Sustainable Production: New Thinking for SMEs

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Abstract-
The future of small and medium-sized enterprises (SMEs) depends greatly, not only on operational excellence and performance to execute successful business ideas but also on sustainable production practices that combine both environmental and socio-economic considerations to meet optimal product, process and productivity expectation. In an advanced lean operation scenario, such as the Production Preparation Process (3P) or Total Productive Maintenance (TPM) process, etc., when integrated into the environmental conservative-adherence requirement, is essential to lead a sustainable pathway to operational excellence, and boost enterprise business competitiveness. The author in the present paper empirically examines the likeness of SMEs responsiveness toward sustainable production activities to accelerate business performance, while, promoting social, economic and environmental interest. Several mechanisms by SMEs to achieve sustainability in their manufacturing operations: the combinatory approach of lean principle to improve non-emissive, conservable energy-practice and eco-design/materials selections are reviewed. More so, the paper contributes to the literature on sustainable development for developing countries and sub-Saharan Africa in perspective. Within the different models of development and networks for improvement of the concept of sustainable industry practices, SMEs play a quintessential role. This goes to say; there is a great need to consider collaborative, Governmental/policy, and the integration of new developing Information Communication Technology (ICT) initiative to promote corporate business profitability actively and transform enterprise structures to become more resilient while functioning sustainably.

Keywords: Business performance, environmental consideration, SMEs, sustainable production

1. Introduction
The result of global energy price increase, pollution, and rise in the Earth surface temperature, attracts strict environmental regulations relating to environmental performance by all stakeholders, and SMEs to diversify their operations and activities to participate in the reform manufacturing as we know it [1]. Lean manufacturing practice and implementation have been globally considered and widely accepted as a profitable strategy to address challenges regarding industrial production waste management and through identification and elimination of activities which may not add value to the overall operations process. But which improves performance to foster organizational coordination to become more efficient, profitable, and flexible in its’ performance [2]. Sustainable growth improvement strategies (lean and green operations) and value-added practices which aim to tackle waste associated with product creation and services delivery without adverse environmental impact [3] is one area for consideration by SMEs.
New government requirement and regulations, combined with developing market strategies to combat environmental degradation challenges, thereby, encourage customers who patronize sustainably manufactured products to decide the growth trend of businesses – SMEs to shift from the traditional culture of pre-existing operation to focus on sustainable production to remain relevant in the market economy [4]. The call on SMEs concerning their share of contribution and environmental protection obligation through a nascent approach and technology-innovative integration to achieve no-waste production and without toxic dispels while adapting the most environmentally friendly, sustainable approach: material and energy resource consideration during the manufacturing process [5] is timely.

2. Literature and previous consideration

There is little wonder that human activities and exploration operations of enterprises’ over the years have depleted the geo-ecology, and therefore recalls for a new strategy. The birth of new thinking which says “the process of aligning an enterprise with the business environment to maintain a dynamic balance” also calls to the global habitat for change. The implication of environmental management or performance by firms’ and growing industries is hinged to the business perspective, and have as well brought about the question of sensitivity of the result of previous research works. While in some cases, the most viable option for waste management may adopt the ISO 14001 system, other ventures, considering firms’ seize differences, may require hardware that can treat or in more advanced cases bury their waste; leading to varying financial throughput and operational cost [6]. The authors explore a systemic investigative strategy to assess enterprises’ sustainable production activities to ascertain their impact, and to understand the extent to which new mechanisms for growth may supports sustainability in businesses/enterprise performance.

From the horoscope of sustainability and within the framework of strategic planning for future SME to become resilient and viable, integrating sustainable measures to ensure economic, social and environmental consideration is pivotal [7], and requires the integration of eco-innovation strategies with sustainable business models to achieve positive results. The focus is on developing African countries, especially within the sub-Saharan regions. While very little in terms of research have been carried out to consider the impact of sustainable operations and eco-production consideration from the context of SMEs in the engineering disposition, this paper is a contribution to that regard. The authors consider 'Sustainable Production,' to be active economic business activities which does not impact negatively on the environment and human health [8], while applying mechanisms that utilize optimal energy and conserve natural resources, with reduced production of waste and dangerous, noxious substances.

2.1 SMEs from the perspective of embracing sustainability

The concern for a sustainable future and adjustment to the growth trend, innovations that threaten the norm as per change requirement for employability and employment opportunities may not be taken too lightly. Also, social and environmental consideration cannot be ignored in the current pace of technological advancement and entry of new businesses and economic models. The rebound effect on the ecological balance when not carefully monitored could be detrimental [9]. That is to say; ample expectations rest on business enterprises’ to contest the economic growth rate and explore various chances, e.g., introduce robust communication technologies [10] that will support the envisaged change and deploy strategies to favor SMEs
participation and survival during the process. Needless to say that, these small firms form the bedrock upon which conglomerates strive and become successful, as such, their characteristics and performances influence sustainable achievement report and support business evolution and growth.

The role of SMEs to contribute and manage the global geo-ecology requires a systemic approach of conscious and deliberate actions towards operational assessment. Coordinated activities which go on in the firm: to embrace collaborations and promote integration and incorporate a new mechanism which will overcome SME challenges over the implementation of sustainable practices (innovation in enabling technologies, robust network of communication and supply chain) [11]. An enterprise resilient-ability to construct, integrate, and reorganize both internal and external competencies to address the rapid change in business economy and environments are indices of success to cope with the dynamic markets and regarding the response to change. According to Rothaermel and Hess (2010) [12], “the antecedents to build these organizational capabilities can be found at the individual, organizational, and network level.”

2.2 SMEs adoption of Lean Practices

SMEs, while looking through the lens, having to increase their market values and profitability must desire to continue to grow regardless of the change expectation from the context of cultural, technological or regulatory policies, etcetera, to become resilient. According to Trim and Lee, (2008) [13], the statoscope has seen SME operations in the past, and managers to be contempt rather than introduce innovation and mechanism that may proactively affect environmental challenges as a driver of sustainable production. This section gives a brief review of the support mechanism, and lean operations within the manufacturing SME environ. Table 1 presents a selection of lean practices which support sustainable production activities for SME development.

Table 1: Review of Lean Practices in manufacturing SMEs

| Lean principles          | Researching Authors’    | Activities                                      |
|-------------------------|-------------------------|-------------------------------------------------|
| Kanban                  | [14]–[16]               | Reduce idle time in production operation        |
| Kaizen                  | [17], [18] [19]         | Continues improvement process                    |
| Total Productive        | [20], [21] [22]         | Promote effectiveness and increased productivity |
| Maintenance             |                         |                                                 |
| Value Stream Mapping    | [23], [24] [25]         | Manage information and resources/material flow  |
| Jidoka                  | [26], [27] [28]         | Automation/human interference which promotes quality and Energy performance consideration |
2.3 Sustainable production versus economic performance

The new international economic perception which considers the integration of smart and innovative strategy to drive technical excellence, ought to imbibe ecological perseverance, with social and societal value in the pursuit to reach financial freedom despite government policies, employability, and employment challenges etcetera. A commonly accepted knowledge of what is understood to describe eco-innovation portrays the authors' capsulation concerning sustainable production for SMEs and future small businesses involved in engineering development across the world [29]. Hence, sustainable production “The production, assimilation or exploitation of novelty in products, production processes, services or in management and business methods, which aims, throughout its lifecycle, to prevent or substantially reduce environmental risk, pollution and other negative impacts of resource use (including energy).” The strategic action taken by a firm towards product development in the short term has a direct impact on the society. In the long, run since every consumer behavior affects the process through the product/services they patronize, and thus require a systematic monitoring process and assessment of the progress of the appropriate mechanism and actors (JIT and other lean practices) that facilitate sustainable production.

Figure 1: An outline of the scenario map for sustainable product development [30]
The significance the subject matter is to corporate responsibility of businesses to support, either directly or indirectly, the seventeen sustainable development goals, to i) salvage people from hunger, poverty and equality issues. ii) resolve climate degradation and natural resource exploitation. iii) ensure socio-economic progress and technological advancement. iv) promote inter and intra-communal security and tranquility, and v) encourage inter and intra-geopolitical partnership. Overall, the emphasis is more on judicious use of resources and with energy management in consideration. A conceptualization approach by Gaziulusoy, Boyle, and McDowall, (2013) [30] with a proposition of a scenario method, illustrated in figure 1 (for a typical small-sized business-workshop) shows scenarios of planning towards the successful achievement of sustainable production, while considering short term product development strategy and long-term vision of doing business continually and successfully. The model above allows firms growth and development and transition to newer business coordination, like in the case of selecting alternative energy options and remaining relevant in the sector.

3. Methodology
In an attempt to proffer logical inference about the current trends concerning organizational effectiveness, and discover a future pathway to corporate business advancement or suggest mechanisms to propel change in the manufacturing industries sector, we consider the relationship between sustainable production initiatives and the growing propensity of manufacturing SMEs to embrace the idea. Collation and analyses of qualitative data generated from questionnaires modes were duly received from 38 senior managers/experts/owners of indigenously registered enterprises, involved in manufacturing operations. The firms in question were selected, having a work-force of at least 40 to 100 personnel, as this range meets a comfortable management assessment for SME operation. A semi-structured interview was also conducted, and eight academics’ within the rank of senior lecturers (Professors) and professional within the scope of sustainable engineering from prestigious universities were contacted wherefore responses were managed and analyzed accordingly.

A construct of qualitative assessment themes which represents sustainable initiatives and practices, and which dominates a supposed ‘better industrial operations process and SME performance, as filtered from the interview process resulted to the design of a more refined open prompt question which formed the themes that are capsule in the questionnaire. The Likert scale (five-point: zero consideration, start-up stages, medium consideration, extensive consideration, and complete implementation) was used to understand the developmental trend of operations in SMEs with regards to sustainable production integration, also, to answer a set of five questions in each theme. The items which form the content of our questionnaire seeks to explain the level to which sustainable production impact: i) work ergonomics, ii) waste reduction, iii) compliance to sustainable development policies (where, and if any), iv) change in long-term culture and operations and iv) its effect of business performance.

The data were collected from different firms within Nigeria, Uganda and South Africa contingent on sustainable disposition as provided by the respondent in each interview process was also used in the questionnaire design. The feedback was coded to give symbolic meaning to the themes established concerning the purpose of the research investigation. An analysis was conducted using SPSS version 25, and the resolve compared with the response and observation from the interview process. The data was validated; reverse scored (factor analysis) and tested
for acceptable correlation. Also, a reliability test of the data was carried-out accordingly [31]. In the present paper, we identified and evaluated sustainable production activities and categorized them as ‘high chance’ or ‘low chances’ to promote corporate enterprise growth and development.

4. Findings and assertions

According to the findings, sustainable production orientation holds more to be desired and points to what is yet to come. SME operations and coordination will improve as innovation in resources management and materials research apex globally, or as communication technologies transform, and the artificial neural network expansion becomes a household idea. The juxtaposition is that; an inclusive, sustainable production business model is tantamount to drive innovative thinking, and support enterprises to strategize and improve their economic performance. The niche in our investigation which had affected the research analyses owing to the economic advancement capacity between South Africa, Nigeria, and Uganda, and government policy resulted in furthering the synthesis of the data. We observed that the potential to deliver high on the quality of product and service at reduced cost with optimal yield, through sustainability consideration approach in the most energy efficient and lean manufacturing process is achievable in all three nations to support growth and development. As such, pose the possibility for success in sub-Saharan African state.

Other pivotal findings: sustainable production is yet to receive full acceptance by SMEs. Lean practices and implementation are not majorly a concern to business owners (use what is available). Management interest is mainly to make profits. Environmental/Social and societal consideration is a priority but rarely included during business planning with only 25% implementation. Sustainable production is under consideration in more than 90% of the total firms, optimistic about embracing change and implementing it in the near future. Sustainable production initiative will require training; however, improve maintenance practices, reduce operation downtime, promote eco-innovative activities and increase the general business productivity. Interestingly, all the firms in the study agree to advance business performance with sustainable production implementation.

Sustainable production success from the technological enabling point-of-view must consider newly developing renewable resources/energy options which are legal and relevant to support the economical components to register high productivity and performance as one strategy for emerging business models [32]. None the less, the measure of sustainability performances on outputs of businesses should mirror a diverse approach which accommodates ecological and social-societal interest also, as an overbearing issue which past researchers have not covered, as per, different firm size/capacity. Governmental back-up on the establishment of favorable policies and framework as a support mechanism for SMEs to roll-out operational strategy and business models with nascent ideas within the context of sustainability will prompt the spring-up of new businesses. These businesses regardless of their small nature or sizes offer dynamism and is a potential to satisfy immediate consumption demand of customers and serve as an intermediary between big economy/large business and consumers.
5. Conclusion

The inference on sustainable operations strategy is dependent on the nature of business i.e., the scope and capacity/size of the enterprise, and also on the preparedness of the firm to meet operational effectiveness. The promotion of capital investment for sustainable practices toward result oriented solution in engineering offers future enterprise owners a high chance to create and manage a sustainable supply chain process. It goes to say that a sustainable producer is a viable supplier of sustainable products with the ability to attract unparalleled opportunities or network to transform the global value chain. SMEs having to integrate social and environmental sustainability practices in their production processes stand a chance to extend their social and financial trajectory to the scope of their business reach. This will lead to new opportunities for innovation that will cement prospects for future product development and service delivery. The measure of the level of performance by SMEs considering various lean practices or combined lean principles must form part of the guiding process towards standardization and when formulating necessary policies and strategy for investment.

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