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ARTICLE INFO	Gezani Richman Miyambu and Solly Matshonisa Seeletse (2016). Numeric measurement of business process optimization. *Environmental Economics*, *7*(4), 20-24. doi:10.21511/ee.07(4).2016.02
DOI	http://dx.doi.org/10.21511/ee.07(4).2016.02
RELEASED ON	Friday, 09 December 2016
JOURNAL	"Environmental Economics"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **0**

NUMBER OF FIGURES **0**

NUMBER OF TABLES **0**

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Abstract

The paper describes a simple, straightforward method to measure progress of business process optimization (BPO). The aim is to derive measures of the degree of BPO attainment in order to identify future priority focus for ensuing exercises. These measures can help to identify components of business that should be improved towards full optimization of processes in business. In an ideal case of the business containing all the components, a large business scenario is assumed. However, flexibility is permissible when changes are experienced with either some business aspects missing or new ones added. A measure of BPO progress was eventually developed based on these circumstances. A BPO measurement is described for presentation as a percentage or proportion.

Keywords: BPE, BPO, change management, measure, risk management, success factor.
JEL Classification: C1, C3, C5, C6, O3.

Introduction

The case of quantifying optimization levels in business processes is far from maturity. On the other hand, measuring is important, because it guides the level of success or failure (Penrose, 2007). This is because many users of optimization methods, especially where pressure of competition is an issue, tend to classify optimization as being either not achieved, thereby implying that nothing has been done, or as achieved, thereby implying full achievement. This approach is fragile, as it leads to a tendency of business failures even in cases where some optimization progress has been made. In reality of existing businesses, though, neither zero nor full achievement of optimization ever exist (MaseTshaba & Seeletse, 2014; Miyambu & Seeletse, 2015). Certain relative levels of achievement lead to classification of non-achievement or full achievement. Thus, business process optimization is usually measured on a relative basis in which comparatively low achievements are taken as zero, while exceptionally high achievement may be considered as full achievement. These approaches have weaknesses that may lead to poor business results and practices. This paper develops numeric measures which businesses can use to adjudicate their level of optimization achievement in a more objective way, and to be able to develop methods to improve.

The paper develops numerical measures to quantity BPO progress, and explains how to incorporate improvements in the measures when new developments are realized. That is, it explains ways to measure the level of BPO attained at any business stage, and also determines missing gaps, as well as updates the measure when new developments emerge.

1. Literature review

1.1. Business performance. Business performance refers to a combination of management and analytic processes that allows managers of an organization to achieve pre-determined goals (Franco-Santos et al., 2007). It has to be managed in order to ensure its enforcement. Business performance management is a set of such processes to facilitate the administration of an organization's performance in order to accomplish the pre-selected goals. Modern businesses apply scientific concepts in their operations to enhance their performances in the market. Scientific approaches enable objective performance measurement, and can also provide reliable measures and approximate models for business operations. Also, when scientific methods are applied to business, they can contribute in improving business efficiency. Burlton (2001) informs that when this happens, there can be escalations of revenue and profits. Judicious business organizations customize scientific and marketing benchmarks in order to maximize business benefits while minimizing losses. Maximizing benefits while minimizing detriments within the applicable context is optimization. This can be achieved using industrial engineering methods of value engineering. Thus, optimization and value engineering concepts are illuminated below.

1.2. Optimization. Optimization refers to an act, process, or methodology of making a system as totally impeccable, functional, or effective as possible (De, Kar, Mandal & Ghoshal, 2015). In mathematical terms, optimization entails the mathematical procedures for finding the maximum of a function. In business practice, it refers to the selection of a best element pertaining to some criteria from some set of available alternatives. In a multivariate context, each time a new variable may be included in an existing setting and the previous optimal solution may lack optimality. Therefore,

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adding an objective to an optimization problem adds complexity. Also, when two objectives are in conflict, a trade-off must be created. This paper establishes optimality in a general setting, and, then, extends it to cases where additional or reduced inputs occur.

1.3. Value engineering. According to Steward (2010), value engineering (VE), also known as value analysis (VA), refers to a systematic procedure to develop the value of goods or products and services by analyzing utility while lowering costs. Value, which is worth, can, therefore, be increased by either improving the function or reducing the costs. A fundamental VE norm is to preserve the basic functions by ensuring that they are not reduced when increasing value, but, instead, ensuring elimination of waste. This implies that in VE, business processes should attempt to design a product or service that possesses the desired attributes that are durable up to the level at which they are required and not including features that are not needed. This explains that VE reduces extra costs because companies only typically use the constituents that satisfy the product's essential attributes.

1.4. BPO. BPO refers to the problem of constructing feasible business process designs with optimum attribute values such as duration and cost (Tiwari, Vergidis & Turner, 2010). Hence, BPO can be categorized as a scheduling problem, described to be a problem of assigning resources to tasks over time subject to a set of side constraints with the goal of optimizing one or more objectives. The efforts of BPO are often influenced by competitive environments that an organization faces within an industry. Lee (2005), then, concludes that BPO is a voucher to competitive advantage. According to Leymann and Roller (2000), BPO entails to (re)design the business processes for the underlying service composition to fit a given constraint. It, therefore, takes into account some constraints for a specific service infrastructure. Business processes consist of providing worth to a customer through value-added activities, moving across functional area boundaries, controlling process standards and measuring process execution. Furthermore, Papazoglou and Ribbers (2006) describe BPO as involving optimization of all process flows, crossing any application, company boundaries and connecting process design and process maintenance. It, therefore, requires adapting the business process to improve the process execution to reach a higher quality of service level for any particular service composition.

1.5. BPO drive. Businesses and other organizations contest against competitors to have a greater market share (Armstrong & Greene, 2007; Farris et al., 2010). Their competition tactics include a determination to retain existing clients, endeavors to acquire new ones, and struggles to displace clients from their competitors. The dynamics of competition are complicated further by new businesses. According to Cranston (2011), the emergence of new companies has elevated competition as each participant contests to obtain an increasing market share. BPO is a vital business concept which is one of the business approaches to assist the companies to remain focused, competent and competitive. However, a weakness in using BPO is largely the lack of appropriate technical models to reach efficiencies in its approaches. The paper contributes by incorporating science in BPO by finding objective measures to analyze BPO magnitude.

1.6. Recent BPO studies. The study by Babulall (2012) identified the fundamental components of BPO, and further sub-components to describe the main components. MaseTshaba and Seeletse (2014) modelled BPO using linear programming methodology. Miyambu and Seeletse (2015) used regression methods to model BPO. The last two studies were consistent that the usage of percentages of progress made to measure the extent of progress in BPO achievement.

2. Major BPO components

In the VE interest, issues and components in business process that do not add value, or which reduce the worth, are (assumed to be) eliminated. Then, after ensuring that detrimental activities are removed, possible attainment of BPO at different levels of achievement indicates the variable nature of BPO. Therefore, BPO is considered to be a dynamic and stochastic business practice. Several authors (Apostolou et al., 2010; Babulall, 2012; Gong & Janssen, 2011) established or confirmed that the three principal components of BPO are business process effectiveness (BPE), risk management (RM), and success factors & change management (SFCM). Each of these factors is also a random vector, because, first, each has several component random variables and, second, they can attain various levels according to the random occurrences controlling their conditions. In formalizing this assertion, define these random vectors as:

$\mathbf{X}_1$ = Business process effectiveness,

$\mathbf{X}_2$ = Risk management, and

$\mathbf{X}_3$ = Success factors and change management

2.1. Description of the components. The attributes above are described as follows:

2.1.1. Business process effectiveness. A business process is said to be effective if it is able to contribute the desired level of performance (Malakooti, 2013). It, therefore, refers to the delivery of performance at the predetermined value.

2.1.2. Risk management. Risk management entails identifying, assessing, and prioritizing risk, then, coordinating and economically applying resources to minimize, monitor, and control the likelihood and influence of ill-fated events (Hubbard, 2009), or to maximize the realization of opportunities. According to Antunes and Gonzales (2015), the objective of risk management is to assure that uncertainty does not deflect the endeavor from the business goals.

2.1.3. Success factors. Success factors refer to critical areas where an organization must perform well on a consistent basis to achieve its mission (Gates, 2010). These factors must be identified and enhanced, and also protected against possible risks to ensure performance to desired levels of performance.

2.1.4. Change management. Change management is any approach to transform individuals, teams, and organizations by using methods intended to re-direct the use of resources, business processes, budget allocations, or other modes of operation that significantly reshape a company or organization (Little, 2014).

2.2. BPO model. Assume a linear approach to modelling, then, define:

$$BPO = X_1 + X_2 + X_3. \quad (1)$$

2.3. Initial BPO measure. A usual approach is to say $X_1 = 0$ (if BPE is considered missing) or $X_1 = 1$ (if BPE is present). Similarly, $X_2 = 0$ or 1; and $X_3 = 0$ or 1. This gives the measure of BPO:

$$0 \leq BPO \leq 3. \quad (2)$$

The possibilities of attainment of BPO are limited to 0% (no attribute achieved), 33.3% (achievement of only one attribute), 66.7% (two attributes) and 100% (all attributes). This approach assumes that each variable can only be either completely absent or fully achieved, which is a weakness. The other weakness is that the variables are considered to be contributing equally to BPO.

3. Static linear approach to BPO

This approach considers the BPO random vector as an unpretentious sum of its components.

3.1. BPO descriptor variables. It was concluded that each random vector has component random vectors (Apostolou et al., 2010; Babulall, 2012; Gong and Janssen, 2011).The random vector $\mathbf{X}_1$ has 12 probabilistic attributes or random vectors, $\mathbf{X}_2$ has four and $\mathbf{X}_3$ has five. These probabilistic attributes are:

$\mathbf{X}_1$ = **Business process effectiveness**

X_{11} = Time saving

X_{12} = Follow up with resources from other divisions

X_{13} = Work on many systems to complete tasks

X_{14} = Work involves technological processes

X_{15} = Allows for the best customer service delivery

X_{16} = Cost effective processes

X_{17} = Competitiveness in the organization

X_{18} = Ability of organization to attract new clients

X_{19} = Increase in profits

$X_{1,10}$ = Ability to identify new opportunities

$X_{1,11}$ = Launch of new innovative products

$X_{1,12}$ = Serve as a platform for new system selection

$\mathbf{X}_2$ = **Risk management**

X_{21} = Business processes mapped in a suitable business framework

X_{22} = Access to these mapped processes

X_{23} = Processes allow easy identification of risks

X_{24} = Risks mitigated through processes updating

$\mathbf{X}_3$ = **Success factors and change management**

X_{31} = Process change initiatives align with the organization's strategy

X_{32} = Organization has effective mechanisms for managing process change

X_{33} = Business processes continuously reviewed

X_{34} = Process training provided for effecting process change initiative

X_{35} = Staff involved in the process change from start to finish

The attributes do not share features (Babulall, 2012). Thus, the random variables $\mathbf{X}_1$, $\mathbf{X}_2$ and $\mathbf{X}_3$ are mutually exclusive. Also, these factors are the only ones explaining the main variables. Thus, they are exhaustive.

3.2. Further BPO advancement. Since the modelling is assumed to be linear, then, define:

$$\mathbf{X}_1 = X_{11} + X_{12} + X_{13} + X_{14} + X_{15} + X_{16} + X_{17} + + X_{18} + X_{19} + X_{1,10} + X_{1,11} + X_{1,12,} \quad (3a)$$

$$\mathbf{X}_2 = X_{21} + X_{22} + X_{23} + X_{24,} \quad (3b)$$

$$\mathbf{X}_3 = X_{31} + X_{32} + X_{33} + X_{34} + X_{35.} \quad (3c)$$

Upon assuming that the singular units count equally for each variable and, ultimately, towards BPO, then, the measures of the components are:

$$0 \leq \mathbf{X}_1 \leq 12, \quad (4a)$$

$$0 \leq \mathbf{X}_2 \leq 4, \quad (4b)$$

$$0 \leq \mathbf{X}_3 \leq 5. \quad (4c)$$

Then, the new form of BPO generalized from equation (1) is:

$$\text{BPO} = \mathbf{X}_1 + \mathbf{X}_2 + \mathbf{X}_3. \quad (5)$$

The new interval measure is:

$$0 \leq \text{BPO} \leq 21. \quad (6)$$

3.3. Measure. Each component can be measured separately (see equations (4a) to (4c)). Thus, deficiency in BPO can be identifiable at component (BPE, RM or SFCM) level. BPO = 21 is ideal and would occur if every attribute is attained fully satisfactorily. If BPO < 21 due to only one component, the process is question can be classified accordingly, such as deficiency in BPE, in RM or in SFCM. Also, BPO < 21 shall be regarded as suboptimal, while BPO = 0 shall be known as non-optimal. Positive values constitute the measure of BPO to indicate the level of optimality. However, for a more useful measurement, equation (5) divided by 12 shall give the measure of BPO as a percentage (or proportion as $0 \leq \text{BPO} \leq 1$) as:

$$0 \leq \text{BPO} \leq 100\% \quad (7)$$

4. Description

4.1. Method to quantify BPO. The three random variable components of BPO are exhaustive. They can be measured individually because each one of them is a complete business feature. Hence, by counting the attributes of the various variables, BPO has a total of 21 units from the sum of 12+4+5 individual mutually exclusive attributes. The three main variables contribute unequally to the measurement of BPO. Also, each of the three variables may fail to occur (=0) or may occur (=1) in a business. BPE can measure from zero (0) if all the component variables give 0, and up to 12 if they are all present (at 1 each). In BPO, therefore, BPE can contribute from 0 to 12 units. Since BPE can be measured as an independent variable, the extent of each attribute can be assessed. RM has four attributes. Hence, it can contribute from 0 to 4 units. Lastly, SFCM has five attributes. Thus, the units that SFCM can contribute from 0 to 5 units.

4.2. Relative importance to BPO. BPO success often implies that business processes are optimized through change (Hammon, 2007). Then, the value 21 is fantasized. This also, therefore, implies that each of BPE, RM and SCFM has been fully achieved. Due to the unequal numbers of attributes that each variable contributes to BPO, the component variables of BPO differ in levels of worth in their contribution to BPO. In the 21 BPO units, BPE has value of 12, RM has value 4 and SFCM has value 5. Thus, for full BPO, BPE has relative worth of about 0.57 (12/21), RM has about 0.19 (4/21) and SCFM has about 0.24 (5/21). Thus, the contribution to full BPO of BPE, RM and SCFM are about 57%, 19% and 24%, respectively.

Discussion and conclusion

Provision. The paper assumed a business which is ideally containing all the attributes of a business. For BPO, the three components variables were assumed. However, the possibility of a larger business for an additional component is not ruled out. Further, the component variables of the new component variable must not overlap with the ones of other methods. In the case where all overlap, then, it means that the new variable is redundant. In case of mutually exclusiveness, a new BPO total should be calculated. The contributions of individual components should also be revised. In case of smaller contexts, removal of excessive components should be made suitably and new measures should be calculated. Similar procedures as in this paper can be used.

Discussion. The paper developed an adaptable technique to numerically measure the degree of BPO achievement in business optimization exercise. Since the components can be studied or assessed separately, the developed method can also indicate the achieved and the outstanding BPO elements. In practice, it will be possible to determine the amount of effort needed to invest in the business in order to accomplish the remaining gaps towards optimization.

Conclusion. The procedure to measure BPO is straightforward and should be maintained, especially with its advantages of knowing how much has been achieved and how far there is still a lack. Regarding the developed regression model for BPO, at this stage, this shows to be an acceptable model.

Recommendations. The study recommends that the measures should be used flexibly and contextually. At the theoretical level, a generalized model should be developed with appropriate statistical tests.

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