to enhance the services and goods that are already available. Organizational innovation can be used to develop a new production method or even enhance the existing business procedure in both the most straightforward and complex ways. Creating a new method of production, or more accurately, a new form of production, in this case implies exceptional efficiency with regard to manufacturing, which can include reducing time, cost, increasing productivity, or producing better products while maintaining the same level of production. Organizational innovation is also essential since it can pave the way for a new market. This can be viewed as the marketing dimension and relates to attempts to guarantee that the products are successfully marketed. Under this scenario, employee and management innovation will result in better marketing possibilities and more sales. Organizational innovation can also lead to the creation of new supply sources for things like materials, machinery, and various other inputs.

Banes of Data innovation process in organizations

The adoption of organizational innovation in organizations is hampered by a number of variables, making it a crucial concept. In contrast to the positive effects of administrative intensity, complexity, external communication, internal communication, functional differentiation, managerial attitude toward change, professionalism, slack resources, specialization, and technical capacity on organizational innovation, Greenhalgh et al.'s (2004) meta-analysis of service and manufacturing organizations demonstrates that centralization has a negative impact on organizational innovation. Numerous studies have identified external factors that can affect the innovation process as well as the impact of personal factors like motivation, demographic factors, and job characteristics in the prediction of data-driven innovation that promotes data-driven decision making, creative self-efficacy, and creative performance (Babu et al. 2021).

However, another area of research where academic scholars can look at how social processes like conflict and power shifts might affect the innovation process is the investigation of the social processes related to innovation in a data-driven environment (Troilo et al. 2017).

Data driven management and Organizational innovation

Data can be considered to develop and strengthen organizations competitiveness, in today’s intricate business environment the management of data and data driven decision is very crucial for profitability and performance. Following the construct development, to harness the true power of data and analytics, organisations should formulate a secure data strategy that broaden the access to data and promote a data culture that enables data monetization and data-driven innovation (Legner et al. 2020; Shi et al. 2022; Symons 2022). In the same vein, the rising interest in investing in data initiatives, organizational data is recognized as a strategic resource and a catalyst for developing innovation capabilities (Lokuge and Sedera 2020; Sedera and Lokuge 2019a), as well use data to achieve competitive edge. Manufacturing firms need to be data driven to be sensitive in business environment and to make informed business decisions that will enhance performance upon tailoring product and service to customers need and operate effectively. It is pertinent to

emphasize that the main goal of data driven management is to have an impact on the firm's innovation, product and process. Moreover, t, data-driven innovation is considered a key pillar of the business growth (Chatterjee et al. 2022).

Methodology

In this study, the method is opined in a quantitative and qualitative approach. Fifteen manufacturing firms were involved and encompassed in these study's sample. The staff that were selected were method of simple sampling techniques. To achieve the objective of the study, the study includes constructive instrument. Data was gathered by the researcher and validity were established while reliability was achieved. Furthermore, questionnaires were personally given to manufacturing firms staff. The total of 106 questionnaires with the rate of 97.5% response rate were returned. Spearman's Rank Correlation was used to examine the hypotheses with the aid of Statistical Package for Social Science (SPSS). The male respondent make up 65.20% of the sample's respondents, while the female folks 34.8% of the other respondents. 80.9% of respondents were senior management staff, 19.9% were managers do to according to the data obtained and the strategic conceptualization of the construct. Also data gathered were initially established and confirmed on scale which further validated the measure of the subject matter.

Discussion of the Findings

$H0_1$: There is no significant relationship between robust analytics capabilities and technological innovation.
$H0_2$: There is no significant association between data driven culture and technological innovation.

Correlations

			Robust analytics	Organizational Innovation
Spearman's Rho	Robust Analytics	Correlation Coefficient	1.000	.803**
		Sig. (2-tailed)	.	.000
		N	101	101
	Organizational Innovation	Correlation Coefficient	.803**	1.000
		Sig. (2-tailed)	.000	.
		N	101	101

**. Correlation is significant at the 0.05 level (2-tailed).

Source: Field Survey Data, SPSS Output

Correlations

			Data Driven Culture	Technological Innovation
Spearman's Rho	Data Driven Culture	Correlation Coefficient	1.000	.903**
		Sig. (2-tailed)	.	.000
		N	101	101
	Technological Innovation	Correlation Coefficient	.903**	1.000
		Sig. (2-tailed)	.000	.
		N	101	101

**. Correlation is significant at the 0.05 level (2-tailed).

Source: Field Survey Data, SPSS Output

The result of the tested hypotheses illustrate the relationship between robust analytics capabilities and technological innovation revealed rho value of .803** for hypothesis one and .903** for hypothesis two. This demonstrated a strong relationship between robust analytics capabilities and technological innovation of selected manufacturing firms in Port Harcourt, Rivers State, Nigeria. Robust analytics capabilities is very crucial in manufacturing sector as its enable business re-engineering in the process and production of products. The present study has showed data driven culture relate so much with technological innovation which means that when manufacturing firms incorporate data driven culture it increases product innovation, business model and enhance decision making on process and product underlying quality insight.

$H0_3$: There is no significant connection between technological capabilities and technological innovation.

Correlations

			Technological Capabilities	Technological Innovation
Spearman's Rho	Technological Capabilities	Correlation Coefficient	1.000	.871**
		Sig. (2-tailed)	.	.000
		N	101	101
	Technological Innovation	Correlation Coefficient	.871**	1.000
		Sig. (2-tailed)	.000	.
		N	101	101

**. Correlation is significant at the 0.05 level (2-tailed).

Source: Field Survey Data, SPSS Output

Decision: From the SPSS table above, the probability value is 0.000 (PV < 0.05) while the correlation value is .871** which indicates strong relationships between technological capabilities and technological innovation. Hence, we reject the null hypothesis and accept the alternative hypothesis which implies that there is a positive relationship between technological capabilities and technological innovation of manufacturing firms in Port Harcourt.

Conclusion

Looking at the gap and based on the outcome of this study, it was concluded that organizations that leverage on data driven management pose competitive edge, as it enables organization to be digital savvy while keeping up with the latest marketing trends and wave, once an organization establishes and implements the correct data strategy to enhance innovation activities, it will improve product development opportunities and organizational performance (Chaudhuri et al. 2021; Sedera et al. 2022b). In the same vein, data-driven can influence an organization's innovation competency for more specific types of firms such as multinational corporations, small and medium-sized enterprises (Bhatti et al. 2022; Ghasemaghaei and Calic 2019). Meanwhile, organisations can also extend their existing innovation skills, processes, and knowledge to improve innovation competencies or renew their exploration competencies by implementing data driven strategies (Adikari et al. 2021; Sedera and Lokuge 2017; Visvizi et al. 2021). Furthermore, with data communication is lucid, as it enables organization to visualize performance in an easy-to-understand ways through the use of charts and tables, offers step-by-step guide with clear instructions to make strategic and data-driven decisions akin to straightforward guidance for updates and maintenance of product and services. However, data plays a vital role in the improvement of organizational performance, boost productivity and connote innovation with evidence based information to make insightful decisions.

Recommendation

Given these backdrop and findings from the study, data enable organizations to maintain a cost saving and industrial leading performance that precipitate innovation and growth. The following stance are recommended;

i. Organizations should leverage on customer ecosystem whilst tailoring product and services to customer needs rather than generic purpose alone, as understanding the market's needs help them to improve their capability in their product innovation.
ii. Organization should embrace data, as it will enable organizations scale in profit, performance, value and recognize room for further improvement and business continuity while meeting their customer taste amidst fierce competition in business environment.
iii. Organizations should focus on data to enable them attained innovation, get meaningful insight thereby link with competitive edge in business environ, hence adapting to data driven organization ensure response to external market changes.
iv. Organizations should leverage and strategize on data to help them attain performance driven culture with seamless performance on work plans and outputs.
v. Organizations should embrace data, as it will aid them to revolutionize work processes, activate innovation and empower workers to accomplish more

However, manufacturing firms should re-focus their strategic objectives to consider data as the key levers of efficient decision-making and implement smart technologies for efficient and cost-effective data management practices that drive the conversion of data into data-driven insights in their organization (Visvizi et al. 2021).

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