Utilizing SWOT Analysis for the Energy Research: A Methodological Overview

Ridoan Karim [1,] *, Firdaus Muhammad-Sukki [2], Mohd Nabil Muhtazaruddin [3], and Jorge Alfredo Ardila-Rey [4]

[1] Monash University Malaysia, Malaysia
[2] Edinburgh Napier University, United Kingdom
[3] Universiti Teknologi Malaysia, Malaysia
[4] Universidad Técnica Federico Santa María, Chile

* ridoan.karim@monash.edu

Abstract. This paper is an attempt to guide the future researchers who want to utilize the SWOT as a method to understand a particular energy industry of a country. This study is the pioneer in the domain of SWOT analysis in the energy research, as it strategizes options which a researcher may count to understand the overall scenario of a particular energy industry. The main focus of the research is on the scientific assessment of SWOT analysis and this research is a methodological guide that would be extremely beneficial for researchers who wish to conduct research on specific energy industries to understand the entire situation.

1. Introduction

The SWOT analysis is a well-known analytical tool that assesses and strategizes a business/project/industry's internal strengths and vulnerabilities and presents prospects and potential risks posed by external influences. SWOT analysis has always been used as a beneficial method for researchers, administrators and investors to strategize decision-making routinely, and it is dynamic enough to be used at a particular industry of a country level. The findings of a SWOT analysis assist firms in building on their assets, exploring new markets, and working to minimize or eliminate any emerging competitive threats. [1].

The acronym “SWOT” stands for strengths, weaknesses, opportunities and threats. Strengths and weaknesses mainly associated with internal characteristics and describe an industry's competitive situation. Opportunities and threats represent external aspects of the industry/organization — factors that are positive or negative to the management strategy. This analytical tool is widely recognized by energy researchers to consider the overall and important scenario of a country's energy sector. For instance, Ishola et al. [2] used SWOT analysis to test Nigeria's nuclear exploration agenda. Kamran et al. [3] utilized SWOT study to examine Pakistan's renewable energy (RE) market. Furthermore, an in-depth analysis was carried out using the SWOT theoretical approach in light of the potential applications of renewable energy technologies in the East Asian economies of South Korea, Japan and Taiwan [4]. SWOT analysis has also been used to measure solar photovoltaic (PV) capacity in Africa and China [5]. Another researcher used SWOT tests to evaluate Macedonia's national energy market [6]. A SWOT analysis was conducted to help investors in the Tunisian real estate market

understand the major issues and factors that will help the sector develop [7]. A SWOT study was recently conducted to better explain the policymaking of nuclear energy production in Ghana [8].

Hence, this paper is an attempt to revere the advantages and disadvantages of SWOT analyses for energy research to guide the future researchers who want to utilize the SWOT as a method to understand a particular energy industry of a country. This article is mainly concerned with the empirical appraisal of SWOT analysis. It will be a highly useful methodical guidance for scholars who wish to study a certain energy market by utilizing a SWOT analytical tool to comprehend the whole scenario.

2. Energy Research & SWOT Analysis - Advantages and Disadvantages

This methodological approach has many advantages: it seems to be inexpensive, and it can be used by anyone who understands the specific field in question. It also reflects on critical variables that could have an effect on the efficient operation of an industry or organization. It can also be useful for generating proposals, but it is not very useful for understanding in-depth specific problems [9]. A SWOT (strengths, weaknesses, opportunities and threats) assessment will enable you to recognise and consider key problems impacting a country's energy market, rather than always offering the solutions. It has certain limitations as well in addition to the benefits, and as a researcher we must understand the limitations of utilizing the SWOT analysis as a method for conducting energy research. Realizing what you would realistically expect to do will enable a SWOT review even valuable to your study.

The SWOT approach is a technique for organizing strategy discussions on the table. Consequently, an issue or cycle approached utilizing the SWOT method can be considered different stages of development of ideas. The strategy formulation, in general, involves several phases or stages. SWOT review can generally be regarded as a brainstorming session, which merely serves as a reusable instrument for gathering information about a certain topic or problem. If a company/industry decides whether a brainstorming session is necessary to discuss a growth strategy or a comparative review on each instance, and if they consider the SWOT process as a technique to promote such session, then SWOT can be particularly found effective. Similarly, to understand a country's overall energy scenario, a SWOT can present the brainstorming for the researchers to confront the prospects and challenges associated with such an industry itself.

Just like implementations in any business, a SWOT analysis in the energy research can be used to evaluate a particular energy sector. Furthermore, SWOT analysis is useful in analyzing a specific energy process, the commodity demand, or the application of a specific technology in the energy industry.

Another advantage of SWOT analysis is that it can process a vast amount of information in a simple and understandable way. Every energy researcher encounters troubles working with so much data and to analyze them accordingly. Thus, whether there is a chance to simplify things, taking advantage of it should be a good option. A SWOT analysis aids in the retrieval of vast volumes of data, so that the observers of the study will be able to understand the general situation while spending more time on highly crystalline problems. The approach will assist both the researcher and the reader in identifying risks and opportunities at the state, global, and international levels. Anything is dependent on how much surface the researcher wishes to explore. It is much easier to move forward or develop new plans, particularly in the energy sector, if knowledge is well coordinated. Hence, this analysis hold serious importance as a methodological tool not only for research endeavors, but also to strategize practical implementations.

This analytical tool has a good number of disadvantages as well. Study of SWOT results in four separate lists of strengths, weaknesses, opportunities and threats. But the method does not have a function in either list to classify the importance of one element over another. Consequently, the true effect of one aspect on the overall industry is difficult to assess.

SWOT analysis construct a single-dimensional framework, which classifies the ability, vulnerability, potential or hazard of each issue in detailed manner. As a consequence, factors can overlap between strength or weakness or between opportunities and threats. For example, increasing energy demand can be both considered as opportunity and a threat from the government perspectives.

Hence, the researcher attempting to utilize SWOT analysis for a specific energy industry, must understands the overall strengths and weaknesses of this analytical tool. Table 1 provides a clear picture on the advantages and disadvantages of SWOT analysis:

Table 1: Advantages and Disadvantages of SWOT Analysis for Energy Research

Advantages	Disadvantages
Consolidate strengths	May tend to persuade researchers to compile lists rather than think about what is actually important in achieving objectives to develop a particular energy industry.
Identify Weaknesses	Presents lists uncritically and without clear prioritization so that, for example, weak opportunities may appear to balance strong threats.
Facilitates Planning & Alternative Choices	Usually a simple list and not critically presented.

A specific energy field study must be focused on accurate, applicable, and comparative data to affect energy science considerably. Therefore, the compilation and review of SWOT data mean that a subjective method represents the partiality of those who gather the data and carry out the study. Furthermore, the data entry for the SWOT study can be easily obsolete. When you do a SWOT report, please remember that it may give you a biased picture of the overall situation as it is qualitative. For complicated issues, more in-depth study and analysis are normally essential to take decisions rather than just utilizing SWOT. Please note that a SWOT review includes categorizes problems in only four dimensions relating to the importance of the topic. Because of this reality, many important factors outside of the strength, weakness, opportunities and challenges can be missed out.

3. Practical and Managerial Implications of SWOT in the Energy Industry

For determinants of foreign direct investment in the energy market, the SWOT analysis may be very useful. FDI is the term often used to indicate overseas investments in the national economy. FDIs are nonetheless distinct from investments in portfolios, in which an investor mere purchases shares of foreign firms. A foreign direct investment (FDI) in the energy industry is the investment by the foreign company's in a country's specific energy industry with commercial interests. Furthermore, SWOT studies will offer a thorough perspective at both corporate and state levels. This is very useful in understanding a specific energy industry law in current and future local and FDI companies.

This research provides guidance on how to use SWOT for the delivery plan of the project in a certain energy sector. Success is crucial, as a perfect approach can help to prevent the underlying challenges and to work in advance on the vulnerabilities, a thorough explaining of the strengths, weakness, opportunities and risks of the energy sector will therefore summarize the crucial factors to help policymakers understand the overall business scenario. Therefore, SWOT approaches would support the FDI company in the energy sector to make the best decision. We believe, if anyone wants to utilize SWOT analysis as a method to understand the energy industry, they may follow the illustration showed in Figure 1.

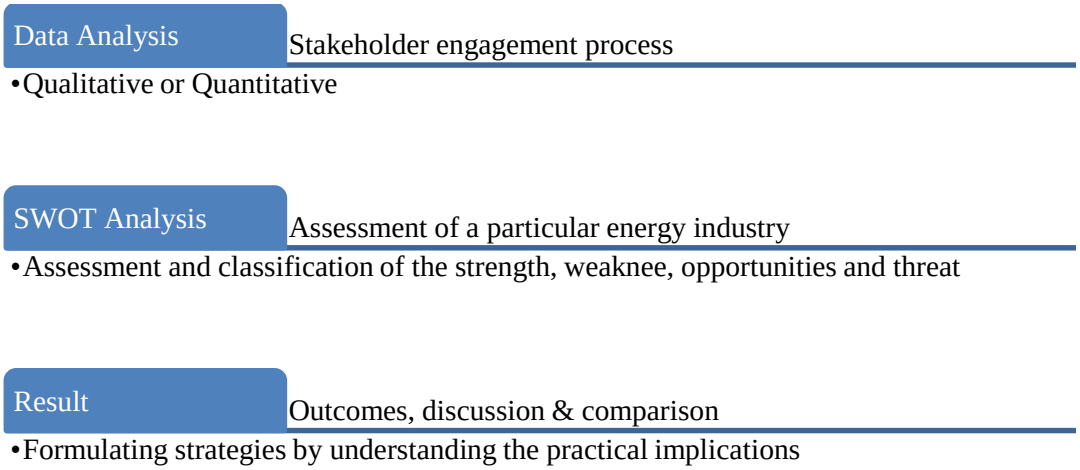

Figure 1. Method to utilize SWOT Analysis.

First, a researcher must collect the relevant data for analysis, either using quantitative or qualitative methods or both as a mixed method. Then, the researcher must review the internal strengths of a particular energy industry by looking at what different stakeholder's controls/influences. It is important to identify such a sector's competitive advantages in a given scenario, e.g. government policies helping the industry to flourish. A very good example can be renewable energy, where most of the government support such industry with numerous tax exemption or with feed-in-tariffs. Then, the researcher must evaluate the potential resources of that particular energy sector. Suppose if the researcher is conducting a SWOT analysis on the natural gas power plant industries, he must identify whether the country holds particular resources to support it sustainably. Other strengths, such as geographical locations, political stability, government's willingness to promote, overall economy etc. might be the factors that the researcher should concentrate on.

Afterwards, the researcher needs to concentrate on listing down the weaknesses of particular energy industry experiences internally that negatively affect or limit the success of such an industry. Weaknesses may consist of a lack of effective policy or ineffective human resources that needs improvement. Concentration must be given to the resources that the industry lacks, such as profit repatriation controls, or lack of natural resource, or geographically disadvantageous position, or limited access to local finance.

Subsequently, the researcher must outline the external opportunities and factors that are related to it. For example, whether the technology of the mentioned energy industry is developing rapidly or not, or whether the price of energy technology decreases. Increasing energy demand can also be a potential external opportunity that a researcher might find out. Research trends related to that particular energy industry should also be reviewed in understanding the factors pertaining to external opportunities. Last but not least, the researcher must focus on the external threats as well. Discontinuity of energy policies or bureaucratic management might be the factors that the researcher must focus on and analyze.

Finally, the researchers will be able to develop tactics from strength and vulnerability, along with challenges and risks to improve the opportunities with current strengths and address the vulnerability with the resources. Any FDI business aiming to invest in a specific energy sector will develop a stronger strategy if they at least analyze these SWOT variables with the actual field data. Researchers can also understand the overall scenario of a country's energy industry by implementing SWOT analysis.

4. Conclusions

An energy research can benefit with a SWOT analysis to identifying nearly everything that a person may want to know about a particular energy industry. It helps the investors, policymakers and the government to determine the appropriate strategies to flourish the industry. Nevertheless, a SWOT analysis has certain limitations as well and a researcher must understand about it. This study concentrates

mainly on the scientific evaluation of SWOT analysis, which will be extremely useful for the research methodological guide that wishes to gain knowledge into a certain energy market in order to understand the whole scenario.

5. References

[1] Phadermrod B, Crowder R M and Wills G B 2019 Importance-Performance Analysis based SWOT analysis *Int. J. Inf. Manage.* **44** 194–203

[2] Ishola F A, Olatunji O O, Ayo O O, Akinlabi S A, Adedeji P A and Inegbenebor A O 2019 Sustainable nuclear energy exploration in Nigeria - A SWOT analysis *Procedia Manufacturing* vol 35 (Elsevier B.V.) pp 1165–71

[3] Kamran M, Fazal M R and Mudassar M 2020 Towards empowerment of the renewable energy sector in Pakistan for sustainable energy evolution: SWOT analysis *Renew. Energy* **146** 543–58

[4] Chen W M, Kim H and Yamaguchi H 2014 Renewable energy in eastern Asia: Renewable energy policy review and comparative SWOT analysis for promoting renewable energy in Japan, South Korea, and Taiwan *Energy Policy* **74** 319–29

[5] Lei Y, Lu X, Shi M, Wang L, Lv H, Chen S, Hu C, Yu Q and da Silveira S D H 2019 SWOT analysis for the development of photovoltaic solar power in Africa in comparison with China *Environ. Impact Assess. Rev.* **77** 122–7

[6] Markovska N, Taseska V and Pop-Jordanov J 2009 SWOT analyses of the national energy sector for sustainable energy development *Energy* **34** 752–6

[7] Hamami S, Aloui H, Chaker N and Neji R 2015 SWOT Analysis: Tunisian Energy System *2015 6th International Renewable Energy Congress (IREC 2015)* (Sousse, Tunisia: Institute of Electrical and Electronics Engineers Inc.) pp 317:1-6

[8] Agyekum E B, Ansah M N S and Afornu K B 2020 Nuclear energy for sustainable development: SWOT analysis on Ghana's nuclear agenda *Energy Reports* **6** 107–15

[9] Queensland Government 2020 Benefits and limitations of SWOT analysis *Bus. Queensl.*

Acknowledgement

This research was supported by Ministry of Education (MOE) through Fundamental Research Grant Scheme (FRGS/1/2020/TK0/UTM/02/110).