Industrial Sectors Eligibility for Rehabilitation Programs: An Integrated AHP – TODIM Approach

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ABSTRACT

The study reports the findings of a project carried out to rank the industrial sectors in terms of their eligibility for rehabilitation programs using multi-criteria decision making methods. First, criteria, sub-criteria, and alternatives (industrial sectors) were identified using literature review and experts' interviews. The alternatives identified include construction, chemical, wood, plastic, food and textile industries. The Analytical Hierarchy Process (AHP) and the Tomada de Decisão Interativa e Multi-critério (TODIM) method were used to produce the ranking. The AHP was used to produce a ranking and as an input to the TODIM method. Results showed that food and construction are the most important sectors that should be rehabilitated followed by metal and wood sectors whereas chemical sector came last in the ranking. The two methods resulted in two rankings with slight differences. The findings were shown to industrial experts who agreed that results were consistent, realistic and logical. They agreed on the importance of the findings and recommended that the methodology be used in future rehabilitation programs.

Keywords: *Analytical Hierarchy Process (AHP), Industrial, Multiple Criteria Analysis, Rehabilitation Programs, Tomada De Decisão Interativa E Multi-Critério (TODIM)*

INTRODUCTION

The industrial sectors are one of the most important productive sectors due to their vital role in economic development along with their ability to contribute to the growth of economic, political, and social fields. It is noted that the contribution of the industrial sectors to the Palestinian Gross Domestic Product (GDP) increased from 8% during the Israeli occupation period from 1967-1994 to 17.4% after the establishment of the Palestinian National

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Authority (PNA). After the start of the political unrest in 2000, the industrial contribution slipped to 13% and remained unchanged till 2007 (Palestinian Central Bureau of Statistics).

The December 2008/January 2009 military operation on Gaza Strip resulted in damaging approximately one third of Gaza private industrial sector establishments, (around 324 industrial establishments). The Palestinian National Authority (PNA) has pledged to assist those damaged establishments with support from the European Union (EU) program that will lead to the reactivation of those establishments (PalTrade and PFI, 2010)

Compensation programs such as the European Union's GPSR (Gaza Private Sector Revitalization) and those sponsored by the Islamic Development Bank (IDB) were very helpful. However, the industrial sectors in Gaza strip still need other compensation programs to restore their former operating conditions. In the previous compensation and rehabilitation programs, attention focused on individual establishments regardless of the industrial sector they are affiliated with. The eligibility ranking was conducted according to certain criteria applied to individual establishments rather than sectors. This was one of the motives behind conducting this study.

Multi Criteria Decision Analysis (MCDA) provides a description of any structured approach to determine the overall preferences among alternatives which accomplishes several objectives. MCDA is more suitable in situations where it is difficult to optimize all criteria simultaneously; those criteria maybe conflicting, quantitative as well as qualitative (Belton and Stewart, 2002). MCDM has been used for the past decades in strategic decisions ranging from services to production with vital applications such as customer relationship management (Akbari et al., 2013) in service sectors and supplier selection and order allocation (Sodenkamp & Suhl, 2012) in production sectors to name a few.

It is known that industrial sectors do not have the same degree of importance for the society in Gaza Strip. Some industrial sectors are more vital than others. Some sectors are labor intensive, thus decreasing unemployment rates; others have less contribution in this matter. The main objective of this study is to rank the industrial sectors using multiple criteria to allocate more funds in future rehabilitation projects to the high ranking ones. For this purpose, the study uses two Multi Criteria Decision making methods, namely the Analytical Hierarchy Process (AHP), and TODIM. For more details on allocating budget to sub entities with several concerns, the reader is referred to Bagloee and Reddick (2011).

AHP decomposes a complex decision problem into a hierarchical structure according to the decision-making environment. Additionally, AHP is capable of handling qualitative and quantitative criteria during the complex decision-making process of all alternatives.

Since it was first proposed, AHP has been extensively used in many applications. These applications involve selection problems as in (Lai et al., 2002; Shang et al., 1995; Archer et al., 2002), evaluation(Wang et al., 2007; Weiwu et al., 1994; Chin et al., 1998; Agha, 2008), allocation and planning problems(Andijani, 1998; Kwak et al., 1998; Ramanthan et al., 1995; Jenab et al., 2012), and forecasting problems(Ulengin et al., 1994; Korpela et al., 1997). These applications span a variety of areas ranging from production, manufacturing, healthcare and other services.

TODIM which is a Portuguese acronym of Tomada de Decisão Interativa e Multi-critério – Interactive and Multi-criteria Decision Making is a method used in the multi criteria analysis applications based on the prospect theory which means that, underlying the method, there is a psychological theory (Gomes and Lima, 1992a,b). The use of TODIM relies on a global multi-attribute value function. This function is built in parts, with their mathematical descriptions reproducing the gain/loss function of Prospect Theory. The global multi-attribute value function of TODIM then aggregates all measures of gains and losses over all criteria (Tversky, 1969).

The TODIM method makes use of pair comparisons between the decision criteria,