

The management efficiency analysis framework for global defense company

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Abstract. Analyzing and evaluating the management efficiency is important issue for management innovation. The accurate management efficiency analysis has been important. Hence, this research suggests an analysis framework of management efficiency for global defense companies. Most previous researches used DEA to analyze management efficiency. However, DEA have some problems for analyzing management efficiency. The research framework is proposed based on DEA-AR and ANP for solving shortcomings of DEA. We can acquire more accurate analysis results using the proposed framework.

Keywords: ANP, DEA, DEA-AR, Management Efficiency

1 Introduction

The importance of defense industry has been increased for national security and strategic synergy with other industries. The improvement of management efficiency is important issue in companies including Defense companies. Generally, DEA(Data Envelopment Analysis) has been utilized for analysis of management efficiency. However, there are some problems for using it. The accuracy of assessment is reduced by excessive measurement and weights assignment, etc.[1, 2, 3]. So, various research have utilized DEA-AR model for solving them and improving the accuracy of results but the research about global defense companies is a relatively insufficient research field. Hence, this paper aims to propose a framework for analyzing efficiency of them. Additionally, based on the proposed framework, we did a case study to show the feasibility of it.

The proposed framework consists of extracting variables, relative importance using ANP (Analytic Network Process) and assessment of relative efficiency based on DEA-AR model to analyze the accurate efficiency results. DEA-AR model is to assign the Assurance Region about the weight range of input and output variables in DEA [1].

This research is organized as follows. In section 2, we review previous researches related with analysis of efficiency using DEA. In section 3, we propose a framework for analyzing efficiency of global defense companies. The research finishes with concluding remarks in Section 4.

2 Literature Review

The analysis of efficiency using DEA had been done mainly for public area such as governments but it has also been utilized for private area such as manufacturers recently [4]. In other words, the utilization of DEA has been broaden due to the strengths of it, providing the measurement information about inefficient Decision Making Unit (DMU)[5].

There are various researches using DEA in military area such as military hospitals, units and defense companies due to the strengths of it. However, the research related with the advanced DEA for solving the weakness of DEA or applying another tool is a relatively insufficient research field. So, this paper aims to propose the analysis framework for analyzing the defense company accurately based on DEA-AR and ANP.

Thompson et. al.(1990) proposed the DEA-AR model using Assurance Region that indicate the accurate and discreet analysis results than DEA model which has shortcomings such as indiscreet analysis because of the over-measurement and unreasonable weights. The weight ratio of other variables' weights based on specific variable's weight is used to determine all variables weights in DEA-AR[7]. Using the DEA-AR model, the superior analysis results to the existing DEA model are extracted due to the change of the frontier of DMUs by assigning weights[8].

There is formula for setting the weights of input and output variables.

$$L_{1,i} \leq \frac{v_i}{v_1} \leq U_{1,i}, i = 2,3,\dots,m$$

$$L_{1,r} \leq \frac{u_r}{u_1} \leq U_{1,r}, r = 2,3,\dots,n$$

$$L_{1,i} : \min\left(\frac{\text{input variable } i}{\text{input variable } 1}\right) \quad U_{1,i} : \max\left(\frac{\text{input variable } i}{\text{input variable } 1}\right)$$

$$L_{1,r} : \min\left(\frac{\text{output variable } r}{\text{output variable } 1}\right) \quad U_{1,r} : \max\left(\frac{\text{output variable } r}{\text{output variable } 1}\right)$$

AHP(Analytic Hierarchy Process) is often used for calculating the relative weights but this research uses ANP considering dependency among variables.

3 Framework

The framework which can be used to derive the efficiency of global defense companies is shown in [Fig. 1].

Variables (Input and Output) taking into account the multidimensional aspect of defense industry can be developed based on the procedure of phase 1. The purpose of this phase is to extract variables and relationship among them. The cause and effect

relationship among variables is analyzed based on the results of interviews and studies.

The second phase in this framework is to derive how much each variable affects efficiency based on ANP. The purpose of this phase is to decide the weighted relative importance of variables using cause and effect relationships and ANP. This phase consists of three phases; constructing a hierarchical and dependence model (network model), extracting the limit matrix and estimating the weights.

Once this process has been completed, the next phase is constructing DEA-AR model. Based on the relative weighted importance and the data of variables, the next phase is to calculate the efficiency of global defense companies. The efficiency of them can be analyzed into TE (Technology Efficiency), PTE (Pure Technology Efficiency) and SE (Scale Efficiency). In the future, they can be utilized for extracting the improvement strategies about management efficiency.

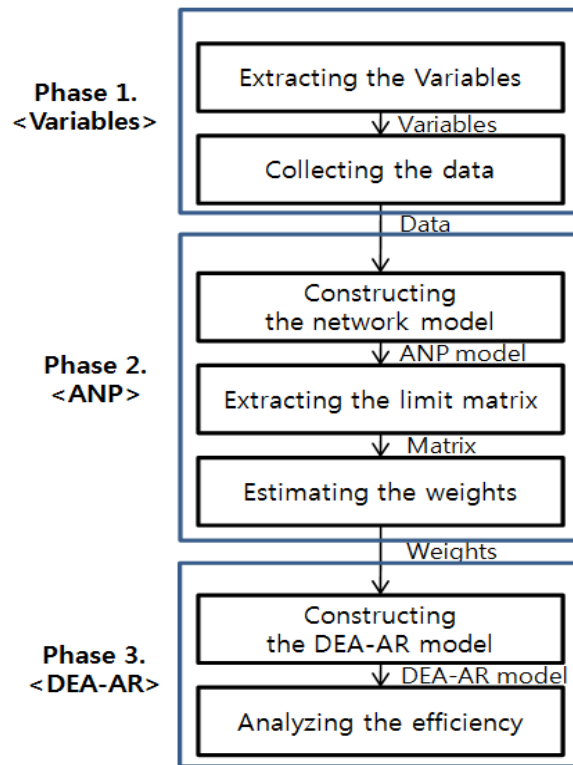


Fig. 1. Framework

4 Conclusion

The importance of defense industry has been increased for national security and synergy effects with other industries. The improvement of management efficiency is important issue in companies including Defense companies. Generally, DEA has been utilized for analysis of management efficiency. However, there are problems for using it. The accuracy of assessment is reduced by excessive measurement and weights assignment, etc. Various research have utilized DEA-AR model for solving it and improving the accuracy of results but the research about global defense companies is a relatively insufficient research field. Hence, this paper aims to propose a framework for analyzing efficiency of them utilizing DEA-AR model and ANP.

The proposed framework consists of extracting variables, relative importance using ANP (Analytic Network Process) and assessment of relative efficiency based on DEA-AR model to analyze the accurate efficiency results.

However, the case study will be needed to show the feasibility of the proposed framework. We can provide the strategies for global defense companies with case study.

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