Chapter 4
Identification of Technology Assessment Indicators:
In SMEs of Renewable Energy Sector

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ABSTRACT

This chapter aims to describe technology assessment (TA) indicators in Iranian small and medium-sized enterprises operating in the renewable energy sector based on the available literature and expert viewpoints. For this purpose, data were collected from 234 participants by simple random sampling method. This study also determines the difference in viewpoints of technology manufacturers and technology suppliers in case of TA factors and sub-factors, sustainability, and technological capability and attractiveness. Data is analyzed through Cronbach's alpha, confirmatory factor analysis, descriptive methods, and non-parametric two independent sample tests. The results are comprehensive TA indicators that comply with the conditions under study that can be applied to the rational and structured analysis of potential and existing technologies and provide decision makers with information on technology strategy planning.

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INTRODUCTION

There are extremely diverse opinions on what technology assessment (T.A.) is or what it should be (Van Eijndhoven, 1997). TA aims to provide a framework based on which potential and existing technologies can be the rationally and structurally analyzed (Glasser, 1988). It emerged in the 1970s as a comprehensive form of policy research to assess short- and long-term social outcomes (for example, social, economic, ethical, and legal consequences) of the application of technology (Banta, 1992). The goal in this process is to gather data on the current and future state of technology development, to evaluate the prominence of each technology in the competitive arena, and to assess the strength of the organization in each technology (Vlok, 2003). This will provide decision makers with information on different policy options such as allocation of research and development (Banta & Behney, 1981).

TA calls for an examination of potential side-effects and risks involved in innovative developments, to recognize benefits of new technologies at early stages of the development, and to explore strategies that can help an organization make an optimal use of potential chances (Fleischer & Grunwald, 2008). TA can be studied at organizational, division or industry, and national levels. One of the most appropriate methods that can be used in all three levels is the method of critical technologies based on feasibility and attractiveness factors (Ebrahimi et al., 2013; Klusacek, 2011; Jafari & Sahafzadeh, 2010; Ghazinoory et al., 2009). According to Ghazinoory et al. (2009), a number of factors are involved in determining the attractiveness of the technology such as potential socio-economic advantages, scientific value, and technological opportunities. Besides, feasibility is determined based on research and technology potentials, and the societal ability to effectively utilize the new technology.

Furthermore, a part of literature presented sustainability assessment of technologies which comprises economic, environmental, technological, and social-political aspects. For instance, it has been applied to biomass hydrogen technologies (Ren et al., 2013), for housing construction technologies (Wallbaum et al., 2012), for management of bioenergy systems (Scott et al., 2012), for TA of renewable energy (Musango et al., 2012), and for renewable energy technology (Luong et al., 2012).

Technologies can be assessed by using different indicators. Thus, the methods of multi–attribute decision making (MADM) seem to be a suitable choice for comparing energy technologies. For example, MADM approaches are applied for assessing energy technologies (Oberschmidt et al., 2010), for oil and gas pipeline planning (Tavana et al., 2013), for assessment of solar photovoltaic technologies (Jamil Sheikh, 2013), and for analysis of alternative biogas technologies (Raoa et