

# **ENHANCING LEAN INTERVENTIONS THROUGH THE USE OF SYSTEMS THINKING IN THE FOOD PRODUCTION INDUSTRY: A CASE IN THE NIGER DELTA REGION OF NIGERIA**

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## **ABSTRACT**

This paper discusses how Lean Thinking (Lean), can be enhanced through the use of Systems Thinking (ST) tools and methodologies. Lean has emerged as a process improvement philosophy aiming to enhance value through identifying and eradicating waste through, inter alia, various tools. However, Lean tends to focus narrow stakeholder input, their views and their agendas, leaving out the impact of the operational process on the other relevant stakeholders that may be affected by the system. Such a narrow view has an impact on Lean implementation and adoption, and on its success in improving processes and sustaining changes. To address this gap, we argue for the use of Systemic Lean Intervention (SLI) by combining Lean and Systems tools, using a case of a commercial livestock farm in the Niger Delta region of Nigeria. We suggest that SLI can assist in a wider acceptance of Lean improvements and we highlight constraints related to SLI including the autocratic leadership style and boundary rigidities, which hinder effective team play. Finally, it is noted that this approach would require time to be adopted and used in the particular context.

## **INTRODUCTION**

Over the last years, organisations have used a combination of approaches to address operational challenges and efficiency in particular, Lean thinking (hereafter Lean) has become popular among scholars (Bhasin and Burcher, 2006; Gregory, 1992; 1996; Hines et al, 2004 Shah and Ward, 2007; Wan and Chen, 2008;Womack et al, 1990). Lean is in sharp contradiction of the former practice of rigid organisational practices, associated with minimal human resource interference (see Brown et al, 1988; Emiliani, 1998; Taylor, 1967; Wild, 1989; 1998).

A common factor attributed to the use of Lean is the identification and elimination of waste and enhancement of operational processes, while at the same time aiming for value development in an operational systems- seeking to achieve more value, by using fewer resources (Womack et al 1990; Womack and Jones, 2003; Jorgensen and Emmitt,2008).

Radnor et al (2012) note that an effective focus on value creation in a firm's operational process is what can naturally lead to efficiency, and sustainable waste elimination. This argument is synonymous with of authors (e.g. Byrne, 2013; Liker, 2008; Smeds, 1994; Schuring, 1996) who suggest that the quest for Lean organisations is to develop effective value additions for the stakeholders (e.g. customers). This positions them for both operational effectiveness and efficiency, via a connected operational approach that seeks to ensure satisfaction and survival for the long term.

However, Lean practice may significantly neglect the involvement of wider relevant stakeholders coverage which could have ensured better effects of its practice on the stakeholders. This may be possible via an overall embrace of a systems practice in its implementation in an operational process. This weakness has tended to constitute an inhibition to the continual success of Lean.

To address this gap, this paper provides a qualitative case of Lean intervention using Systems thinking tools to address organisational issues in a commercial farm, in the food production industry in the Niger Delta region of Nigeria. The paper adopts a systemic approach, involving a wider range of stakeholders, who participated in the intervention process. This resulted in the development and application of a new theory – Systemic Lean Intervention that involves the combination of different methods and ideas in the intervention process.

The structure of the paper is as follows: the next section provides a brief overview of the literature on Lean and Systems Thinking, and section 3 describes the methodology. Section 4 presents the findings of the case study whereas section 5 discusses the findings. Section 6 concludes the paper.

## **TOWARDS A SYSTEMIC APPROACH TO LEAN INTERVENTION PRACTICE**

Lean aims to eradicate waste from organisational processes while focusing on customer value (Womack et al., 1990). Lean practitioners tend to devote much of their effort to satisfying end customers (Garrido and Pasquire, 2011). However, there are a wide number of ways that managers can become aware and explore Lean further, especially in the areas of key stakeholders' interest<sup>1</sup>. The influence of these stakeholders seems to be considerably lacking (Boyle et al, 2011). Stakeholders' involvement serves as means of exploring business environmental opportunities which can help sustain productivity (Bhasin, 2011; Eisenhardt and Martin, 2010; Emery and Trist, 1965; Smalley,2009; Sawhney et al,2010). Failure to explore these collaborative measures can lead to negative responses from key stakeholders and sometimes result to conflicts in an operational system the operational system. For instance, Osagshae (1995), points to the failure of the government and some multinational oil companies in the Niger Delta region of Nigeria to recognise key stakeholders who are affected by the operations of these firms.

Apart from stakeholders, business environments experience unending changes as a result of interactions among different fragments of business environment that generate "emergent properties" that stimulate interest in seeking further actions for resolution (Checkland and Scholes, 1990;Midgley, 2000; p40). This raises the question of whether Lean, being a foreign management philosophy could be transferred to developing countries like Nigeria where this research is based? It also suggests that a priority for a developing country is not just to adopt new operations management approaches, but to address certain environmental challenges like the problems of inadequate infrastructure and cultural issues (such as low levels of trust, inadequate power supply etc), so that these approaches will work effectively, which accounts for the deliberate choice of adopting Lean on a platform of wider systems practice in this intervention. Jackson (1991; 2000; 2003) notes that systems approach has a capability to address complex organisational problems, via its various methodological ideas with due recognition to various stakeholders' interests.

Adopting systems approach in this research process would encourage the establishment of a mutual relationships culture with these stakeholders as part of an organisation system; which could offer an advantage to the context of this research in terms of embracing the basic attributes that make up Lean by the participants in an environment where its holistic practice of Lean seems to be unpopular (see; Gregory, 2007; Seddon and Caulkin, 2007; Seddon, 2008).

Thus, systems approach can help Lean explore the 'bigger picture' of the complexity<sup>2</sup> of the Nigerian context, as well as facilitate the stakeholders' acceptance among practicing organisation in the Niger Delta region. This will encourage a structured approach meant to work on each component in the process of finding holistic methods to improving on current operational practices in the food production industry, where the case study organisation for this research operates (see, Clark et al, 1998). This argument suggests that implementing Lean on systems basis could also facilitate effective learning across cadres of the entire system operated by the case study organisation.

However, apart from few exceptions (Gregory, 2007; Seddon, 2003), detailed applications of systems theories tend to be scarcely used among Lean authors. A combination of these approaches to the research process would engender a productive research that would encourage further development

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<sup>1</sup> Gibson (2000) defines interest in stakeholders' management context as the needs and wants of stakeholders which may be satisfied by the other party.

<sup>2</sup> Schoderbek et al (1985) defines complexity of a system as the outcome of the interactions of the elements that comprise the system and the rules guiding the interactions or specifying the attributes. Richardson and Lissack (2001) describe complex system as one that has a number of connectivity, comprising non-linear relationships, displaying evidences of difficulties in separating these connecting activities within the system.

both in theory and practice, on the two subjects of Lean and Systems tools (see, Taylor and Taylor, 2009). To address these gaps, the following questions are raised:

How could Lean and Systems approaches be applied in order to improve organisational processes in the food production industry?

How can the practice of Lean as a process improvement tool be enhanced with the use of Systems approaches to address the issues identified? What are the challenges associated with this use?

## RESEARCH METHODOLOGY

### Research Strategy

This intervention assumes an action research<sup>3</sup>. Lean and Systems tools are to be applied in the intervention process. The choice of cases is in alignment with the submission of Lean authors that most Lean projects come with certain peculiarities. Focus would be on the operational process, seeking to find in-depth answers to challenging issues (see, Liker and Hoseus, 2008; Liker and Ogden, 2011; Liker and Convis, 2012; Papadopoulos et al, 2011; Yamamoto and Bellgran, 2010; Yin, 2004). The proposed research process would be devoted to exploring the problems and challenges associated with Lean and Systems approaches in the intervention process via the use of different ideas and methods from different methodologies. This research draws on the submissions of pluralist authors (e.g. Midgley, 1997; 2000; Jackson, 2000; 2003)<sup>4</sup>.

Midgley (1997; 2000) suggest systemic intervention, which he defines as a purposeful action/s by intervener/s, drawing on methods from a variety of methodologies and then employ them using his or her own methodological understanding. Adopting this in this research would enable a significant flexibility in the approach, based on the understanding of the participants (see Córdoba and Midgley, 2006; Midgley 2000, 2011; Midgley and Ochoa-Arias, 2004).

### Data collection methods

*Semi-structured interviews:* these were conducted with the stakeholders of the case study organisation. The use of open questions were adopted to allow the interview respondents the opportunity to respond adequately (see, Asika, 2000; De Vaus 1986; Gillham, 2000; Gillham, 2005; Hiller and Diluzio, 2004; Kitzinger 1994; Wu and Wu, 1994).

*Root Definition and CATWOE identification:* CATWOE were applied alongside boundary setting that formed a foundation for the entire intervention process. The initial personal interview data that were used to the identification of the CATWOE elements of each root definition, needed to explore the various parts of the identified issues as well as the views of the actors and owners (stakeholders) about the proposed transformation process. This was focused on the identification of the concerned stakeholders in the deliberation on the transformation process.

*Boundary Critique:* Boundaries for this research process were based on positions interest, the educational status of the participants, the kind of data to be sourced and Participants' availability and willingness. Effective boundary setting limits the number of stakeholders and the issue focus in order to facilitate a practical intervention, unanticipated issues and perspectives emerge, and the thorough

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<sup>3</sup> Rapoport (1970) defines action research as a practical research approach that involves people collaboratively to explore an identified problematic situation within a mutually agreed ethical framework. This is in tandem with the assumption of action researchers (e.g. Brydon-Miller, 2003; McKernan, 1991; McNiff, 1998; Yin, 1994), in their overall interest in live data that represent current phenomena under consideration in a research process.

<sup>4</sup> Jackson (2003) defines pluralism the merger of different methodologies from different paradigms to solve complex problems in an intervention.

exploration of what improvement might mean in the context of the intervention (Churchman, 1970; Córdoba and Midgley, 2006; Midgley, 1997; 2000; Levick and Woog, 2000; Ulrich, 1983, 1996).

*Participants Observational Method:* This method was chosen to fill in the gap that may be created by issues of misunderstanding between the researcher and the respondents in the case study firm, on current practices which may not be easily understood, due to differences in worldviews and usage of unfamiliar terms. It was applied as a complement to other methods used in the intervention (e.g. personal interviews). It provided the opportunity for participants (both the researcher and the respondents), to have a continuous critical reflexion<sup>5</sup> on the context of data collection process (see, Liamputtong and Ezzy, 2005).

*Workshops:* Lean tools including value stream mapping and rapid improvement events were used to facilitate a better understanding and identification of relevant issues that were addressed in the intervention process. Participants for workshops would be selected via the use of boundary critique and CATWOE. The selected participants were engaged at different times to deliberate on operational issues.

*Development of rich picture representation:* Rich pictures were applied as an auxiliary method to lay emphasis on deliberations on relevant issues surfaced through the boundary critique, observed data and confidential interviews or workshops. Such were combined into rich pictures for use in enhancing the data collection process (focused on the identification of systemic issues (see, Bell and Morse, 2013; Checkland, 1981; Midgley, 2000).

## **DATA ANALYSIS**

Collected qualitative data were recorded with the consent of the participants at each stage of the intervention process. Manual collation and analysis was adopted. It highlighted the main points of the data collected, which informed further discussion on the findings, based on extant literature.

## **OVERVIEW OF THE CASE STUDY ORGANISATION**

The case study organisation is a livestock commercial farm located in the Niger Delta region of Nigeria, Africa. The farm is currently located in a rural community in one of the Niger Delta states, in the south-south region of Nigeria. Among the products on its offer are pigs, table eggs, processed chicken products, Live broilers, day old chicks, livestock feed, cattle, snails and fish.

The main stakeholders identified in this research process are the host community; who plays host to the organisation, the regulatory Government agency that set the operational standards and ensures conformity of the organisational operations, the input suppliers, the internal organisational members, the customers, and the top management of the organisation. Others are the Middle managers and supervisors and the Junior staff.

The operational process of the organisation is led by the General Manager who leads with the support of other top management staff (e.g. the Assistant general Manager, the Administration Manager, the General Accountant). The various departments are headed by appointed Middle Managers and Supervisors who work with the Junior staff and deliver reports to the Top Management.

The main departments run by the organisation are interconnected to related functions within the organisation. These include: the 'Parents stock' that produces fertile eggs for the Hatchery department. The Hatchery Department incubates and hatches day old chicks for the Production

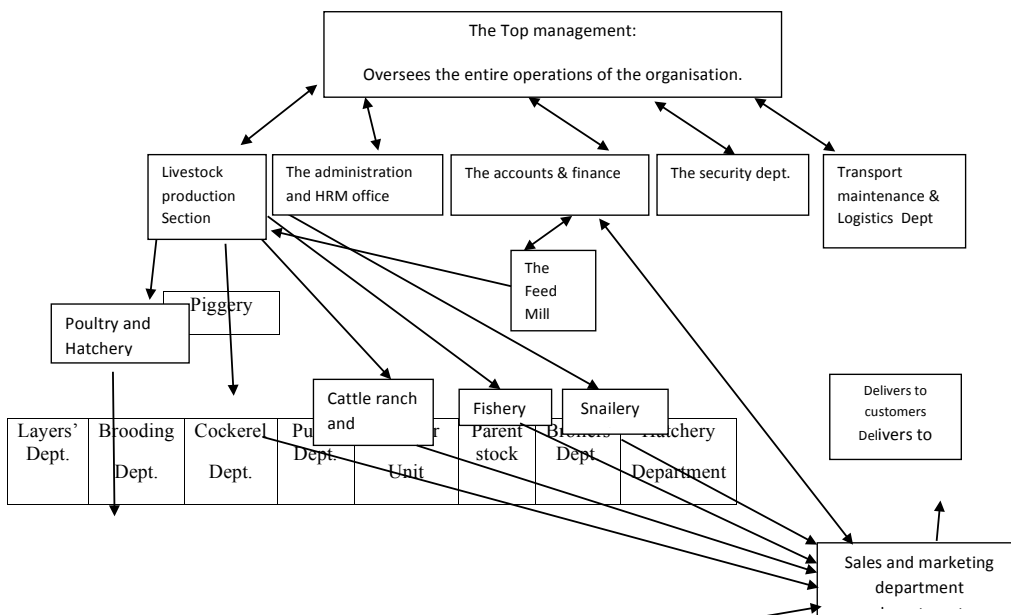
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<sup>5</sup> Reflexivity prompts the researcher to think about a suitable approach to interact with the respondents, in order to generate data that can be analysed for interpretations (Mauthner and Doucet, 2003).

section-the Broilers, the Layers, the Cockerel, Brooding departments. The Feed mill is responsible for the sourcing and milling livestock feed for the entire livestock in the Farm. The Piggery rears pigs ( e.g. piglets, adult pigs). The Cattle ranch rears Cows and Bulls to produce calves, adult cattle). The Fishery rears fish to produce fingerlings, table size fish. The Abattoir receives products from the production section (Broilers, Cattle, pigs) for processing to feed the customers.

All the products from the farm are marketed and sold to customers by the Marketing and Sales Department. They have the link with the various customers; either the wholesale or retail. However, despite the application of a streamlined operational approach which adopted a centralised management style, the organisation has continued to face sustainability challenge as its operational approach could not match the need for a resilient operation that could meet the stake holders' expectations. These accounted for the various challenges faced by the organisation (e.g. conflict with the host community, inability to meet downstream customer demands)As a result of these, the search for a more resilient operational approach that necessitated the choice of Lean and Systems tools applied in this research, with the aim to identify operational issues and address them from the relevant stakeholders' perspective/s.

**Figure 1: The internal operational process of the case study organisation.**



## IMPLEMENTING LEAN AND SYSTEMS TOOLS IN ORGANISATION A

This section presents the main issues as well as operational wastes identified in the case study organisational. These data were sourced via engagement with the concerned stakeholders identified, who participated in the research process. This was achieved via the use of various data collection methods to implement Lean and Systems tools.

**Table 1: Summary of identified issues and suggestions about security in Organisation A**

Identified Issue	Suggestions for solution for transformation.
1.Low educational qualification of current security staff	<ul style="list-style-type: none"> <li>Review current employment requirements to include a minimum academic qualification of ordinary level.</li> </ul>
2.The issue with age and non-inclusion of female security Personnel	<ul style="list-style-type: none"> <li>Offer more training to current security force and equip them for better performance on the job.</li> <li>Employment of female personnel</li> </ul>

**Table2: Challenge of Livestock Mortality (Fishery, Poultry section, Piggery and Cattle ranch)**

Issue	Affected Departments	Suggestions
Livestock mortality issue	<ul style="list-style-type: none"> <li>All departments in the production section. E.g. Layers, Cockerel, Pullet, Broilers and Parents' stock.</li> <li>The marketing and sales that deals with the delivery of products to the downstream customers.</li> </ul>	<ul style="list-style-type: none"> <li>Committed attention to the practice of bio security<sup>6</sup> measures,(e.g. the use of disinfectant foot dip by all visitors to the pen houses)</li> <li>Improvement on the firm laboratory</li> <li>Review of the academic qualification for junior staff employment in the future.</li> <li>Employment of an additional veterinary Consultant to complement current ones.</li> <li>Develop critical livestock feed internally</li> </ul>

**Table 3: Challenge of Inadequate Power supply**

Affected Department	Challenging effects
1.Abbattoir	<ul style="list-style-type: none"> <li>Poor storage of processed livestock products posing the danger of decay and losses.</li> <li>Inability to operate the machines for processing livestock</li> </ul>

<sup>6</sup> Bio security is the practice of effective hygiene in livestock farming operations with the aim to meet set standards set by the regulatory authority.

	products
2.Feed Mill	<ul style="list-style-type: none"> <li>• Challenge of inability to mill Live stock feed for the farm and customers</li> </ul>
3.The entire livestock production sections (e.g. Layers, Broilers, Brooding)	<ul style="list-style-type: none"> <li>• Inability to effectively pump water and provide lighting</li> </ul>
4..Abattoir	<ul style="list-style-type: none"> <li>• Poor storage of processed livestock products posing the danger of decay and losses.</li> <li>• Inability to operate the machines for processing livestock products</li> </ul>
5.Feed Mill	<ul style="list-style-type: none"> <li>• Challenge of inability to mill for the farm and customers</li> </ul>

**Table 4: Challenge of Junior staff Multi-tasking across the operational structure of the case study organisation**

Affected Department	Effects
Abattoir, Poultry, Fishery, Feed Mill and fishery	Shortage of skilled staff to complete operational tasks
Feed Mill Poultry and Hatchery and fishery	Wastage of operational resources
All the affected departments	Loss of special skills
All the affected departments	Depleted focus and performance morale among Junior staff

**Table 5: The challenge of Poultry waste disposal**

Issue	Affected Stakeholder	Decision
Poor management of poultry waste disposal	Host communities, Regulatory Government Agency.	<ul style="list-style-type: none"> <li>• Embark on reduction of current waste sent to the land fill through the development of further values from the current livestock dung via:</li> <li>• Use of wet livestock dung to develop maggot for the fishery</li> <li>• Process livestock mortality into supplement for the fishery</li> <li>• Plan to develop Biogas electricity power supply from current wet wastes generated</li> </ul>



**Table 6: Main operational wastes identified at operational process of the case study organisation**

Source	Affected Departments	Suggestion/s from Participants
Waste due to overfeeding Live stock	Fishery, Poultry	<ul style="list-style-type: none"> <li>Regulate and monitor the feeding process to match with the population requirements</li> </ul>
Unsold stock of Livestock (e.g. fish kept in the pond)	Abattoir, Fishery	<ul style="list-style-type: none"> <li>Smoking all current old stock for sales to reduce production cost</li> <li>Improve on current marketing strategies to cope with the expanded capacity.</li> </ul>
Waste due to wrong choice and use of livestock pen house preparatory materials	Poultry	<ul style="list-style-type: none"> <li>Strict adherence to the advice of pen house managers and consultants in the purchase decision these materials</li> </ul>
Waste due to procrastination	Cattle Ranch, Hatchery, poultry, Fishery, Veterinary and Hygiene	<ul style="list-style-type: none"> <li>Quicker decision process that matches critical emergencies in their operational process.</li> </ul>
Waste due to poor hygiene practice	Veterinary and Hygiene, Hatchery and Poultry	<ul style="list-style-type: none"> <li>Embark on effective bio-security practices that meet with the regulatory government agency standards.</li> </ul>
Waste due to machine malfunction.	Feed Mill	<ul style="list-style-type: none"> <li>Use of higher quality parts to fix machines</li> <li>Effective equipment turnaround maintenance</li> </ul>
Delays in the arrival and poor quality input materials	Feed Mill, Poultry, Fishery	<ul style="list-style-type: none"> <li>Cultivate own farm on these products for easier access and smooth operations</li> <li>Source input materials from host community farmers</li> <li>Embark on direct acquisition from the sellers at the northern markets.</li> <li>More provision for filtration of input materials for quality livestock Feed Milling.</li> <li>Re-negotiate the contract of supply with the input suppliers to meet required quality/ quantity</li> </ul>

## DISCUSSION

### **Implementing Lean in Organization A**

Effective Lean practice has been well documented in different perspectives in literature (see, Chen and Meng, 2010; Kundu et al, 2011; Seddon, 2008; Womack and Jones, 2003 ). However, Lean tools in the context of the case study organisation tended to be weak in finding an all-round solution to the issues identified, mainly due to the connected effects of these challenges, cutting across different functions in the case study organisation . This therefore explains the complexity associated with these identified issues, which require multiple approaches to address<sup>7</sup>. Furthermore, Lean tools tend to focus on eradicating waste/s with less consideration for the effects from specific functional part of an organisation, while other parts that are affected may be neglected or made to suffer adverse effects from such effort. While authors (e.g, Byrne, 2013; Womack et al, 1990), argue that Lean approaches concentrate more on the current organisational function, with a significant relationship with some operational partners (e.g. suppliers), they maintain minimal concern for other external stakeholders (see, Mitchel et al, 1997) who are affected by their operations, especially those who tend to command a wider systemic involvement in today's business practice, as found in the case study organisation -e.g. The Host community in Organization A. Such narrow relationship with fewer stakeholders groups could not address the complexities faced by the case study organisation and this shortcoming of Lean could lead to 'end-to-end' negative effects (see, Fischer et al, 2011; Womack and Jones, 2003). Consequently, the success of Lean implementation on one part would lead to breaches on the operations of other sub sections of an organisational system, and possibly resulting to conflict between the case study organisation and these relevant stakeholders. It therefore follows that Lean per se may not adequately address these identified systemic challenges in in the case study organisation. This is because of the inherent involvement with diverse key stakeholders and the presence of operational issues that tend to be interwoven and dependent on different parts of the operational process of the organisation. Moreover, part of the complexity in the operational system of the case study organisation is the lack of basic infrastructural support e.g. security, good road network, constant electricity power supply which could significantly impair effective Lean practice that could be result oriented as it is in the developed world (e.g. Japan where the development of Lean was popularised), where these facilities are in place for effective operational uses (see, Ikelegbe, 2005; Adenikinju, 2003).

In response to these weaknesses of Lean, writers have suggested the use of multiple approaches in combination to address these complexities in an operational process (Haines, 1998; Jackson, 2003; Krishnamurthy and Yauch, 2007; Mason-Jones et al, 2000;Midgley 2000; Mingers and Rosenhead, 2004; Taylor and Taylor 2009). Therefore, the suggestion for a combination of ideas and approaches therefore points out that in the case study organisation would require a suitable intervention underpinned by a 'Systems' approach, which would recognise the importance of paying attention to the various parts of its operational process. Hence, a combination of both Lean and Systems ideas to apply different tools to identify and address operational issues is relevant.

### **Systemic issues during Lean intervention practice**

The involvement of a wider stakeholders in the data collection process created a platform to source different suggestions that are of their interests and concerns in the operational process of the case study firm. For instance, this was evident in the areas of Livestock waste management issue in which the top management was able to develop a lasting solution via an effective consideration of the concerned stakeholders' expectations, to address during the intervention process. Through the various sessions of deliberation on the issue between the top management and the concerned stakeholders, consensus was reached, recognising the challenge and its effects on both the organisation and stakeholders, and the development of a systemic solution via the use of bio-gas electricity. This

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<sup>7</sup> EIMaraghy and Urbanic (2004) identified organisational complexity in three forms: product complexity, process complexity and operational complexity. Although their research background is different from this intervention, it seems that a significant similarity in terms of operational process issues that are found complex in the case study organisation

boosted the hope of a resolution in the case study organisation, not just to address the issue of Livestock waste disposal management but also the challenge of power supply in their internal operational process.

Hence, involving these stakeholders from the onset set a platform for operational process 'fair play' that was built on a wider consideration of the interests of the different stakeholder's groups. It stood as a wedge against certain environmental challenges such as resistance and/or scepticism from the affected stakeholders, and can also serve as an exit way out of crisis situation between the organisational leadership and the relevant stakeholders both with the organisation and the business environments. Systems scholars have observed that systemic approach to addressing identified stakeholders issues would provide a platform for a lasting solutions founded on the support and full acceptability of the key stakeholders (see, Jackson 2000; 2003; Midgley, 2000).

From a Lean perspective, authors (e.g. Liker and Ogden, 2011) have observed that stakeholders appreciate and show concerted willingness to participate in the decision as a mark of respect accorded them by the organisation. This was evidenced in terms of accountability, assumption of responsibility towards the overall success of the operational system of the case study organisation. Lean and Systems authors (e.g. Oliviella et al, 2008; Seddon, 2007; 2008) explain this further, noting that such participatory approach would put the entire organisation on the platform of resilience to continue to face operational challenges, bring out better innovative ideas that could provide a joint approach to addressing identified challenges while retaining a versatile operational systems.

#### **Systemic Lean Intervention: a definition**

To address the problems described previously, we argue for the combination of Lean and Systems tools into 'Systemic Lean Intervention' (SLI). SLI is a new methodological approach to implementing Lean via a wider stakeholder representation, through the use of Systems tools and boundary critique in particular. It adopts exploratory action research, which seeks to develop joint plans for changes, with the concerned stakeholders identified. This approach draws on Córdoba and Midgley, 2006; Midgley, 1997; 2000; 2003; 2011), who defines Systemic intervention as a purposeful action by an agent to create a change. SLI offers the free opportunity to the agents (which in this research case are the researcher and stakeholders), to take control of the intervention process based on their level of understanding.

The application of SLI as a theory for intervention in the case study organisation is set to provide a fair ground for all participants who are definitely affected and involved with the operational process of the organisation, rather than being subjected to the dictates of the researcher. Therefore, SLI allows the intervener(s) to define the context of the intervention based on their acceptable principles. As observed, the operational issues in in the case study Organisation were unstructured and interwoven which assumed the form of 'wicked problem' situations that require more than a content philosophical approach ( i.e. a single approach) to be addressed (see Grint, 2005; Midgley, 2000; Rittel and Webber, 1973). These challenging issues led to the formation and application of SLI in this research process.

SLI applies a subjective approach which gives the participants the discretion to fully participate in setting the boundaries at various stages of the intervention process, embark on identification and choice of suitable means to address them (McNiff, 1998; 2000; Midgley, 1997). SLI draws on principles from a variety of paradigms in the intervention process. This flexibility in the choice and use of approaches tend to fit well with research issues that assume complex features, which would require a variety of approaches to adequately address.

The application of SLI was not expected to yield a consensual action plan from the intervention, but to adequately recognise the diversity of opinions of the different participants/ groups and emphasise on increasing understanding of different perspectives of the identified problems. This ensures that the participating stakeholders can develop more informed actions in the longer term, choosing which decisions to implements or ignore. This is arguably the root success of vita organisational models like Lean (see, Midgley, 2000; 2003; Womack et al, 1990).

Furthermore, the study results suggest that SLI became instrumental to harnessing interests and participation, cutting across boundaries in the operational structure of the case study organisation. It facilitated the achievement of their core values, and helped sustain ‘an all-round systemic improvement’ in decision taking at different parts of the operational process (see, Byham, 2002; Haines, 1998; Midgley, 2000; Womack, 1990).

### **Methodological underpinnings of Systemic Lean Intervention**

A basic foundation to the application of SLI was set with the combination of different methods from Lean and Systems in the intervention process. These were framed into a working approach to identifying and addressing operational issues in the case study organisation. The methods underpinning SLI are extrapolated in Table 7.

SLI methods included firstly the definition of boundaries through interviews. Boundary Critique, as used in research by authors (e.g. Midgley et al, 1998), was applied in the selection of participants and the relevant issues to be discussed; the latter were based on the perceived interests of the participants.

Midgley (2000) has proposed the use of boundary critique in two forms: primary boundary and secondary boundary that would produce emergent properties that could either be sacred or profane. However, this work applied just a single boundary approach that seeks to achieve a common ground among stakeholders in addressing complex issues. This includes adjustments in terms of participation and discussion, depending on the context (see, Beers et al, 2006). While this is not a full contrast to Midgley’s approach, it was adopted for simplicity reasons in the intervention process, that could easily be understood by the participants, especially those who were not literate.

**Table 7: Methods underpinning Systemic Lean Intervention**

<b>Lean Systemic Intervention</b>		
<b>Lean methods/tools</b>	<b>Definition</b>	<b>Operationalization</b>
VSM	Aimed to understand the operational systems and the relevant stakeholders	Process map Participants Observation
Waste identification and Process improvement Events	To identify operational waste/s and their impacts on stakeholders. Aimed to initiate Lean and Systems changes, while minding the impacts on other relevant sections of the organisational system	Workshops Participant Observation
<b>Systems methods/tools</b>	<b>Definition</b>	<b>Operationalization</b>
Boundary Critique	Setting boundaries	Personal Interviews
CATWOE	Selecting relevant participants	Personal Interviews
Rich Pictures	For clarity and Understanding	To express the identified issues and suggested solutions for better comprehension by participants

Applied alongside boundary setting interviews was the use of CATWOE. This was instrumental in the selection of the relevant stakeholders and created an effective boundary practice that recognised the interest of the participants at each stage of the intervention process, based on the relevance of their stake with the identified issues. This informed the conduct of Lean and Systems workshops at

different levels, participant's observation and the using various Lean and System tools, bringing relevant stakeholder groups together or seeing them separately. These were carried out with the identified stakeholders based on the set boundaries, which informed the selection of attendance.

For instance, on different occasions, the issues surfaced through boundary critique interviews were combined into rich pictures, which were used in framing the empirical research. Rich pictures were used during the workshop session to facilitate further understanding among the participants on the issues raised for deliberations. While, researchers (e.g. Bell and Morse, 2013; Midgley, 2000; Horan, 2000) presented accounts on interventions, in which the participants had to do the drawing of rich pictures, the rich pictures used in this research were drawn by an independent artist who was supervised by the researcher based on the data provided by the participants at the earlier stage of the data collection, due to time constraints and disinterest of the participants at certain session of the data collection, and low level of literacy of the participants, at some of the sessions. This readily aligns with the observation of Checkland and Scholes (1990), that the usage of Systems methods and ideas, are simply anchored on the subjective acceptance and willingness of the participants at every stage of an intervention.

Lean and Systems workshops were useful at this stage because they allowed participants the opportunity to learn from one another and come with consensus understanding of the identified issues of interest. However issues such as power relationships, individual preference, and time constraints kept making posing challenge to the use of workshops. For instance, the usage of rich pictures was disallowed in a Lean and Systems workshop at the Feed Mill, due to time constraint and disinterest by the participants. There were also instances where some internal organisation members decline to comment or participate in the intervention process (e.g. workshop), due to the fear of what actions might be taken against them by the top management, even though their purported contribution were not to hurt anyone's interest.

To address these issues, the use of alternative data collection methods like the interviews, were used as complement to gather further data (e.g. further comments about issues earlier discussed at the workshops or observed issues that unfolded during the intervention process), from relevant individual participants, where necessary.

While researchers (e.g. Checkland and Scholes, 1990; Macadam et al, 1990), would suggest the use of CATWOE alongside other SSM methods in an intervention, it was however applied along in setting boundaries on complementary basis. CATWOE was more useful in the intervention process as it provided the flexibility for maximum participation and productive contribution by the stakeholders. This was in contradiction to the ordinary view of either the usage of CATWOE alongside other SSM methods or in isolation.

Some authors (e.g. Jackson 2003), have criticised SSM as a methodology for failing to adequately address coercion. Mingers (1992), narrows a criticism to CATWOE on the fact that there is bound to be flexibility of status assumed by participants under CATWOE (e.g. owners, Customers), noting these could be due to changes in the environments and the interest of the participants in an intervention. Other authors (e.g. Bergvall-Kareborn et al, 2004), provide a suggestion for the modification of CATWOE to enhance a reflection on the context under which an intervention is carried out.

However, the combination of CATWOE and other Systems methods in this research process provided a means to learning more about the interests and the wishes of the participants in the research process offering a clearer view of the boundaries, creating a valuable access to more relevant information needed for the intervention process.

These tools joined together, created a foundation for the application of other Lean tools (e.g. VSM, Waste identification events, process improvement), to address the operational process of the case study organisation. A number of authors (e.g. Hines and Rich,1998; Womack and Jones, 1996; 2003), have highlighted major types of waste ( e.g. due to: overproduction, unnecessary stock, inappropriate processing, inefficient transportation, delay in waiting times). It is relevant, however, to note that

these types of waste were identified in different industrial backgrounds and contexts other than the ones found in the case study organisation, where identified wastes assumed different forms which are familiar with the food production industry and the stakeholders, as well as the environment where it operates.

## **CHALLENGES ENCOUNTERED DURING SYSTEMIC LEAN INTERVENTION**

### **Challenges related to Leadership**

The case study organisation tends to adopt an autocratic leadership approach in their operation. This was observed to be responsible for the distant relationship between the different levels on the operational systems adopted in the case study organisation. Authors (e.g. Akata, 2008) have recognised the conflicting challenge between the leadership approach and organisational mode of operation as an inherent issue among contemporary firms in the Niger Delta region of Nigeria, where the case organisation operates. For example, the junior staff in the organization were kept on the receiving end- barely acting to implement top management decisions in the internal operations of the organisation. This also seemed to constitute a pre-established barrier to effective flow of activities, which hinders the opportunity for these junior staff to offer any suggestions or modifications on their daily operations that may be necessary, except authorised by the top management. Similarly, the Middle managers were not granted the free authorisation to either take part in some professional decisions (e.g. acquisition of the right materials), or completely had to adopt the decision of the top management on certain critical issues (see, De Cremer, 2006). This practice was observed to have kept the members uniformed about certain changes in the case study organisation.

Vugt et al (2004) expressed the concern that autocratic leadership may not be effective for the long term in a group setting due to minimal participation by the members in decision-making process. For the case study organisation, the choice of autocratic leadership style was equally justified by the fact that the organisation needed to act in the way they do to address other operational issues like checking fraudulent practices among organisation members at different levels of the operational structure. According to the participants members, the organisation had challenges e.g. fraud among organisation members, which the top management has chosen to address via a streamlined operational process.

While it can be said that the use of autocratic style might become an instrument of control and fraud prevention in the operational process, a further view at its effects would show that other vital parts of the operational system does suffer setbacks in areas like delays in decision and actions and other bottleneck activities within the operational process (see, De Cremer, 2006).

Autocratic leadership approach negates the original platform upon which Lean was developed, which was based on human interactions and contributions of ideas towards achieving effectiveness in an operational system that leads to waste identification and elimination (see, Ohno, 1978; 1988; Samddar and Heiko, 1993; Womack et al 1990). This was a significant impairment to effective SLI in in the case study organisation, because all activities were anchored on a 'top dawn' basis, with minimum room for flexibilities in the operational system.

It is therefore argued that the leadership approach is a critical concern to the success of SLI in the case study organisation, especially in the quest to identify and eliminate waste as well as considering the connected effects on the different parts of the operational structure. With minimum autonomy of participation in the operational process, though justified by the top management, the freedom and willingness to jointly identify and work out ways to eliminate wastes by these concerned internal stakeholders could be impaired. Furthermore, it is argued that autocratic leadership practice during SLI would lead the organisation to a functionalist structure which encourages minimal human intervention and modification, making the operational structure to become more prefixed (see, Jackson, 2000), and recognising that humans do not have much authorisation to influence the operational system even when necessary (Midgley, 2000). This study argues that leadership approach that empowers stakeholders to participate in the leadership process is appropriate, especially in situations that may require immediate attention such as in the case study organisation (Van de Vliet, 2006).

### **Lack of information flow and impact on decision-making**

Another case of concern to the implementation of SLI in the case study organisation was the issue of filtration of relevant information, which was highlighted by Junior staff as a contributing factor to misrepresentation of their interest before top management. This was evident in the practice of rotational posting of staff to different sections that were unfamiliar with them (both Junior staff and the Middle Managers) without due orientation given to these staff, letting them interpret the exercise as ‘multitasking’. In effect, it was observed that inadequate number of employees (mostly Junior staff at the various departments) had ended up with the challenge of ‘under staffing’ which resulted in wasteful challenges like product breakages, delays in information deliveries.

Information sharing has gained popularity among authors (e.g. Achanga et al, 2006; Lee et al, 1997; Smith, 2011; Yusuf and Adeleye, 2002; Womack et al 1990), because it promotes the development of skills and expertise in diverse lines within an operational system. But the present approach to information circulation, adopted by the organization tended to encourage disinterest (especially among Junior staff), which obviously formed a challenge to the intended purpose of SLI. Furthermore, insufficient information sharing placed a challenge to the free flow of actions in the operational process, by hindering employees’ authorisation to suggest or modify operations to avoid foreseeable issues that could be adversarial to the objectives of the operations.

Lean and Systems authors (e.g. Gregory, 2007; Lee et al, 1997; Yusuf and Adeleye, 2002; Tseng, 2010), have noted that the current pace at which changes occur in a firm’s operational process, coupled with the need for timely dissemination of the right information and at the right time can promote acceptability, creativity and adaptability among employees and leaders in the organisation. They also note that such effects become a source of sustainable competitive advantage through productive interactions with the organisation’s environment, which Lean requires for effective implementation. For instance, the issue of delays and unnecessary filtration of information in the operational process were a major issue that could hinder Lean or System intervention in their operation. This is also because the use of inappropriate information, coupled with significant rigidity in their operational structure could deny the possibility of making necessary amendments, which accounted for the occurrence of incidences like complaints rendered by the concerned stakeholders, (customers). It is therefore argued that SLI is based on appropriate information sharing that encourages SLI and facilitates a comprehensive recognition of stakeholders’ expectations (see, Lee et al, 1997; Christopher, 2005; Tseng, 2010).

## **CONTRIBUTIONS**

This paper attempted to apply Lean and Systems tools under a new methodology- SLI. We draw on previous research (e.g. Gregory, 1992; Jackson and Keys, 1984; Jackson, 2000; 2003; Midgley, 1997; 2000) on pluralist approaches aimed at addressing organisation complexity. We however argue for combining Systems and Lean tools implementation in the context of food production industry in a less developed economy. We address the gap concerning how Lean interventions could be enhanced via applying both Lean and Systems tools through an innovative intervention methodology, that is, SLI.

Systemic Lean intervention exposes managers and practitioners to the need to embrace a participatory approach to learning, development and application of operations management models, which allows priority focus on both the immediate organisational improvement as well as the systemic effects on the concerned stakeholders. The involvement of stakeholders during Lean intervention and practice may tend to create a significant impairment to this in terms of delays in deliberation and conviction. However, we argue that the end effect would ensure a ‘systemic’ acceptance of the chosen change approaches by stakeholders.

## CONCLUSION

This paper dwelt on the implementation of Systemic and Lean tools. Central to the argument of this paper is the proposition of SLI. The research applied various data collection methods and involved different stakeholders that were identified, taking cognisance of the effects and the challenges encountered in the intervention process. The findings from this work led to joint suggestions the participants for relevant changes on the operational process of the case study organisation for improved operational practice, targeted to achieve stakeholders' satisfaction via the use of SLI.

The short time frame for this research prevented the researcher to see the long term effects SLI impact. While this constituted a limitation to this study, future research could explore the long-term impacts of SLI. This would engender learning on the possibility of adaptability of Lean and Systems models among organisations in the food production industry in the Niger Delta region, where this work was carried out.

Another limitation to the research is that, in the case study organization, the changes suggested tended to depend on the discretion of the top management who have the final authorisation due to factors such as the availability of resources, organisational policy guidelines. It may be useful, then, to apply SLI in less authoritative contexts to see whether it can be effective as in this case.

The failure of this research to view the impacts of employees' motivation policies on the Lean and Systems implementation in the research process could be viewed as a weakness to this research findings. This was due to factors like the unwillingness of the participants to respond to this aspect of the research process. Future research could therefore explore this area in the light of Lean and Systems among organisations in this region for the furtherance of an all- round development of SLI in the region and beyond.

Finally, this work could not cover areas such as the Legal systems and Lean practice among organisations, which could have opened up learning about the support of the legal process to the success of Lean and System. This could be recommended for further SLI research in the context of the Niger Delta region. Hence, it is within our purpose to provide food for thought to both Lean and Systems academics and practitioners for the further adoption of SLI in organizations.

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