



Process Improvement Strategy for Sustainable Land Administration in Developing Countries: Imperatives for Six Sigma

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ABSTRACT

The criticality and centrality of land to man's existence, sustenance, sustainability in social, economic, political and environmental ramifications is a non-negotiable inevitability. Therefore, its management and administration present yet another non-negotiable inevitability for sustainable development to be attained. However, land administration in developing countries such as Nigeria has recently attracted attention for the wrong reasons due to a deluge of unsustainable processes. To address these unsustainable practices and engender a transformation to sustainable land administration in developing countries, certain arguments have been proffered as panacea which include the adoption of Internet of Things, Digitalized Land Administration Systems, land reforms, privatization, public private partnership arrangements, and the lot. What is yet to be adequately considered in extant literature is the place of a renowned process improvement strategy such as 6 Sigma in stimulating sustainable land administration in the global south. Therefore, the aim of the study was to investigate the effect of 6 Sigma strategy on sustainable land administration in a developing country, using Nigeria as case study. Survey research method was employed on a population of 398 land officers in the Ministry of Lands Survey and Town Planning in South East, Nigeria. The research instrument was questionnaire, while data was obtained from primary sources. Hypotheses were tested using One-Sample t-test at 5% level of significance. It was found that 6 Sigma has prospects of enhancing improvement of quality service delivery in Nigerian land registries. The study concluded that sustainable land administration processes in Nigerian land registries would be improved by an adoption of DMAIC 6 Sigma strategy. It was therefore recommended that supervisory agencies of government develop a framework for senior management staff of land

registries in Nigeria to imbibe process improvement strategies such as frequent capacity building, recruitment by merit and 6 Sigma methodologies as a means of improving service quality in the business of land administration.

KEYWORDS: Land administration, Six Sigma, DMAIC, Sustainable development, Process improvement

I. INTRODUCTION

Process improvement as a requisite and core policy of corporate bodies, public institutions and project managers is a critical path to organizational performance and sustainability. As a result, scholars have argued for it to be embedded in the organizational culture and structure as a means of attaining customer satisfaction and retention (Antony & Gupta, 2019; Kreuzer et al., 2020; van Assen, 2018). In agreement, various strategies for achieving this sustainable approach to business and management have been identified amongst which is the 6 Sigma strategy. Six Sigma is a product of Engineers at Motorola in 1986, and was employed as a quality improvement initiative. Those who advocate for 6 Sigma as a process improvement strategy leverage their argument on its propensity to eliminate or alleviate waste, reduce defects, and save cost (Alhuraish et al., 2017; Gupta et al., 2020).

Following this, organizations and institutions who manage big data adopt 6 Sigma strategy to improve processes and customer satisfaction (Sigh & Rathi, 2019). However, the level of 6 Sigma adoption in developing countries do not compare favourably with peers in the global north (Albliwi et al., 2017; Atelhe & Akande, 2018; Daniel, 2019). Placing more emphasis on the cruciality 6 Sigma strategy to process improvement, Sadiq (2014) asserts that the deficiency of the practice in several Nigerian organizations culminate



in performance and revenue drops of between 25 to 40% as a result of defects, cost and waste increments. All these lead to customer dissatisfaction, which is a critical aspect of sustainable business performance.

A perusal of extant literature confirms these empirical findings as it was found that amidst the deluge of 6 Sigma studies as a critical big data manager, very little is known of its adoption in land administration institutions in Nigeria. The problems of land administration in Nigeria have been documented, ranging from policy formulation-implementation disconnect, information mismanagement, bureaucratic bottlenecks, data loss and alteration, land titling irregularities, outright fraud and process delays (as long as 2 years application-response gaps) (Adjekophori et al., 2020; Ghebru & Okumo, 2016; Nwokike, 2019; Obi-Aso et al., 2020). To advocate for a 6 Sigma integration into land administration processes as a panacea, there is need to outline core processes that define land administration in Nigeria.

These include registration of title, management of land information, policy articulation, determining, recording and dissemination of ownership data, title security and taxonomy, land allocation, valuation, land market regulation, environmental management, and taxation (Adjekophori et al., 2020; Fabiyi, 19984; Obi-Aso et al., 2020; Otubu, 2017). Analyzing the criticality of these challenges to the sustainable operationalization of land administration processes, there is indeed a compelling argument for an integration 6 Sigma strategy by land administrators in Nigeria. Our motivation finds credence in

assertions as that extrapolated by Otubu (2017) which sees sustainable land administration as equitable wealth distributor, and economic growth and development stimulator.

Study Objectives

1. Identify 6 Sigma prospects for sustainable land administration in Nigeria.
2. Ascertain the relationship between organizational structure and 6 Sigma implementations in Nigeria's land registries.
3. Identify the challenges encumbering implementation of 6 Sigma in Nigerian land registries.

Justification of the Study

The study identified the prospects and challenges of 6 Sigma implementations in Nigerian land registries, while examining the organizational structural effects of such implementations. By doing so, the study is at the fore of presenting the empirical reality of 6 Sigma adoption from the perspective of land administration in a developing country.

Study Area

The study area is South East Nigeria. The South East geopolitical zone of Nigeria consists of 5 States – Abia, Anambra, Ebonyi, Enugu and Imo States. South East Nigeria was chosen as the study area as a result of the researchers' insight into the land administration processes in the area, as Consultants to land and real estate matters in the region. Figure 1 is the geospatial data of the South East geopolitical zone.



Figure 1: Geospatial Data of South East, Nigeria

Source: Geographical Information System Laboratory (2020)

II. LITERATURE REVIEW

With the highly evolving and globalized business environment, organizational performance and sustainability is a function of lean management, waste and cost reduction, continuous improvement, innovation and customer satisfaction. To address this, there is a global accentuation of 6 Sigma as a process improvement and cost reduction strategy (Obinna, 2005; Sadiq, 2014; Thomas et al., 2009).

By process improvement, we lay claim to the extrapolations of the concept by Bakotic & Krnic (2017) and Kahn et al. (2017), which see it as series of activities conducted with a view to ameliorating business operations and methods.

Organizations who employ the 6 Sigma strategy for this purpose do so through a statistical, systematic, evidence-driven, measurable approach



that reduces process errors and defects while improving its design and functionality (Antony et al., 2017). It refers to a service quality control methodology using available data to achieve faster, cheaper and more stable outcomes (Laureani & Antony, 2019). The implication of this assertion is that 6 Sigma does not just reduce waste and cost, but it also predicts business outcomes. As a result, organizations can mitigate risks and plan better. This analogy is simplified by Sunder & Antony (2018) who infer that 6 Sigma involves the use of project management, financial and statistical analysis for the attainment of business functionality. From a corporate standpoint, former Chief Executive Officer of General Electric defined 6 Sigma as “a quality program that improves customer’s experience, lowers costs, and builds better leaders”.

Progressing from semantics to actualities, it is imperative to offer a distinct practicality of 6 Sigma strategy. Integration of 6 Sigma as a process improvement strategy in any organization follows a definite set of procedures which range from action definition, measurement, analysis, improvement and control; otherwise known as DMAIC. Sadiq (2014) holds the view that in the application of DMAIC, it is pertinent that the organization constantly has the customer in mind, as 6 Sigma begins, ends and exists for the customer.

Following this methodology, the define aspect of 6 Sigma examines operational processes in the organization with a view to establishing current situations which involve what is going well, where the problems lie and where improvement is needed. It refers to the identification of the core processes of the business, recognizing the key inputs and outputs, and how they affect the customer (Sadiq, 2014). To establish how the customer is affected, part of the definition should be determining customer requirements and essential demands. For the land registry, the core business or processes involve the operationalization of land policy, security of tenure and title, land market regulation and revenue generation (Adeniram, 2013). Sadiq (2014) posits that the criticality of defining the core processes lies in its pertinence in prioritizing processes in accordance with effective contribution to customer satisfaction.

The definition phase of DMAIC makes the following considerations:

- i. Who are the customers and what are their needs and expectations?
- ii. Understand customer requirements and transform them into deliverables

- iii. Who is responsible for what personnel, cost and material operationalizations?
- iv. What are the core processes? How can they be prioritized?

The measurement aspect evaluates current performance as it relates with planned performance. Soundararajan & Janardhan (2019) opine that this can be obtained through a comparative analysis of organizational goals and current productivity levels. It analyzes the correlation between human capital, financial and material inputs and service delivery benchmark. For land registries, this applies to a comparison of the customer satisfaction goals of prompt, accurate, reliable service against the extent to which service is delayed, insufficient and stringent for the customer.

Again, this phase has its own considerations, such as:

- i. Decide what to measure and how to measure it?
- ii. Measure current performance of the process, such as throughput yield and capability levels
- iii. How capable is the measurement system?
- iv. What is the variability contributed by the measurement system to the total variation?

The result obtained from the measurement is then analyzed with a view to make accurate inference of the level of performance in the organization. This explains why 6 Sigma is referred to a data-driven process improvement strategy. Hakimi et al. (2018) explains that the analysis entails the isolation of each input or resource, and evaluating their contribution to process efficiency or deficiency. As a result of this analytical approach, it becomes easier to identify reasons for process default and delays. For land registries, for instance, delays may be caused by overdependence on traditional and analogue processes of information processing and recording.

For the analysis stage, the following deliberations suffice:

- i. Identify the root causes of defects or failures?
- ii. Make sense of the data (using simple statistical tools such as scatter plot, histograms, and the like)
- iii. Use of simple tools ANOVA, Hypothesis test, Regression analysis for data analysis
- iv. Isolate the ‘vital’ from the ‘trivial’.



Identification of the problem areas as a result of this operational data analysis, efforts are then directed towards integration of improvement and innovative progressions (Ahmed, 2019). If we must take cognizance of land administration in this regard, from the identified problems of error-prone traditional methods, it then becomes obvious and necessary that a paradigm shift towards more digitalized processes is crucial. These include the adoption of blockchain technology, machine learning capabilities and other Internet of Things depictions. At this point, Tsarouhas (2020) avers that control be introduced as a means of ensuring continuous compliance to process improvement while attenuating any activity that may lead to regression and inefficiency.

Sadiq (2014) provides a precis of DMAIC as a compendium of the following considerations:

1. **What is the vision?** – Improvement opportunities are validated in comparison to the business vision, strategies, goals and objectives.
2. **Where are we now?** – In order to be able to track and measure improvement, it is important to create an initial baseline of how services are currently being delivered and how effective and efficient Service Management processes are, as well as the effectiveness of the service lifecycle itself.
3. **Where do we want to be?** – Defining targets for services such as availability and reliability, and key performance indicators (KPIs) for Service Management processes provides a means for a service organization to track progress from the baseline to the defined targets.
4. **How do we get there?** – The difference between where we want to be and where we are today is a performance gap that should be addressed through a dedicated effort so that the gap is closed through the work of an improvement project team that is managing work on a core set of deliverables to produce the expected results.
5. **Did we get there?** – To measure whether the gap is closed requires ongoing validation measurements and assessment. Were the desired outcomes achieved?
6. **Keeping the momentum going** – Ensuring that changes are embedded in the organization.

In light of these process improvement methodologies, it is pertinent to examine the condition of land administration in a proxy developing country like Nigeria, with a view to ascertaining the practicality of 6 Sigma strategy

towards enthrone sustainability in land administration.

Land Administration in Nigeria

The criticality and centrality of land to man's existence, sustenance, sustainability in social, economic, political and environmental ramifications is a non-negotiable inevitability (Ewurum, 2016). Therefore, its management and administration present yet another non-negotiable inevitability. Ademiran's (2013) land administration definition as "the process of determining, recording and disseminating information about ownership, value and use of land" in accordance with land policy provides an accurate description of the tenet of land administration in a developing country like Nigeria. It is agreed that when this tenet is applied, land policy and reforms are operationalized for sustainable development (Otubu, 2017).

Land administration in Nigeria have recently attracted attention for the wrong reasons. It has been riddled with encumbrances of ineffective land policy such as the Land Use Act of 1978 (Kasim & Agbola, 2018; Otubu, 2018), information and data mismanagement (Oyetayo et al., 2017), titling irregularities (Obi-Aso et al., 2020), traditional and obsolete machinery (Abolade et al., 2018), market nonequilibria (Odenigbo & Ewurum, 2018), outright fraud and corruption (Awyah, 2018; Otubu, 2017), to name a few.

The manifestations of these challenges have led to speculative and non-regulated land markets and aided land grabbing by the elite and political actors (Adeniran, 2013; Otubu, 2017). This has presented a lopsided business climate that has made this scarce resource scarcer, with existential threats and deterrents to sustainable real estate investment. Currently, as a result, the country battles a housing deficit of over 17 million housing units. Hideous implementation of land policy such as the Nigerian Land Use Act has also led to the compulsory acquisition of land for announced public purpose, which then is subsequently allocated for private use and occupation. Lending credence, we outline the following unsustainable qualities of land administration in Nigeria:

- A. State autonomy posing a problem to control of land markets (Adeniran, 2013).
- B. Inadequate sustainable indigenous technical expertise in the country (Adeniran, 2013). However, this assertion has been contended by Ewurum et al. (2020) with the argument that the



country boasts a preponderance of technical expertise on this region, just that the recruitment system is relatively flawed.

C. Low-level capacity need determination and capacity building for sustainable land administration (Ewurum et al., 2020).

D. Ownership risk posed by unsustainable land policy leading to foreign direct investment dissuasion in the country (Obi-Aso et al., 2020).

E. High capital outlay, financial requirement amidst low technical support and infrastructural deficit (Adeniran, 2013).

F. Inadequate large scale cadastral maps for land title preparation and documentation (Adeniran, 2013).

The Underlying Issue

To address these unsustainable practices and engender a transformation to sustainable land administration in developing countries, certain arguments have been proffered as panacea which include the adoption of Internet of Things, Digitalized Land Administration Systems, land reforms, privatization, public private partnership arrangements, and the lot. What is yet to be adequately considered in extant literature is the

Test of Significance

Level of Significance:

$$\alpha = 0.05$$

Test statistic:

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - e_{ij})^2}{e_{ij}}$$

Where;

O_{ij} implies observed cell frequencies

e_{ij} implies expected cell frequencies

Decision Criterion:

Reject H_0 if $p < 0.05$ otherwise do not reject H_0

For objective one on the prospects of 6 Sigma for sustainable land administration in Nigeria, we hypothesize as follows:

H1: 6 Sigma enhances improvement of quality service delivery in Nigerian land registries.

place of a renowned process improvement strategy such as 6 Sigma in stimulating sustainable land administration in the global south. This defines the crux of our investigation into the effect of 6 Sigma strategy on sustainable land administration in a developing country, using Nigeria as case study.

III. METHODOLOGY

The study employed survey method over a population of 398 land officers in the Ministry of Lands, Survey and Town Planning in South East, Nigeria, as obtained from the personnel department. As a result, the study employed universal sampling. Google forms was used to design the research instrument which was a 5-point Likert Scale structured questionnaire. Questionnaire return rate was 77%, comprising 306 successfully returned copies of the study questionnaire.

Analysis of Data

Data was analyzed using One-Sample t-test. Prior to conducting this analysis for each of the stipulated hypotheses, we first evaluate and determine the decision criteria for the acceptance or rejection of the null hypotheses.



Table 1: Descriptive Statistics for Prospects of 6 Sigma in Sustainable Land Administration in Nigeria

	N	Mean	Std. Deviation	Std. Error Mean
6 Sigma does not enhance improvement of quality service delivery in Nigerian land registries	306	12.01	3.345	.203

Table 2: One-Sample Test Result for Hypotheses 1

	Test Value = 0			
	t	df	Sig.(2-tail)	Mean Difference
6 Sigma does not enhance improvement of quality service delivery in Nigerian land registries	47.600	270	.000	12.014

Decision

The null hypothesis, 6 Sigma does not enhance improvement of quality service delivery in Nigerian land registries should be rejected since ($t = 47.600$, $p < .05$)

For objective two which centers on the relationship between organizational structure and 6 Sigma implementations in Nigerian land registries, we hypothesize as follows:

H2: Relationship between organizational structure and 6 Sigma implementations in Nigerian land registries is significant.

Table 3: Descriptive Statistics of the Relationship between Organizational Structure and 6 Sigma Implementations in Nigerian Land Registries

	N	Mean	Std. Deviation	Std. Error Mean
Relationship between organizational structure and 6 Sigma implementations in Nigerian land registries is not significant.	306	8.03	2.804	.166

Table 4: One-Sample Test Result for Hypotheses 2

	Test Value = 0			
	t	df	Sig.(2-tailed)	Mean Difference
Relationship between organizational structure and 6 Sigma implementations in Nigerian land registries is not significant.	43.038	282	.000	8.025

Decision

The null hypothesis, relationship between organizational structure and 6 Sigma implementations in Nigerian land registries is not significant, was rejected since ($t = 43.038$, $p < 0.05$).

For objective three which centers on the challenges of encumbering implementation of 6 Sigma in Nigerian land registries, we hypothesize as follows:

H2: Land policy formulation and implementation is the most significant challenge encumbering implementation of 6 Sigma in Nigerian land registries.



Table 5: Descriptive Statistics for the Most Significant Challenge Encumbering Implementation of 6 Sigma in Nigerian Land Registries.

	N	Mean	Std. Deviation	Std. Error Mean
Land policy formulation and implementation is not the most significant challenge encumbering implementation of 6 Sigma in Nigerian land registries.	306	10.94	7.312	.236

Table 6: One-Sample T-Test Result Hypotheses 3

	Test Value = 0			
	t	df	Sig. (2-tailed)	Mean Difference
Land policy formulation and implementation is not the most significant challenge encumbering implementation of 6 Sigma in Nigerian land registries.	47.078	291	.000	10.943

Decision

The null hypothesis, land policy formulation and implementation is not the most significant challenge encumbering implementation of 6 Sigma in Nigerian land registries, was rejected as a result of ($t_c = 47.078, p < .05$).

IV. FINDINGS

1. 6 Sigma has prospects of enhancing improvement of quality service delivery in Nigerian land registries ($t = 47.600, p < .05$).
2. Relationship between organizational structure and 6 Sigma implementations in Nigerian land registries was significant ($t_c = 52.129, p < 0.05$).
3. Land policy formulation and implementation was the most significant challenge encumbering implementation of 6 Sigma in Nigerian land registries ($t_c = 47.078, p < .05$).

V. CONCLUSION

The study concluded that sustainable land administration processes in Nigerian land registries would be improved by an adoption of DMAIC 6 Sigma strategy. When the define, measure, analyze, improve and control constructs are integrated in land administration in developing countries, sustainability would be achieved through improvement in service quality.

VI. RECOMMENDATIONS

The study recommends that supervisory agencies of government develop a framework for senior management staff of land registries in

Nigeria to imbibe process improvement strategies such as frequent capacity building, recruitment by merit and 6 Sigma methodologies as a means of improving service quality in the business of land administration. Also, it is recommended that the business of 6 Sigma implementation be outsourced to requisite professionals who will conduct frequent DMAIC processes to ensure that process improvement is sustained as core organizational culture in land registries. Management of land registries should bridge the communication gap with customers so as to build a database of customer needs and demands, with a view to the delivery of customer satisfaction in the registries.

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