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OPERATIONS RESEARCH AND DECISION SUPPORT INVOLVING ELECTRICITY DISTRIBUTION SYSTEMS

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ABSTRACT

The objective of this paper Is to bring out over the Mozambican power utility the impact of implementing a resilient model based on proposed key performance vectors for decision making support on electricity supply.

The reason why the assessment is carried out, it has been related to methodological issues to support the energy decision makers, such as the power companies sector and the power regulator authority in Mozambique. And, with a straight instrument that demonstrates how effective the model is, to be implemented for measuring the efficiency of 14-branches. Decision Making Units (DMUs) are available in the only one power utility company in Mozambique, which geographically are separated along the country with liability in electricity supply and technically designated as DMUs.

The study of this subject is precisely supported by the subject matter of implementation of a resilient model based on proposed key performance indicators for decision making support measures in the Mozambican electricity utility. The present study is developed in a specific substance to convey a resilient model by the fact that it has based on selected key performance indicators in such a way that first, would empirically be implemented within the present article in the efficiency measurement of the DMUs and second, to empirically express the improvement of electricity distribution by Mozambican power utility. The article contains information regarding efficiency measurement analysis to the sector of electricity distribution in Mozambican as well as measurement of productivity change within 14 DMUs. A comparative study is initially conducted before the specific methodological objectives of the main matters of the article, so that it could guide the mechanisms of selective key performance vectors to be applied in the efficiency assessment in developing countries (DGCs) such as Mozambique. The article uses the Data Envelopment Analysis (DEA), which is a nonparametric method of operational research approach to explore the technical key performance vectors for modelling the electricity distribution through efficiency measurement and on the other side it should measure the productivity change over 14 DMUs.

Moreover, the aimed design model has in each hand (the left and right) three proposed key performance vectors used in the modelling process, table 1. In order to conduct the assessment, the platform of efficiency measurement system (EMS) was adopted through DEA with input oriented to constant returns to scale (CRS) so that the performance of each DMU should be met during the term 2012 up to 2015. Within the context of the present appraisal, the productivity changes is empirically evaluated through Malmquist Index (MI) by applying data of term 2013 and 2014 while running EMS and following its respective technical frontier.

The empirical result of the study demonstrates that, the ID 5 has repeatedly along the term offered best performance among all efficient DMUs, this is justified by the higher reliability

being used as a reference by inefficient ones. It means, in this context of analysis, ID5 as a peer has been regularly referred over the term 23 times than other IDs and for that reason it has been considered being an efficient steady. Thus, ID11 has been referred 10 times as benchmark after ID5, followed by IDs 8 and 10 both referred 7 times as it can be seen in the tables IV and V. Different position has been given to the ID14, despite being efficient 3 times, it does not exactly avail to be benchmarks for inefficient DMUs as peer since it has only been referred once along the whole term.

The analysis of productivity change of the firm during the term 2013/14 according to the results displayed in the table VII shows that, the utility has an overall change next to the line index improvement and this is supported by the performance of MI due to the high level of DMUs with values greater than one. The particular MI values of IDs 2, 7 and 10 are greater than one (MI>1), meaning that for the reference term in analysis, the productivity for these DMUs has improved. And IDs 5, 11, 12 and 14 possess the MI greater than one (MI>1) with the implication that the productivity has grown at least due to the improvement of the technological sub-index while its efficiency kept unchanged due to the forwarding weight measures linked to the respective frontiers. Eventually, it has been found out that the DMUs with IDs 3 and 4, possess lower values of MI than one (MI<1), explicitly this means that the productivity in the current state has declined only due to the deterioration of the efficiency sub-index.

The outcome got from the study allows to state that, the applied model can reconcile the way how the power utility companies could improve the provision of electricity in Mozambique, by looking into the constraints within the target stage that should be attenuated. Among the key performance vectors applied in the analysis, "energy losses" and "energy delivered" as well as "network length" and "total customers" are described as a reference to highlight the aftermath of the study. On the other hand, the key performance vectors "network length" and "total customers" over "target stage", present a great possibility to improve both vectors while operating at the conditions of the suggested model.

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