

Operational Excellence in Manufacturing, Service and the Oil & Gas: the Sectorial Definitional Constructs and Risk Management Implication

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DOI: [10.22178/pos.26-4](https://doi.org/10.22178/pos.26-4)

JEL Classification: L1,
M11

Received 12.07.2017
Accepted 12.09.2017
Published online
22.09.2017

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Abstract. The current global business climate has not been favorable to most firms irrespective of industry affiliation. That condition necessitated companies to adopt operational excellence as a strategy for optimising output with little resources, reducing lead time with the efficient use of assets and employees and avoiding safety and health issues to people and the environment. As a result of the need for operational excellence, many kinds of literature defined the concept based on the context of industry or sector. Industries such as manufacturing, services, oil and gas, mining and so many industries to mention a few, have their unique construct in the definition and therefore causing dilemma on which dimension to hold on to. It is against this backdrop that this paper synthesizes and integrate all the varying dimensions and fuses out similarities, differences and the antecedence of research directions taken on the few mentioned sectors. The paper thus concludes that the unique construct among all the definitions is continuous improvement, cost reduction, quality, time utilization, operational efficiency, staff involvement and output optimisation. However, they varied on risk management, staff health, safety and the concern for the environment, which is unique to oil and gas industry and that can affect the choice of research variables.

Keywords: operational excellence; risk; continuous improvement; efficiency; cost reduction.

INTRODUCTION

It is generally well acknowledge that businesses, irrespective of industry affiliation are operating under increasing pressure to improve productivity. Improve quality, reduce cost and waste, minimize lead time, optimize efficient asset utilization and flexibility [10, 12, 18]. As a result, businesses have realized that it would be challenging for them to excel in a single dimension of business strategy. For that strategic perspective, firms now resort to operational excellence as the best option to meet up or reduce the rising pressure from their stakeholders to improve performance result with minimal resources. So as a consequence of this strive for excellence, industries fuse out their unique construct of the main performance metrics to pursue in achieving operational excellence [12, 29]. Even at the time of recession, companies that thrived adopted and

maintained operational efficiency as a strategy [14]. The thrived firms reduced the cost of production while improving efficiency in their operations.

Operational excellence (OE) has so many meanings and methodologies [26]. Most industries consider operational excellence as an atmosphere that triggers the accomplishment of optimal performance in all facets of the business in a continuous manner. Author [34] viewed that operational excellence could be attained through innovation, working process improvement and means in managing organisational knowledge; via knowledge leadership, knowledge culture, knowledge technology, knowledge process and knowledge measurement. In another view by [27] operational excellence is about having the strategy management capability, excellent execution of the plan in a speedy, and cheaper manner

and continuous improvement over a long term. That notwithstanding, it rooted in diverse business process improvement approaches employed by industries in the last three decades, they include Six Sigma, Lean manufacturing, continuous improvement, business process management, and process excellence [21, 17]. However, [7] view operational excellence in total isolation from lean management and continuous improvement because they only look at waste elimination and making the organization better every day. Operational excellence is broader because it sets business growth as a goal and provides a step by step approach to achieving it in firms [7]. From the preceding, it would be difficult to have a universally accepted definition of operational excellence.

The spread of the concept of operational excellence in the present day has gone across many industries [16]. Nonetheless, scientific literature describing operational excellence practice implementations in industries, in general, is still scarce [33]. As conclusions from other industries might be difficult to be generalized, a times is even misleading [5]. While some industries may see the definition as synonymous; others may see the approaches (lean, six sigma and continuous improvement) as part of the evolutionary route to OE. Industries such as manufacturing, service and oil and gas are conceptually looking at operational excellence construct from different dimensions. However, they may share certain perspectives in common, but the reality is they have fewer differences of what operational excellence is all about.

Efforts to distinguish the field of operational excellence among industries are rare. This paper, therefore, tried to elaborate on the key issues in the diverse view of operational excellence based on three industries, manufacturing, service and oil and gas with the aim of solving particular research complexities – with concerns to key variables applications. Again is to lay a foundation for theory development in the area of operational excellence that would further enrich literature.

RESULTS AND DISCUSSIONS

Operational Excellence in Manufacturing Sector

Operational excellence has been in the manufacturing industries for decades, known as lean production. Operational excellence in the manufac-

turing practice meant optimizing business processes, broadly production and manufacturing [27]. According to [12], operational excellence is the act of increasing productivity within the minimal lead time flexible while being cost effective for improved quality. In the manufacturing industry, operational excellence is a mechanism for a continuous production improvement at the barest minimum cost for profit maximization. Operational excellence is reaching the height of operational efficiency by doing things better, faster, and cheaper [27]. Operational excellence is the unification of firms' entire operations such as procurement, manufacturing, and after-sales service as an end-to-end system [35]. It has been the purpose of operational excellence to boost production efficiency, improve quality and meet up with market demand. Operational excellence approach is similar to a typical production system combined with customer orientation and the necessity of continuous improvement [17].

Over the past few decades, operational excellence has evolved to include process improvement through individual management programs. In the manufacturing sector, management philosophies such as total quality management (TQM) and Lean Management tools-Six Sigma, Business Process Reengineering (BPR) are often used to achieve operational excellence [17, 12, 27]. OE is the efficient management of people, transactions or hangovers, measurement on quality, cost and time, with a provision of a limited variety of products [18]. The need for operational excellence extends far beyond the manufacturing industries, and there is, therefore, need to study operational excellence in the service sector and probably the oil and gas sector.

Operational Excellence in the Service Sector

Operational excellence is also the current trend not only in the manufacturing industry but also in the service industry. Author [24] in the book see operational excellence as a relatively new phenomenon in many service industries. Operational excellence refers to a significant increase in performance across various aspects including operations [9]. Operational excellence is an approach designed to achieve outstanding production and delivery systems with excellent technical and social aspects [36]. Operations in the service industry, there is no clear production line. As a result, it is influenced by the level variety of offerings and variability of delivery [29]. Opera-

tional excellence is the maximization of value that operations deliver to customers through strong leadership and the application of value-added technologies by maintaining industry best practices [32, 30]. Operational excellence enables sustained delivery of high-quality, cost-effective services and capabilities that provide exceptional customer value [29]. According to [32], Operational excellence is a strategic competitive advantage that leverages on the effectiveness of operations in creating and sustaining customer satisfaction and loyalty.

Operational excellence is the processes of optimizing post-sales services [37]. It is clear that service operations involve synchronization of the various processes involved in service delivery. According to [29], operational excellence is about firm's position in handling costs and risks associated with its service portfolios beyond just operational effectiveness but also for achieving outstanding performance. Operational excellence is expressly about customer satisfaction, cycle time reduction, waste reduction, improvement in quality, cost reduction, yield improvement, and systems development [28]. Operational excellence is the destination of leaders who are passionate about delivering exceptional customer value and outstanding business results [25]. They further maintained that operations excellence is an act of leveraging the power of employees, enacting effective process management, implementing value-added technologies, and installing individual accountability to achieve sustainable success, all on behalf of the customer [25].

Operational Excellence in the Oil and Gas

Oil and gas operations such as exploration, production, and transportation contain inherent risks: like slips and trips, fatalities or severe environmental incidents [10]. Operational performance in the oil sector cannot, therefore, be separated from risk. So because of these inherent risks, and specific recent incidents in the global oil and gas operations, stakeholders pressure for firms in the industry to perform becomes intense [1, 15]. Pressure such as the need to improve productivity that is faster, safer, more reliable, more resilient and environmentally sound [10] made the need for operational excellence in the sector more than ever before [23]. As result of the pressures, companies resort to operational excellence to meet up with these stakeholders demands. So

operational excellence according to [4] is about process safety, environmental protection, risk mitigation and achieving a consistent world class performance. In the oil and gas sector, health, safety, environment, and quality are the foundation of operational excellence [10] where every employee, contractors, and the environment understood the operational risks involved. Operational excellence is a strategy that ensures continued pursuit to eliminate injuries to people, the environment and zero defect approach to product quality [23]. Operational excellence is the process of improving feedback stock flexibility, growing high-value product yield, guaranteeing the availability of product, increasing logistics capabilities and reducing risk [11]. It is saying that product quality, availability, and risk management are among the major elements in attaining operational excellence in the oil and gas sector.

Unlike other areas of the economy, oil and gas companies are under tremendous pressure from both regulators and the environment to reduce risk in their operations. So the growing complexity, costs, and risks combine in the oil sector trigger the need for operational excellence to achieve efficiency more than ever before [23]. Hence any strategy aimed at improving operations and supply chain efficiency is expressly managing and minimizing operational risk and uncertainty [8] categorically in the oil industry. These uncertainties have potential effects on firms' assets and operations that cause failure in the internal process, systems, technology, actions of people, or external events leading to disruption in business operations [14]. This confusion might result in production shutdown and loss of revenue. So effective and efficient services help fulfil organizational goals at the lowest cost, least negative social consequence, and least damaging environmental impact [8]. R. Edgeman position coincides with the saying of [11] that any discussion on oil and gas operations cannot go independent of workers safety, community health and the environment.

Authors [23] and [26] maintain that risk management can play a role in achieving exploration of wells, thousands of kilometres of pipelines and millions of items of processing equipment deliver energy safely to homes, transport systems, businesses, and communities. Thus it could be said that operational excellence in O&G is the management of assets safely, reliably, sustainably and cost-effectively [23]. In its operational excellence,

[4] capitalized on health, safety, and the environment (HSE), quality and reliability. Similarly, according to [6] the oil and gas operations with risks attached, and price fluctuating challenges and costs, the efficiency of operations and safety are crucial to operational excellence in the industry. They further maintained that risks mitigation must be active before the commencement of operations for Lundin to achieve its goal of being a best-in-class operation.

The tremendous pressure on oil and gas industry to control risk, even as challenges on new drilling in the Arctic, ultra-deepwater or intensive on-shore operations in densely populated areas is rising [1, 11]. It is true that operational excellence is demonstrated through integrated performance across risk, revenue and cost [15]. From all the various definitions and perspectives of operational excellence one was made to understand that HSE and risk management are unique constructs in the oil and gas operational excellence.

Area of Convergence and Divergence among the Industries

Operations and operational excellence among industries vary as described in the early part of this paper. For instance, the oil and gas industry is known for combining operations, maintenance, and quality measurements in a particular performance indicator, where general equipment effectiveness is an ideal way of gathering the life cycle performance of processing equipment [2]. In manufacturing sector for instance, if a machine produces 20,000 units, and when it goes down, at the end of the shift, it will be some pieces short of its target [2]. Whereas in the oil and gas, production will drop whenever a compressor goes down, but the dynamics are more complex, so it is harder to measure such an impact in the oil & gas because of the nature of operations in the industry unlike in the case of manufacturing (Table 1).

Table 1 – Convergence and Divergence of Operational Excellence Constructs among Industries

Convergence	Divergence		
	Manufacturing	Service	Oil and Gas
Continuous improvement Cost reduction Quality of product/service Operational efficiency Time utilization Output optimisation Employee engagement Integration of all work processes	Waste reduction (Lean) Flexibility Asset yield	Customer satisfaction Delivery period	Risk management Health Safety Environment Reliability Asset yield

The operations function is strategic in manufacturing as it is in the service companies. The service sector is different from the manufacturing because of its intangible output, higher customer contact, shorter response time, non-inventoried product, and a labour intensive nature [19]. On the other hand, industrial engineering was the root of most operational excellence concepts like scientific management principles, modern quality concepts (six-sigma) and the Toyota Manufacturing System (lean management principles) in the manufacturing industries [37].

In an interview with the chief director of the Shingo Prize for operational excellence, Robert Miller where he shares his view of the common traits between manufacturing and service sectors as regards operational excellence. According to

Robert “principles whether in automobile manufacturing plant, in the bank or hospital are universal by definition and such quality and value addition are applicable principles” [24]. However, because of the difference in policies and systems used by industries, the tools applied also differ, what matters is how well they align to behaviour that generates operational excellence thereby helping the firm produce efficient result [24]. The Shingo (Toyota manufacturing) principles are thus applicable in any business or industry.

Unlike in the manufacturing or service sectors, oil and gas operational excellence definitions emphasize on health, safety, and the environment (HSE) and reliability, for example [35, 11, 4, 10]. Most of their perspective centered on HSE which

by implication means they would need risk management to achieve that. Researchers such as [15, 1, 6, 26] considers the nature of oil and gas operations (onshore or offshore) and therefore capitalized on risk management in defining operational excellence. While in the service sector, the emphasis of operational excellence is customer satisfaction and delivery time, for example, researchers like [37, 32, 29]. Whereas in the manufacturing sector, operational excellence was viewed from the angle of waste elimination (lean), continuous improvement and flexibility [12]. To this end, it is clear that all the industries focused on (manufacturing, service, and oil & gas) in this paper have their unique constructs of what operational excellence is all about. Although they share certain similarities, the difference in constructs between oil and gas and the other industries is so pronounced. Difference such as HSE, reliability and the emphasis on risk management, put on the other hand as an area of divergence in the paper.

All the industries share certain common constructs as regards operational excellence; they are both after improved productivity, cost reduction, and lead-time minimization. Furthermore, the issue of asset yield is found in both manufacturing and the oil and gas industries, as defined by [10, 12, 18, 23]. Most of the articles reviewed showed how valuable employee education and engagement is to achieving operational excellence in all the industries. It is also synonymous with all of them, the issue of efficiency in operations. However, there are issues regarding research dimensions and variables application in each industry. From the few studies conducted in the manufacturing [12] and [3] and service [30] industries, human resource variables such as change management, leadership, culture and six sigma factors used as predictors of OE. In the oil and gas sector with no traced study conducted on OE and due to the nature of its operations, and also considering the definitions that emphasize on HSE and risk management. Perhaps enterprise risk management (ERM) adoption determinants (IT, regulations, new business opportunities, staff capacity, firm size, characteristics, recent incidents, etc.) and ERM implementation intensity would have some effect on operational excellence. It is because the risk involved in operations from the point of oil well drilling, storage, pumping to the refinery, refining, distribution to retailing in the filling station and should there be any incident in the process, the whole

operation would stall. And instead of minimising cost, fixing the event would mean more budget, and by extension, the objective of HSE as factors in achieving operational excellence in the sector is defeated without ERM in place.

Risk Management Implications

Businesses from every industry are faced with strategic, financial, investment, and operational risks. Other risks are that of the business environment such as political, economic, socio-cultural and ecological. Risk management is basically about identifying, analyzing and controlling any uncertainty that would affect firms' business activities [31]. It is the provision of an overview of all risky activities, building recovery plans and consistent monitoring of regular operations of the business [22]. ERM, therefore, turns out to be a framework necessary for companies to improve and sustain performance (operational and financial). So by implication, ERM is relevant to operational excellence in all industries. However, some industries have high risky undertakings than others and therefore consider ERM importance more. ERM has gone beyond only protecting business to making it successful in all quotas, because it would help in costs reduction, eliminate and manage injuries to staff and develop strategies to accept, manage, and capitalize on positive business opportunities [20] and [13]. Perhaps enterprise risk management could be employed in manufacturing industry's OE as it deals with machine processes in production, finances and the environment. As for the oil and gas, enterprise risk management appeared to be a major factor in all their activities. Equally, risks such as loss of customers, service delivery, and financial risk will require enterprise risk management component to be ahead of competitors.

CONCLUSION

The primary aim of this paper was to clear up the conceptual dilemma in the learning field of operational excellence by availing synthesis and integrating three industries perspectives. The paper was able to figure out the dimensions and constructs of operational excellence definition among three industries: manufacturing, service and the oil and gas sector. It has become clear that despite the lack of adequate literature and studies on the subject matter, the paper still fuses out several similarities and differences shared in

the constructs among the industries. Similarities such as continuous improvement, cost reduction, quality, operational efficiency, time utilization, employee engagement and output optimisation discussed. On the other hand the differences so pronounced was that of the oil and gas sector, where HSE and risk management emphasized in OE. As for the manufacturing and service industries, issues such as customer satisfaction, and delivery time are critical to service companies, and waste reduction (lean) and flexibility are in the manufacturing sector. Also, the direction for research and variables to use was also high-

lighted considering what was obtained in earlier studies. The divergence was more on the oil and gas due to the nature of its operations that involve a lot of risks. The paper is presumed to have broadened the scope of operational excellence research by setting a new direction for theory development with concerns to combining enterprise risk management and operational excellence, particularly the oil and gas sector, and other extractive industries.

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