Engineering and Technology Journal e-ISSN: 2456-3358
Volume 09 Issue 05 May-2024, Page No.- 3902-3908
DOI: 10.47191/etj/v9i05.05, I.F. – 8.227

Developing and Implementing a Value-Based Operations and Maintenance Performance Management in Nigeria Electric Power Industry

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ABSTRACT: The Nigeria electric power industry is yet to recognize and adjust management practices, especially those concerned with operations and maintenance, to the changed and changing business conditions in electric power production. Hence, there is a need to review the organization's operations and maintenance policies. This paper intends to develop a value-based operations and maintenance performance which could be implemented in Nigeria electric power stations. An attempt was made to develop a framework for effective management of operations and maintenance performance which will link results to performance drivers. Furthermore, balance scorecard concept was included. The paper emphasized on value-added and intellectual capital in operations and maintenance in the emerging business environment, and stressed that there is a need to move from corrective maintenance or time-based maintenance to a long-term business-oriented approach.

KEYWORDS: Balance scorecard, Intellectual capital, Nigeria electric power industry, Operations and maintenance, Performance, Value-added and intellectual capital

PRACTICAL IMPLICATIONS

If the megawatts are not available at the customers'/consumers' end point when demanded, then there will be no meter reading and hence loss of sales. Availability creates the sales opportunity, since electricity "storage" is limited. Producing at a lower cost than a competitor assures sales in a competitive market. This means that availability is a significant "value-adder" and reliability is thepractical indictor of availability performance, as well as cost being another factor. A plant with a high product cost – even though its product is available will not be attractive in an "economic dispatch" model. Because total generating costs include operating and maintenance costs, plants that turn to value-based operation and maintenance performance will favourably influence availability and cost benefits to their bottom lines This paper calls for a holistic view of operation and maintenance (O and M) and an appropriate basis to show link to the core business in the Nigeria electric power industry.

Furthermore, a comprehensive performance assessment system has to accommodate balanced view on overall performance involving not only results but also drivers of those results, and as well should be able to provide some understanding about the casual relationships between them. A notable interest in this regard is to seek ways whereby the popular balance scorecard concept can be applied within O and M process. This paper looks into these aspects in respect of emerging O and M business environment and elaborate how O and M can be a value-added process to the core business in Nigeria electric power industry.

INTRODUCTION

Productivity improvement is a major concern for O and M managers in today's economy Plant O and M managers worldwide are actively seeking to enhance the productivity of their organizations and called for increased emphasis on productivity in teachings and researches directed towards O and M management The need to improve productivity is particularly crucial in Nigeria electric power industry where her productivity has consistently lagged behind the rest of the world electric power industry.

At the current pace of advancement, both in engineering and business, management disciplines coupled with tighter regulatory regimes, performance management of O and M process has gained considerable momentum, particularly in high risk and capital intensive industries [1], [2], [3]. As a result of the classical financial-oriented measurement techniques being subjected to wider critics in the contemporary business extent, many operating companies have already implemented business-wide O and M performance measurement systems [4], [5]. However, owing to inherent limiting conditions within Nigeria electric power industry settling these, in general,the systems are relatively far frombeing a managerial practices yet.Additionally, as O and M in electric power industry plants and equipment are subjected to a period of transition,potential opportunities are enormous for novel and innovative approaches that could

capture O and M performance that makes good business sense in the Nigeria electric power stations . Electric power production by nature is known to be an economically and a technologically intensive business. Moreso, its social and economic sensitivity is much discussed and debated recently in Nigeria, which will result in an adaptation of very cautious O and M strategies by the Nigeria electric power industry. Subsequently, current practices will render adherence to more complex risk-based decision-making processes throughout the Nigeria power stations. As much as risk remains an inherent element in decision criteria that effectively deal with potential threats [16], asset managers in the Nigeria electric power industry should also pay more attention to capitalize on every single opportunity available to them to get the maximum power generation from the asset portfolio for business advantage.

The value-added concept introduced in this paper explores this opportunistic phenomenon and elaborates how O and M can be heightened as a value-added process to the Nigeria electric power industry. The postulations in this regard are grounded on the emerging sustainable electric power production business context. This sustainable move will be seemingly pivoted to redefining the business role of O and M process in Nigeria electric power industry especially to the largely unexploited opportunities it has brought. The authors' underlying assertions in this endeavour stem from the fact that commercial competitiveness of electric power production in the deregulated environment should be a great threat mitigation and opportunity for realization in the emerging uncertain complex, and dynamic environment for electric power generation business.

BACKGROUND TO THE PROBLEM

More than ever, the Nigeria electric power industry needs units that operate without predictable costs and reliability. Factors affecting random, forced outages in Nigeria electric power systems are many and for electricity consumer in Nigeria, the unplanned loss of a single unit means substantial costs. High electricity costs and erratic power supply in Nigeria has been some of the major reasons driving the end-users to clamour for deregulation. The Nigeria electric power industry benchmarks prove that they are not competitive hence, finding it difficult to restructure for competition. In the light of this new generating environment, the traditional arms-length relationship between plants and experts is likely to become more interested and concerned for plant performance.The Nigeria electricity consumer wants a better deal after all.With proper deregulation, the market will determine the competitive clearing rate for generation. The Nigeria electric power stations will be candidates for repowering. The Nigeria electric power industry now have the option for these plants;

(i) Capital intensive to improve performance
(ii) People/process investment to improve, operates and maintenance performance; re-power the plants; and
(iii) Sell the asset to companies that elect to add value to the plant.

ISO 9000 certificate has driven maintenance process documentation and definition, but this has not had any impact on the organization. Guidelines, expectations, and measurements are still vague and completely absent. To transfer performance responsibility from O and M managers will require performance accountability, particularly, since there has been no objective performance measures premises for the value-based concept

Today, the emphasis in electric power generation signals a managerial transition to adapt a new decision making criteria a course of action; namely" corporate sustainability". [6] revealed that the currently adapted criteria for investment decisions are not excursively economic in nature, but also take into account social and environmental considerations in appraisal of the security of investments. They also contend, for instance, that the indicator called "considerations of environmental and social criteria in business decisions" captives management programmes and processes aimed at describing the management systems capacity to link sustainability issues to business decisionmaking criteria for operations and planning, and that green accounting, eco-efficiency measure, total cost assessment, etc.

[7] maintained that the term "corporate sustainability" may convey a different meaning to many, prevailing myths around sustainability in general advocates quite a blend of economy and technology; ecology and demography; and governance and equity.

In electric power company, business context today mainly should revolve around;

(i) Economical values that rest on the degree of financial accountabilities displayed.
(ii) Social values that rest on the degree of social equity.
(iii) Environmental values that rest on the degree of environmental care displayed.

The degree to which the Nigeria electric power industry opts to this new business norm will in-turn redefine delivery obligations and will also largely be reflected in the current business reporting process. A portal for benchmarking should be developed to review how the Nigeria electric power industry deals with the issue of sustainable development . The portal will primarily constitute five (5) target areas namely; ethics/corporate core values, corporate capacity building, stakeholders relations, environmental management and economics; which will have to be achieved through various internal business drivers.

[2] pointed out that the current trend can be seen as a genuine response to an exposure to a complex profile of risks, and the organizational adaptation to the new world order. The new world order is notably generated by the following;

(i) Globalization, liberalization and technology

(ii) Uprising people and power, and
(iii) Concerns or changes in the global eco-system.

Hence, the definition of Nigeria electric power industry should be involved as a process of value creation and risk mitigation in the emerging sustainable electric power industry business context. This concept termed "value-based management of O and M performance" discussed in this paper, is developed on the basis of empirical evidence from the operating environment for the electric power industry in the developed world. At the core of exposition, there remains the theoretical value of configuration of the O and M process as the point of departure with respect to these changing industrial demographics.

Firstly, this paper is of the opinion that many recent initiatives and incidents within the Nigeria electric power industry or the organizational behaviour at large has avail the opportunity for formula for commercial success in the current business economy which constitute a delicate balance of;

(i) Delivery of short-term results – concerns profitability prospects and
(ii) Consolidation of long-term opportunities – concerns growth potential.

Secondly, this paper of the motion that the notion of values that are critical to the Nigeria electric power industry business in general should arrive at each such a commercial success today and could in fact in two fold;

(i) Accountable value – the tools for financial managers or accountants to report performance in monetary terms, for example, cost savings, production values, cycle time, proved reserves, etc. and
(ii) Unaccountable value – these cannot be presented in monetary terms yet possess a finite value in terms of meeting business prospects and profit margins, for example, cross-trained labour, intellectual capital, increased work morale, enhanced job satisfaction, luster loyalty reputation, etc.

These values presumably are combined in complex patterns to deliver results and subsequentlyto business prosperity [7]. It is hoped that the corroboration facts that could be gathered in this paper and the insights of the information conveyed will substantially help to unfold the complexity to a considerable degree to the Nigeria electric industry. [2] illustrated the resulting theoretical casual configuration that underlie the value-based concept of O and M performance as presented in Figure1[7].

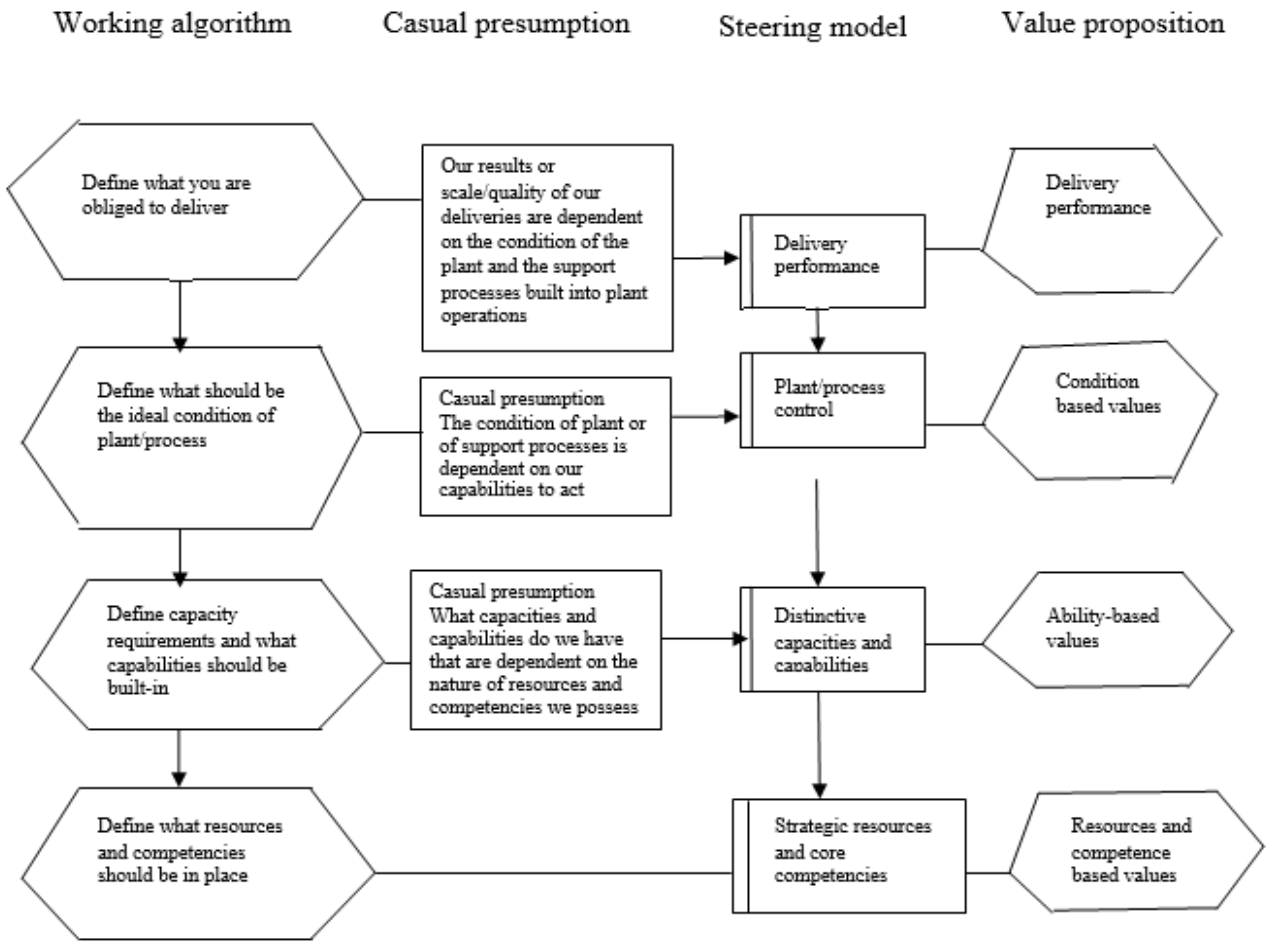

Figure 1: Theoretical configuration of the value based O and M performance concept [7]

Additionally, Table 1 shows high value-maintenance areas in a typical power generating industry;

Table 1: High value-maintenance areas

Areas	Sub-areas	Definition
Work	Processes prioritization	Consistently identifying and working high-value work. Maintaining continuity of work elsewhere.
	Age exploration	Following parts performance. The systematic extension of maintenance intervals with engineering support.
	Flow	Keeping work, paper, etc. flowing.
Planning	Outage	Developing and screening outage work for high-value areas. Establishing outage work priority.
	High volume work	Identifying and maintaining preplanned work plans for high-volume work.
	Daily	Apparently selecting and planning daily work.
CMMS	Cost management	Tracking costs by types and groups.
	Failure analysis	Extracting, evaluating and trending failures for opportunity.
	Maintenance analysis	Evaluation and monitoring of maintenance work and strategies.
	Reporting and measurement	Ongoing performance and cost management at the system and below.
Procedures for production work	simplicity	Keeping procedures available but simple and concise.
	Consistency	Having standard procedures and work format.
	Competence	Having complete work plans including appropriate limits and specification
Parts	Selection	Identifying outage preventing, unavailable parts as critical spares
	Stocking	Maintaining appropriate stock-level.
	Return/use	Keeping spares appropriately available to avoid unneeded.

[8] As shown in Table 1, every O and M staff has a direct plant support role. That is, he or she operates, maintains and keeps plant running through direct equipment support roles. When an individual's contributions the role, it adds value to the system. August [8] points out that for major equipment (boilers and turbines)overhauls, extending an interval for a few days can add value. Other same saving, in aggregate, also add value. Age exploration achieves its greatest potential value when a plant shutdown can be deferred.

For non-essential parts, application, which means keeping parts in continuous service until aging or in-service failure demonstrates life limitations.

How to Apply Value-Added Concepts in the Nigeria Electric Power Industry

Unfolding the inherent complexity of O and M performance further, and any elaboration on the constituents of the steering model for a more universal architecture calls for a better insight into Nigeria electric power industry O and M processes. It implies that they need to develop an adequate level of prior knowledge regarding the role and characteristics of the O and M process and the nature of its interface with the operating environment and the core business. This demands more detailed analysis that can be accomplished through concurrent maintenance assessment.

[7] pointed out that such assessment is aimed at ensuring the following;

(i) Vertical alignment – the degree to which the O and M process is aligned with both business policies and asset condition in a given operating environment.

(ii) Lateral integration – the degree to which the O and M process is sensitive to changes in its environment and to work management policies in other parallel processes; and

(iii) Self-assessment and improvement – the degree to which the O and M process has identified its role and capacity requirement according to their criticality on the process performance and thus on plant health.

Inprinciple, this is meant to portray the level of inter-activity and dependent of the O and M processes in Nigeria electric power industry production environment. The understanding of these dependencies is important so far as they contribute to the knowledge to unfold inherent complexities of O and M performance in the power stations and then define the casual performance model within a given setting. There exists three domains that will contribute to the quality and standard of O and M performance in the Nigeria electric power industry. These are;

(i) Operations work management process to institutionalize proactive activity, operational intelligence and condition monitoring with the purpose of building aneffective operational interface.

(ii) Technology management process to establish technical worthiness of the asset with the purpose of building an effective technological interface, intellectual capital, to build an effective source of competitive advantage and to build an effective human interface.

(iii) Proactive activity in maintenance relies on the use of electronic instrumentation and computerized programmes to effectively pinpoint problems in rotating equipment. The intelligent here implies the ability to understand, learn and make judgements or have opinion that are based on facts from interactive environment, and the worthiness implies suitability to be used, operated or put into function in accordance with predefined specifications. They seemingly will be considered to be increasingly critical to sustain an efficient and effective O and M support in the Nigeria electric power industry. They should remain centrally focused as it is known that they directly contribute to the health of the power station assets. Health here implies the inherent condition of the electric power industry installations and the degree to which it is free of faultsand failures, or the state of being well to ascertain safe and sound operations.

[7] identify two core aspects that elucidate this health issue from O and M as;

(i) Quality and standards of O and M activities; and

(ii) Safe and sound technical functions of technical items compatible with operational specifications.

In fact, the competence of the Nigeria electric power industry O and M to develop within these areas will be advantageous and will make a difference in terms of end results from the plants and equipment. The Nigeria electric power industry should constantly seek for better understanding and knowledge on O and M performance, as well as pool necessary resources and develop core competence, central to drive those results.

Value-Based Concept in Global View

The value-based concept today comprises then following;

(i) Total quality – this recognizes that meeting delivery expectations is a function of developing core technical and organizational capacities and systematic approaches to planning and management of activities. Contemporarily, the need for pursuit of quality ramifies across economic, social and environmental imperatives [9], [10], [11].

(ii) System – this recognizes performance is a function of the joint operations of social and technical systems and that constitutes interaction of a system with its environment as a basis for evolution.it also emphasizes integrity and universality of performance within defined boundaries [12], [13], [14].

(iii) Process – this recognizes the need for accommodating horizontal work flows and strengthening internal interactions and interfacing, and avoidance of sub-optimization for business advantage [15], [16], and

(iv) Balanced assessment – this recognizes adverse impacts on the total reliance on pure financial or result-based measures, and hence the need for assessing overall performance in a financially and non-financially balanced perspectives. Another contemporary issue is the intangible assets [17], [5].

However, for the Nigeria electric power industry to fully implement the value-base concepts, there must be the necessary infrastructural and organizational culture that will promote the absorption of the subject matter and its reception as an effective tool to manage performance.

Another aspect is responsibility and authority. By developing the performance measurement system, the Nigeria electric power industry will enable them clearly define what the responsibilities will be. To make that, what is needed will be delivered needs authority to the O and M value-based concept in balanced scorecard (BSC) perspective. The application of BSC concept as a performance measure has two (2) genuine attributes as presented by [7];

(i) The framework – this constitutes the proposed four perspectives namely: financial, customer, internal; and learning and growth;and

(ii) The logic – this insists on the complementing financial performance with a view on non-financial performance identifying outcome measures and performance drivers, and building casual relationships. The other aspects are intangible assets [5] and intellectual capital [18]. The central theme of this concepts which re-engineers and revitalizes long-lasting performance theories is the necessity to see beyond mere financial performance owing to inadequacy of financial measures alone to help guide business success in emerging highly competitive conditions. [3] give reporton an electric utility's experience of introducing the BSC to measure the total performance of itsmaintenance function. The BSC provides a balanced presentation of strategic performance measuresaround four (4) perspective; financial, customer, internal processes, and learning and growth [4]. The BSC is a powerful communication tool for providing a sharp focus on factors that are important to maintenance in making contribution to business success of an organization.

Intellectual Capital

Intellectual capital has become such a power factor in today's economic reality. The business world has adopted the idea

that knowledge has become the most strategic of corporate assets, the principal basis for competitive advantage. Knowledge is the most important sources of competitive advantage. [19] points out that the terms and ideas such as knowledge managements, the information age and the knowledge-based theory of the form have emerged over the past decades. The much recent significant development in management theory and practice, especially the increased in application of information technology (IT) to handle organizational knowledge.Organizations have always relied on innovative ideas and the knowledge of their employees for their competitive advantage. Today's business models are quite different from yesterday's own, and as a results, today's organizations strive to better understand and manage the relationship between what they know and their value delivery. [20]maintain that there has been a stronger interest in corporate performance management approaches, which use performance indicators to provide insights into organizational performance. [21] maintain that this improved understanding of value creation can be used as the basis for strategic creation or assessment, to motivate people do the right things, and to communicate with external stakeholders.

The knowledge should be the central consideration on which to ground the Nigeria electric power industry strategy and should also be the primary basis on which it can establish its identity and frame its strategy.In the organization, it should be embedded not only in documents or similar organic forms and repositories, but also human forms such as organizational routines,processes, practices and norms. [22] maintains that the treatment of employees as investment is the beginning and the end of knowledge based economy. The combination of financial capital and intellectual capital will together create value. Rational value creation is the goal of any modern industry. With the resources a company can create more or less value. Value added is the most appropriate indicator for business success, an objective indication of business success and shows the ability of a company to create value, intellectual capital has two components; human capital and structural capital.

CONCLUSION

The background for this paper is to open a new vista for development and implementation of O and M performance indicator and value-added in the Nigeria electric power industry. The overall approach is based on custom practices from electric power industries of the advanced economy. Emerging electric power generation business conditions are seemingly more promising to heighten O and M as a critical constituent of core business process in the Nigeria electric power industry. Recognizing its full-blown potential calls for novel concepts that will be more appealing to the management, and promotional campaigns to change the mindset in general. This paper elaborated the view that the changing conditions in the electric power industry business is seen to be more inclined to adapt new course for decision making and action taking along corporate sustainability that emphasizes wider economic, social and environmental imperatives to business conduct. In this paper, we have introduced the value-based concept of O and M process in electric production assets in this emerging business environment. It also discussed how the BSC concept can be used meaningfully to develop an architecture for O and M performance measurement management process as well as the use of intellectual capital to create value. In all, it is an attempt to continuously imply the subject matter and promote O and M as a value-added process in the Nigeria electric power generation business environment. There is need for the Nigeria electric power industryto adjust their management processes, including those concerned with operations and maintenance policies.

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