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COUNTRY MARKET SELECTION
IN INTERNATIONAL EXPANSION USING MULTICRITERIA
DECISION AIDING METHODS

Abstract

Companies, facing globalization and technological revolution, are constantly forced to search for new ways to grow and develop. A profitable growth strategy can be built through international expansion. Recently it has become one of the few effective ways to develop and enhance the competitiveness of a company in response to the changing dynamics of the global economy.

When a company is expanding its business operations to overseas markets a number of strategic decisions must be taken. The company must define the product it wants to market (what), the country market it wants to enter (where), the timing of entry (when) and the entry mode it wants to use (how). Consequently, the country market selection plays a critical role in shaping the performance of foreign activities and influences the future success of the company. This is a complex and difficult decision, requiring the company to analyse a wide spectrum of factors that affect both investment efficiency and effectiveness. The location selection in international expansion may be determined by general macroeconomic factors, demand factors, socio-political factors or cost factors.

The purpose of this paper is to conduct a simulation of the market selection decision with the help of multi-criteria decision aiding methods based on the perspective of a dynamically developing company that is a leading manufacturer and distributor of hygiene, cosmetic and medical products.

Keywords: International market selection (IMS), preliminary screening, MCDA methods, EXPROM II with veto threshold.

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1   Introduction

These days business is conducted in an increasingly globalized environment characterized by fewer barriers, growing competition and greater opportunities for international expansion.

Before expanding abroad a company must take various strategic decisions. One of them is the choice of international markets worth entering. The identification of promising foreign target markets is a vital issue for the future success of the enterprise as errors committed at this stage can be very costly.

A wide range of factors need to be considered by a firm choosing new markets, including economic, political and cultural elements. Hence, this issue is a multi-criteria decision-making problem and it can be solved with the help of MCDA methods.

The aim of this paper is to apply multi-criteria decision aiding methods to the problem of market selection. This paper will illustrate the usefulness of these methods with a real-life example of a leading manufacturer and distributor of hygiene, cosmetic and medical products in its quest for new markets. The scope of the paper is limited to a preliminary screening analysis based on external factors represented by a set of macro-level indicators. The internal factors relating to the firm, its resources, international experience, applied competitive and functional strategies are beyond the scope of this analysis.

This article consists of an introduction, a conclusion and five sections. In the first section the market selection process in international expansion is described. In the second section the first stage of the assessment of foreign markets, namely preliminary screening, is presented in more depth. The third and the fourth sections, in turn, include the description of the case study and the solutions obtained as a result of applying the MCDA methods. Finally, in the fifth section the results of the sensitivity and robustness analysis are shown.

2   The market selection process in international expansion

Starting business operations in overseas markets is a complex and complicated process. It requires decisions about many related but distinct issues. The consequences of these decisions may have a significant influence on the success and performance of a firm.

First, the company must clearly articulate the reasons why it wants to be involved in international business. Objectives and goals of international expansions are an essential prerequisite for the entire international market entry strategy. Second, a firm must define the product or products it wants to deliver to a foreign market. At this point it is essential to determine the distinctive features of the product in terms of price, quality and other characteristics and verify whether they are still unique in non-domestic markets. Managers also have to consider the global product life cycle as well as the scope and costs of adapting products to foreign markets (Root, 1994). Third, a company must

identify the target market or markets in which it wants to offer its product. This is known as international market selection (IMS). More detailed information about this stage will be presented in the following section of the paper. Subsequently, a firm must choose the entry mode it wants to use. This is referred to in the literature as the entry mode decision. At this stage a firm is choosing between non-equity entry modes such as exporting, licensing, franchising, management contracts, turnkey contracts or subcontracting, and equity-based entry modes which result in establishing a company in the host country that is either partly or wholly owned. Finally, a company must also determine the timing of entry. All five decisions are elements of an international market entry strategy – a comprehensive plan that is to contribute to the entry of a firm's products, resources and capabilities into a foreign country. The issue of international entry strategy has been widely addressed in the literature; however, most studies usually focus on the analysis of the strategy elements individually.

In the literature, several approaches to the international market entry strategy have been identified (Root, 1994; Kotler, 2005; Stonehouse et al., 2001). Root recommends a model consisting of five elements: (1) the choice of a target product/market, (2) the objective and goals in the country, (3) the choice of entry mode, (4) the marketing plan, and (5) the control system. There is a logical sequence involving the above-mentioned elements, however the model does not exclude feedback loops that make the strategy a continuing and open-ended process in a short-time horizon (Root, 1994). Kotler also views the international market entry strategy as a process composed of five stages, but he defines some stages slightly differently. His proposed framework covers the following stages: (1) the decision about international market expansion, (2) market selection, (3) selection of entry mode, (4) the marketing plan, and (5) the marketing organization (Kotler, 2005). Stonehouse's model suggests four stages involving: (1) the decision about international market expansion, (2) the overview of the international environment in search of opportunities and threats, (3) market selection, and (4) selection of entry mode (Stonehouse et al., 2001). While analyzing international market entry strategy, it should be emphasized that each individual decision is central to successful overseas expansion. The models that have been presented confirm the complexity of the process and illustrate the broad decision-making set related to overseas expansion.

The selection of foreign markets is one of the most critical decisions in international market entry strategy. According to the models presented above a company identifies the target market in which it wants to launch its product before it selects the entry mode. A firm must choose its target market from a wide range of national markets. The national markets often differ markedly in terms of market size, income, level of development, language, culture, religion, political and economic stability, social aspects and many other important dimensions. The diversity and complexity of market opportunities is huge, hence

the market selection is a complicated process that should be well thought through.

In the literature, several market selection models have been proposed (Root, 1994; Koch, 2001; Kumar et al., 1994; Cavusgil, 1985). They attempt to formalize the decision-making process. IMS is usually seen as a sequential process where each stage is aimed at progressively eliminating the less attractive markets in order to arrive at the selection of the prospective target market at the end of the process. The systematic approach to IMS is crucial in the context of a decision that involves assimilating a huge amount of information from many diverse and complex markets.

Most of the models illustrating international market selection view the process of assessing overseas markets as composed of three stages such as preliminary screening (or screening), in-depth screening (or identification) and final selection (or selection) (Koch, 2001; Kumar et al., 1994; Root, 1994; Cavusgil, 1985). Preliminary screening identifies the prospective target markets for subsequent in-depth analysis. At this stage, companies use set of macro-level indicators to eliminate countries that do not meet their objectives. More detailed information about preliminary screening is provided in the next section of this paper. During the identification stage, the attractiveness of the industry is evaluated. A firm gathers industry-specific information such as market size and growth, level of competition, entry barriers and market segments in order to create a short-list of high-market-potential countries. During the final selection stage, the company focuses on firm-specific information. It analyses profitability, assessing forecasts of revenues and cost, compatibility with the existing portfolio taking into consideration company objectives and goals, resources and strategies (in fact, all stages should bear in mind company objectives and goals, resource constraints and the adopted expansion strategy). The final selection should highlight the country market which best matches company objectives.

The nature of the market selection process (related to analyzing the large number and diversity of foreign markets) means that the existing literature is fairly consistent in describing the desirable features of market selection models. IMS models should be flexible, comprehensive and cost-effective (Papadopoulos and Martín Martín, 2011).

There are two basic approaches to the selection of international markets: expansive and contractible (Root, 1994; Schroeder, 2007; Albaum and Duerr, 2008). In the expansive approach the company favours new markets that have the least psychic distance from those in which it operates. The selection of markets is based on similarities among markets in terms of their political, economic and social nature. The contractible approach takes as its starting point a global perspective including all national markets. It involves a systematic screening of all country markets in order to eliminate the less attractive ones and

focus in greater depth on those which are more promising (Albaum and Duerr, 2008).

3   Preliminary screening of country markets

As mentioned earlier, preliminary screening is the first stage in international market selection models, making it a critical success factor for the entire selection process. It helps to identify prospective target markets that warrant further investigation (Root, 1994). According to Root, this approach tries to minimize two possible errors. First, it reduces the chance of ignoring countries that offer good prospects for a company's generic product by applying a preliminary screening process to all countries. Second, it minimizes the risk of spending too much time investigating countries that are poor prospects by focusing on low cost and widely available quantitative data and a relatively quick and simple screening technique to eliminate a large number of unattractive countries from the subsequent in-depth analysis. In addition, Root emphasizes that this preliminary screening should identify promising target countries without regard to entry mode. However, these two decisions are closely related and should not be discussed separately. Some scholars suggest even that they should be a part of one decision process (Koch, 2001).

Root also suggests that companies identifying potential markets should begin the selection process with the total set of available countries. Cooper and Kleinschmidt state that companies which adopt this approach realize more rapid export growth than those which limit their choice to a few alternatives (Cooper and Kleinschmidt, 1985). These conclusions are not obvious for all companies. There are companies that still tend to select the target market without systematic analysis. It occurs particularly among smaller firms (Papadopoulos et al., 2002). They tend to start their international expansion by entering neighbouring countries in response to unsolicited orders. This behaviour is consistent with the internationalization theory based on stage models. According to the Uppsala model, internationalization is a sequential and successive process (Johanson and Wiedersheim-Paul, 1975; Johanson and Vahlne, 1977). The firm tends to gradually increase its involvement in foreign operations, starting from geographically and culturally close markets. It is only later (with greater knowledge and experience) that firms tend to enter markets characterized by successively greater psychic distance, in most cases greater geographical distance. According to the Uppsala model the market selection process is mainly based on psychic distance, which dictates where a firm will market its product. There is no need for a systematic approach that would allow a firm to analyze the total set of available countries. The general reasons for selecting potential markets without applying a preliminary screening process to all countries include the limited experience of managers in export research, difficulties in collecting data and the lack of a proven effective approach which would include

in its framework the huge diversity and complexity of current markets (Papadopoulos and Denis, 1988).

An effective preliminary screening process can only be implemented if it is possible to identify potential markets by comparing and evaluating country characteristics (Russow and Okoroafo, 1996). The criteria for the country evaluation must be defined before the screening process starts. It is an essential element of the screening stage because in fact it has a direct impact on the screening results. There is no agreement among scholars on which criteria should be used and how they should be measured. The lists of suggested criteria that are available in the literature are based on the respective author's perception of what criteria would be most suitable in a given situation (Russow and Okoroafo, 1996). They are directly related to the objectives and goals of a firm's international expansion and vary from one form of entry to another. They depend on what exactly a firm wants to achieve with its involvement in international business. The criteria applied will vary according to whether a company is driven by market seeking, resource seeking, efficiency seeking or strategic assets seeking motives (Dunnig, 1993)[1]. The criteria suggested will also differ depending on whether a company has chosen export activities or the investment route. However, as mentioned earlier, Root emphasizes that we should screen markets without regard for entry mode.

A literature review of screening criteria indicates that market size and the level of economic development were the most frequently suggested criteria by both international business theory (Vernon, 1966; Dunning, 1988; Porter, 2001) and the marketing literature (Samli, 1977; Root, 1994; Douglas et al., 1982; Gaston-Breton and Martín Martín, 2011, Sheng and Mullen, 2011; Cavusgil, 1997; Natarajarathinam and Nepal, 2012; Sakarya et al., 2007; Whitelock and Jobber, 2004). In addition, international business theory frequently emphasizes the importance of endowment factors (factors of production) as determinants of potential opportunities (Vernon, 1966; Dunning, 1988; Porter, 2001). However, the number of applied criteria supporting the assessment process is significantly wider. Some studies use other and more detailed criteria such as: market growth rate (Cavusgil, 1997; Natarajarathinam and Nepal, 2012; Kumar et al., 1994), market intensity, commercial/physical infrastructure, economic freedom, market receptivity (Cavusgil, 1997; Sheng and Mullen, 2011), country risk (Natarajarathinam and Nepal, 2012;), political stability (Whitelock and Jobber, 2004), geographic distance (Sheng and Mullen, 2011; Whitelock and Jobber, 2004), cultural distance (Sakarya et al., 2007; Sheng and Mullen, 2011; Whitelock and Jobber, 2004), language differences (Sheng and Mullen, 2011;

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[1] The motives presented are directly related to equity-based modes (foreign direct investment), however, assuming that equity-based modes are the most advanced forms of entry modes, the group of motives should also include motives related to simpler non-equity modes.

Whitelock and Jobber, 2004), religious differences (Sheng and Mullen, 2011) or government attitude to FDI and trade barriers (Whitelock and Jobber, 2004).

To keep preliminary screening process low-cost, simple and flexible, most models use a macro approach, focusing on general country factors (Cavusgil, 1997; Cavusgil et al., 2004; Sheng and Mullen, 2011; Samli, 1977; Papadopoulos et al., 2002). However, there are some models that contain industry- or product-specific approaches (Douglas et al., 1982; Root, 1994; Whitelock and Jobber, 2004; Sakarya et al., 2007; Kumar et al., 1994). Root suggests using direct estimates of market size for the candidate product by projecting actual sales data or by projecting the apparent consumption or imports of the product. Sakarya et al. recommends competitive strength of the specific industry in the potential market and customer receptiveness to the products of the foreign industry and its country of origin. Whitelock and Jobber include stable competitive environment in their formalized statistical analysis to select the appropriate foreign market.

While the criteria are identified, there are another two issues to discuss. The first issue relates to the indicators used to measure the applied criteria. Again, theory offers a large array of indicators that help to measure the screening criteria used for selecting the most appropriate foreign market. As in the case of the screening criteria, the author's perception is a key influence in defining the list of indicators used in a market assessment. It seems that there is a need for a standardized variable set that could make the process less subjective in some aspects (Papadopoulos et al., 2002).

The second critical issue that surfaces during the evaluation process is the question of weighting the different criteria. There is no agreement on how to assign weights to the criteria to reflect their relative importance (Russow and Okoroafo, 1996; Papadopoulos et al., 2002). Some studies recommend an approach that weighs all criteria equally; others state that some criteria may be more important than others. Cavusgil suggests the application of a Delphi process involving international business professionals and educators in order to determine the relative importance of each criterion (Cavusgil, 1997). However, there is no general description of how to assign weights to the criteria.

The international marketing literature contributes two main approaches to identifying target markets: clustering and ranking. Both methods are recommended for evaluating and selecting potential markets during an initial country screening process. Cluster methods group countries on the basis of similarities along commercial, economic, political and cultural dimensions. The similarities are aimed at helping managers compare countries and identifying potential synergies among markets (Cavusgil et al., 2004). The approach assumes that firms prefer to enter countries from the same cluster in which they have been operating successfully. They can use already accumulated knowledge and experience from similar markets and apply this to other markets in the same cluster (Johanson and Vahlne, 1990). The second group of methods ranks

countries by order of preference. Markets are evaluated according to one or more criteria (Sakarya et al., 2007). The ones with the highest score should be chosen for further analysis. The approach might give managers an aggregate measure of market attractiveness that might be customized by them according to their own preferences and priorities by assigning weights to dimensions or by adding new dimensions (Cavusgil et al., 2004). Both methods have been recognized as important tools for analyzing a large number of countries with heterogeneous markets, however, both should only be used at the preliminary market assessment stage.

4   Methodology

The present study illustrates the application of multi-criteria decision aiding methods in the preliminary market assessment process. It is based on the example of one of the leading manufacturers and suppliers of sanitary articles, cosmetics and medical devices to the global market. This is an enterprise with 100% Polish capital, composed of 49 companies including 19 manufacturing companies (in Poland, Russia, Ukraine and India), 24 trading companies (in 14 European countries, India and USA) and 6 service (medical and IT technology) companies (in Poland and Russia). It employs over 7.4 thousand people and sells its products in more than 70 countries worldwide (they are available in Europe, Asia, Africa, America and Australia). Thanks to the firm's own Research and Development Centre, which cooperates closely with scientific institutions, its products are manufactured using the most recent technologies. This helps the company to compete successfully in the highly competitive markets in which it operates[2].

A concise history of the firm, emphasizing especially its foreign operations, is presented in the Table 1.

The present simulation of an initial country selection refers to a project already carried out by the company during the period from 2002 to 2005, namely the investment made in India. Consequently, our study involves the verification of a choice made in the past.

It is assumed that the main reason why the company wanted to go abroad was to access new markets. In addition we suppose that the company was willing to run its operations in the foreign market using an equity-based mode as it had already had a relatively high level of experience of operating subsidiaries abroad.

Table 1

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[2]   Information   about   the   company   comes   from   its   website: http://www.tzmoglobal.com/en_GLO (9 March 2013).

Company's history in brief

Years	Event
1950s	The company is established as a state-owned enterprise. Dressing material is produced for the Ministry of National Defence and the Central Mining Office Supply. Production is set to shut down after completing the order but thanks to the high quality of work further orders appear. The company begins conquering foreign markets: products are sold in **European, African and Asian countries**.
1990s	The company is privatised – a joint-stock company is created by individuals (Polish citizens): the employees of the company and representatives of the academic and medical environment. Since the end of the 1990s the company is entitled to mark its products with the European CE safety mark.
2000s	In the early 2000s the company opens a hospital in Poland which – since 2007 –has been serving as a modern polyclinic. Since the beginning of 2000s it has also been providing a sterilization service for hospitals. Production of hygiene products in the newly built plants in the East market starts – in 2003 in **Russia** and in the first quarter of 2004 in **Ukraine**. In 2002 the company establishes a joint-venture company with its Indian partner. A new factory in **India** begins manufacturing hygiene and medical products in 2005. At the end of 2000s it gains the CE mark for medical production. In 2004 the company builds a modern logistic centre in Poland (it serves as a central distribution warehouse). The following year a training, marketing and logistics centre is opened in **Germany**. Another logistics centre is founded in 2007 in **Romania**. In 2008 new business units are established in Poland (e.g. a films and laminates production plant and a clean room for medical production). At the end of 2000s the company starts business activity in North America – it establishes its headquarters in the **United States**.

Source: http://www.tzmo-global.com/en_GLO/companyHistory (9 March 2013).

After considering the various alternatives we have selected 20 countries as the target market set in order to illustrate the model. The pre-selection was necessary to reduce the number of countries for the application of the multi-criteria decision aiding method. The applied criteria were operationalized through a 'total population' indicator. We selected only countries with total population over 50 million for the analysis. However, Germany and Russia were removed from the list, because the company was already operating in these two markets. Furthermore, the Democratic Republic of Congo was eliminated from the list because of the Second Congo War (known as the Great War of Africa) lasting from August 1998 until its official end in July 2003.

Measurement data was collected from three publicly available secondary data sources: The World Bank, The Hofstede Centre and The Heritage Foundation.

As the project which is subject to analysis was completed during the period 2002-2005, we used data from year 2001 for the calculation.

Variables were identified through the literature review and based on information about the company. We selected 15 economic, cultural, social and political variables to assess the markets' attractiveness. The market's attractiveness is measured through the ten fundamental dimensions that are represented by the selected 15 variables. Table 2 shows the 15 variables used to reflect the ten dimensions of the model, along with a description and the corresponding measurement units.

Table 2

Market potential assessment factors (dimensions, measures, units and descriptions)

Dimension	Measures (units)	Indicator Description
Market Size (ability to sell products)	Total population (number of inhabitants)	The total population
	Urban population (number of inhabitants)	People living in urban areas as defined by national statistical offices
Market growth (ability to sell products in the future)	GDP growth rate (annual %)	Annual percentage growth rate at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources
Economic Development (low productivity of the local companies)	Electric power consumption (kWh per capita)	The production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants
Quality of life (ability to sell luxury products to fulfil basic needs)	Life expectancy at birth (years)	The number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life
	Improved sanitation facilities (% of population with access)	The percentage of the population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta
Infrastructure (ability to	Road density (km of road per	Ratio of the length of the country's total road network to the country's land area in

Dimension	Measures (units)	Indicator Description
organize production and distribution of products)	100 sq. km of land area)	2003 or 2004 (Thailand – in 2006). The road network includes all roads in the country: motorways, highways, main or national roads, secondary or regional roads, and other urban and rural roads.
	Internet users (per 100 people)	People with access to the worldwide network.
Market Intensity (ability to satisfy unfulfilled needs)	GDP per capita (GDP per capita constant 2000;US$)	Gross domestic product divided by midyear population.
Market receptivity (ability to export and import products/materials and semi-products)	Trade (% of GDP)	The sum of exports and imports of goods and services measured as a share of gross domestic product.
Cultural Distance (differences in culture preventing the flow of information from and to the market)	Cultural distance (index)	Based on four cultural dimensions (power distance, individualism/collectivism, masculinity/femininity and uncertainty avoidance; long-term/short-term orientation was not included because for a few countries data was not available). Index calculated as Euclidean distance from Poland in accordance with the formula used by Morosini et al. (1998)
Factors of production (access to resources which are not available at home or have higher quality and/or lower cost)	Cotton production (in thousand bales)	Production of cotton; the base years 2003/2004
	Labour force (number of persons)	People ages 15 and older who meet the International Labor Organization definition of the economically active population: all people who supply labour for the production of goods and services during a specified period
Investment Climate (ease of doing business)	Foreign direct investment net inflows (% of GDP)	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. Data show net inflows (new investment inflows less

Dimension	Measures (units)	Indicator Description
		disinvestment) in the reporting economy from foreign investors, and is divided by GDP
	Economic freedom (index)	Overall score (property rights, freedom from corruption, fiscal freedom, government spending, business freedom, labour freedom, monetary freedom, trade freedom, investment freedom, financial freedom)

Source: World Bank, The Hofstede Centre, The Heritage Foundation

To rank countries from the best to the worst from the point of view of international expansion the EXPROM II method (Diakoulaki and Koumoutsos, 1991) with veto threshold has been applied. It is based on the notion of ideal and anti-ideal solutions and enables the decision-maker to rank alternatives on a cardinal scale. Thanks to the introduction of the veto threshold (see Appendix) the technique is partly compensatory (a really bad score on one criterion cannot be compensated with a good score on another).

We decided to employ this method because it is considered to be a user-friendly one – all steps can be quite easily explained to the decision-maker as they are neither very complex nor mathematically challenging. Moreover, this technique allows us to obtain a complete pre-order of the alternatives to which the points are assigned in the final solution. This form of the final solution is recognized as being convincing for the potential users of MCDA methods.

To check the impact of changes in the weights of evaluation criteria on the final rankings of countries we have established five different vectors of weighting coefficients. The first two vectors were determined arbitrarily by the present authors, the third one was created with the help of Hinkle's method, which is also called the 'resistance to change' grid (Hinkle, 1965; Rogers and Bruen, 1998), and the fourth one used the AHP method (Saaty, 2006; Saaty and Vargas, 1991). In the last approach all measures were assumed to be equally important. The authors also established the values of indifference (q), preference (p) and veto (v) thresholds. The model of preferences for the decision-making problem is presented in the Table 3.

5   Results

Table 4 provides a summary of the results obtained by applying the EXPROM II technique with veto threshold using 5 different vectors of weighting coefficients.

Table 3

Model of preferences

Measure	Max/min	Vectors of weighting coefficients					q	p	v
		I	II	III	IV	V			
Total population	max	0,089	0,100	0,120	0,136	0,067	10 ml	100 ml	500 ml
Urban population	max	0,089	0,100	0,120	0,136	0,067	5 ml	50 ml	300 ml
GDP growth rate	max	0,107	0,133	0,120	0,113	0,067	0,5	1	10
Electric power consumption	min	0,071	0,067	0,060	0,04	0,067	100	1000	10000
Life expectancy	max	0,036	0,033	0,010	0,02	0,067	3	10	25
Sanitation facilities	max	0,036	0,033	0,010	0,02	0,067	5	10	25
Road density	max	0,036	0,033	0,010	0,02	0,067	5	50	200
Internet users	max	0,036	0,033	0,010	0,02	0,067	5	10	40
GDP per capita	min	0,071	0,067	0,060	0,04	0,067	500	5000	30000
Trade	max	0,107	0,067	0,120	0,113	0,067	5	15	50
Cultural distance	min	0,107	0,100	0,120	0,113	0,067	5	10	40
Labour force	max	0,054	0,067	0,060	0,057	0,067	5 ml	20 ml	100 ml
Cotton production	max	0,054	0,067	0,060	0,057	0,067	10	100	20000
FDI net inflows	max	0,054	0,050	0,060	0,057	0,067	0,5	3	10
Economic freedom	max	0,054	0,050	0,060	0,057	0,067	5	10	40

The rankings presented in Table 4 show the sensitivity of the solutions to the changes in the vectors of weights as the modifications of the parameter values led to alterations in countries' rankings.

The different rankings of the countries obtained are not in agreement. However, in spite of that it is possible to determine the set of countries which are the best, taking into account their attractiveness as the target of international expansion for the company considered (China and Thailand), the set of countries which are quite good as the values of net flows determined for them are in all cases positive (Brazil, France, India, Italy, Mexico, Philippines, the United States and Vietnam) and the set of countries which are the worst (Bangladesh, Ethiopia, Indonesia, Iran, Nigeria, Pakistan and Turkey). Egypt, Japan and the United Kingdom may be regarded as controversial since in some cases the

values of net flows determined for them are positive and in some cases – negative.

Table 4

Rankings of the countries obtained using EXPROM II method
with veto threshold and 5 different vectors of weights

No.	EXPROM II with veto threshold					No.
	Vector no. 1	Vector no. 2	Vector no. 3	Vector no. 4	Vector no. 5	
1	China	China	China	China	Thailand	1
2	Thailand	Thailand	Thailand	Thailand	China	2
3	Brazil	Brazil	Brazil	Brazil	Italy	3
4	Italy	Italy	Mexico	Mexico	Brazil	4
5	France	France	Italy	Italy	France	5
6	Mexico	India	France	India	Mexico	6
7	Philippines	Mexico	India	France	Vietnam	7
8	Vietnam	Vietnam	Vietnam	Vietnam	Philippines	8
9	India	Philippines	Philippines	Philippines	India	9
10	United States	United States	United States	United States	United States	10
11	Japan	Egypt, Arab Rep.	Japan	Japan	Japan	11
12	Egypt, Arab Rep.	Japan	Egypt, Arab Rep.	Egypt, Arab Rep.	United Kingdom	12
13	United Kingdom	United Kingdom	Indonesia	Indonesia	Egypt, Arab Rep.	13
14	Indonesia	Iran, Islamic Rep.	United Kingdom	United Kingdom	Turkey	14
15	Iran, Islamic Rep.	Indonesia	Iran, Islamic Rep.	Iran, Islamic Rep.	Iran, Islamic Rep.	15
16	Turkey	Bangladesh	Turkey	Turkey	Indonesia	16
17	Bangladesh	Turkey	Nigeria	Nigeria	Bangladesh	17
18	Nigeria	Nigeria	Bangladesh	Bangladesh	Nigeria	18
19	Ethiopia	Pakistan	Ethiopia	Pakistan	Pakistan	19
20	Pakistan	Ethiopia	Pakistan	Ethiopia	Ethiopia	20

To sum up, taking into account all the results we have obtained, the following countries are recommended for further analysis (in-depth screening and final selection) – excluding China and Thailand: Brazil, France, India, Italy, Mexico, Philippines, the United States and Vietnam.

6

7   Sensitivity and robustness analysis

In the first step of the analysis the ranges of variations of indifference and preference thresholds, which do not result in modification of the rankings obtained with the help of the EXPROM II method with veto threshold applying the second and the fifth vector of weighting coefficients, were determined using optimization tools integrated with Excel. The analysis was carried out separately for each of the thresholds provided that they satisfy the following condition: $0 \leq q_k \leq p_k \leq v_k$. The results are displayed in Tables 5 and 6. They indicate that the rankings obtained are not very sensitive to variations of the values of the thresholds.

Table 5

Ranges of variations of the indifference and preference thresholds values
in the case of EXPROM II method with veto threshold applying
the second vector of weighting coefficients

Measure	q min*	q original	q max**	p min*	p original	p max**
Total population	0	10 ml	24,46 ml	91,48 ml	100 ml	113,21 ml
Urban population	0	5 ml	8,05 ml	42,08 ml	50 ml	53,28 ml
GDP growth rate	0	0,5	1	0,87	1	1,49
Electric power consumption	0	100	381,94	100	1000	2048,70
Life expectancy	0,33	3	9,20	3,63	10	14,20
Sanitation facilities	0	5	10	7,22	10	12,34
Road density	0	5	11,50	43,74	50	67,24
Internet users	1,47	5	10	6,87	10	18,29
GDP per capita	0	500	1691,50	2734,65	5000	6370,28
Trade	0	5	15	7,59	15	16,24
Cultural distance	0	5	9,51	7,50	10	13,50
Labour force	0	5 ml	7,90 ml	5 ml	20 ml	26,16 ml
Cotton production	0	10	100	10	100	382,69
FDI net inflows	0	0,5	1,86	2,28	3	3,75
Economic freedom	0	5	8,79	5	10	13,13

     * Values are rounded up to the nearest hundredth.
    ** Values are rounded down to the nearest hundredth.

To check the impact of the method applied on the final rankings of the countries we have employed two other outranking techniques, namely the PROMETHEE II method with veto threshold (Górecka and Pietrzak, 2012) and the modified ELECTRE III method (Górecka, 2009). The results obtained with the help of them are presented in Tables 7 and 8. In both cases five aforementioned vectors of weighting coefficients have been applied to show the influence of changes in the weights of evaluation criteria on the final rankings of countries examined.

Table 6

Ranges of variations of the indifference and preference thresholds values
in the case of EXPROM II method with veto threshold applying equal weights

(the fifth vector of weighting coefficients)

Measure	q min	q original	q max	p min*	p original	p max**
Total population	0	10 ml	100 ml	95,88 ml	100 ml	500 ml
Urban population	0	5 ml	50 ml	47,46 ml	50 ml	300 ml
GDP growth rate	0	0,5	1	0,88	1	1,61
Electric power consumption	0	100	1000	100	1000	2474,98
Life expectancy	0	3	10	6,35	10	10,39
Sanitation facilities	0	5	10	9,33	10	12,47
Road density	0	5	50	33,53	50	52,76
Internet users	0	5	10	5	10	25,96
GDP per capita	0	500	5000	4466,96	5000	7885,30
Trade	0	5	15	14,47	15	17,26
Cultural distance	0	5	10	5	10	10,51
Labour force	0	5 ml	20 ml	19,68 ml	20 ml	38,00 ml
Cotton production	0	10	100	10	100	116,57
FDI net inflows	0	0,5	3	1,40	3	3,04
Economic freedom	0	5	10	5	10	10,39

*Values are rounded up to the nearest hundredth.
**Values are rounded down to the nearest hundredth.

Once again, it can be easily noticed that the rankings obtained do not differ much from each other. Hence, it is possible to determine the set of countries which are the best, taking into account their attractiveness as the target of international expansion for the considered company (China and Thailand in the case of the PROMETHEE II method with veto threshold; Brazil, China and Mexico in the case of the modified ELECTRE III method), the set of countries which are quite good (Brazil, France, India, Italy, Mexico, Philippines, the United States and Vietnam in the case of the PROMETHEE II method with veto threshold[3]; France, India, Indonesia, Italy, the United States, Thailand and Vietnam in the case of the modified ELECTRE III method[4]) and the set of countries which are the worst (Bangladesh, Ethiopia, Indonesia, Iran, Nigeria, Pakistan and Turkey in the case of the PROMETHEE II method with veto

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[3] The values of net flows determined for them are in all cases positive.

[4] The differences between the number of countries outranked by them and the number of countries that outranks them are in all cases non-negative.

threshold[5]; Bangladesh, Egypt, Ethiopia, Iran, Pakistan and Turkey in the case of the modified ELECTRE III method[6]).

Table 7

Rankings of the countries obtained using PROMETHEE II method
with veto threshold and 5 different vectors of weights

No.	PROMETHEE II with veto threshold					No.
	Vector no. 1	Vector no. 2	Vector no. 3	Vector no. 4	Vector no. 5	
1	Thailand	China	Thailand	China	Thailand	1
2	China	Thailand	China	Thailand	China	2
3	Brazil	Brazil	Brazil	Brazil	Italy	3
4	Italy	Italy	Mexico	Mexico	Brazil	4
5	France	France	France	Italy	France	5
6	Mexico	Mexico	Italy	France	Mexico	6
7	Philippines	India	India	India	Vietnam	7
8	Vietnam	Vietnam	Philippines	Vietnam	Philippines	8
9	India	Philippines	Vietnam	Philippines	India	9
10	United States	United States	United States	United States	United States	10
11	Japan	Egypt, Arab Rep.	Japan	Japan	Japan	11
12	Egypt, Arab Rep.	Japan	Egypt, Arab Rep.	Egypt, Arab Rep.	United Kingdom	12
13	United Kingdom	Iran, Islamic Rep.	Indonesia	Indonesia	Egypt, Arab Rep.	13
14	Indonesia	United Kingdom	United Kingdom	United Kingdom	Turkey	14
15	Iran, Islamic Rep.	Indonesia	Iran, Islamic Rep.	Iran, Islamic Rep.	Indonesia	15
16	Turkey	Turkey	Turkey	Turkey	Iran, Islamic Rep.	16
17	Nigeria	Bangladesh	Nigeria	Nigeria	Bangladesh	17
18	Bangladesh	Nigeria	Bangladesh	Bangladesh	Nigeria	18
19	Ethiopia	Pakistan	Ethiopia	Pakistan	Pakistan	19
20	Pakistan	Ethiopia	Pakistan	Ethiopia	Ethiopia	20

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[5] The values of net flows determined for them are in all cases negative.

[6] The differences between the number of countries outranked by them and the number of countries that outranks them are in all cases negative.

Furthermore, it should be noted that rankings obtained with the help of three different MCDA techniques are similar. This observation can be confirmed by the Spearman rank correlation coefficients presented in Table 9. These coefficients, calculated separately for each of five vectors of weights considered, indicate the existence of strong correlation dependencies between the obtained orderings of the countries.

Table 8

Rankings of the countries obtained using
modified ELECTRE III method and 5 different vectors of weights

No.	Modified ELECTRE III					No.
	Vector no. 1	Vector no. 2	Vector no. 3	Vector no. 4	Vector no. 5	
1	Brazil	Brazil	Brazil	Brazil	Brazil	1
2	China	China	China	China	China	2
3	Mexico	Mexico	Mexico	Mexico	Mexico	3
4	India	India	India	India	Italy	4
5	Indonesia	Indonesia	United States	United States	Thailand	5
6	Vietnam	Vietnam	Vietnam	Indonesia	France	6
7	Thailand	France	Thailand	Vietnam	India	7
8	France	United States	France	France	Indonesia	8
9	Italy	Thailand	Indonesia	Thailand	United States	9
10	United States	United Kingdom	Nigeria	Italy	Japan	10
11	United Kingdom	Italy	Italy	Japan	Philippines	11
12	Japan	Japan	Japan	Philippines	Vietnam	12
13	Philippines	Philippines	Philippines	United Kingdom	United Kingdom	13
14	Nigeria	Egypt, Arab Rep.	United Kingdom	Nigeria	Bangladesh	14
15	Egypt, Arab Rep.	Iran, Islamic Rep.	Egypt, Arab Rep.	Egypt, Arab Rep.	Turkey	15
16	Iran, Islamic Rep.	Turkey	Iran, Islamic Rep.	Iran, Islamic Rep.	Egypt, Arab Rep.	16
17	Turkey	Bangladesh	Turkey	Turkey	Iran, Islamic Rep.	17
18	Bangladesh	Nigeria	Bangladesh	Bangladesh	Pakistan	18
19	Ethiopia	Ethiopia	Pakistan	Pakistan	Nigeria	19
20	Pakistan	Pakistan	Ethiopia	Ethiopia	Ethiopia	20

To sum up, the analysis performed has illustrated that the solutions obtained are quite robust to changes in the values of the parameters of the preference model. It has also shown that the rankings of the countries are not very sensitive to choice of the decision-aiding technique.

Taking into account all the results of the research conducted, the following countries are recommended for further analysis (in-depth screening and final selection): Brazil, China, France, India, Italy, Mexico, Thailand, the United States and Vietnam. The Philippines has been removed from this list as according to the results obtained with the help of the modified ELECTRE III method it does not belong either to the set of countries which are the best or to the set of countries which are quite good from the point of view of their attractiveness as the target of international expansion for the company [7] considered.

Table 9

Spearman rank correlation coefficients

Vector no. 1			
Method	EXPROM II	PROMETHEE II	Modified ELECTRE III
EXPROM II	1,0000	0,9970	0,8748
PROMETHEE II	0,9970	1,0000	0,8718
Modified ELECTRE III	0,8748	0,8718	1,0000
Vector no. 2			
Method	EXPROM II	PROMETHEE II	Modified ELECTRE III
EXPROM II	1,0000	0,9955	0,8195
PROMETHEE II	0,9955	1,0000	0,8150
Modified ELECTRE III	0,8195	0,8150	1,0000
Vector no. 3			
Method	EXPROM II	PROMETHEE II	Modified ELECTRE III
EXPROM II	1,0000	0,9955	0,8711
PROMETHEE II	0,9955	1,0000	0,8598
Modified ELECTRE III	0,8711	0,8598	1,0000
Vector no. 4			
Method	EXPROM II	PROMETHEE II	Modified ELECTRE III
EXPROM II	1,0000	0,9985	0,8699
PROMETHEE II	0,9985	1,0000	0,8662
Modified ELECTRE III	0,8699	0,8662	1,0000
Vector no. 5			
Method	EXPROM II	PROMETHEE II	Modified ELECTRE III
EXPROM II	1,0000	0,9985	0,8831
PROMETHEE II	0,9985	1,0000	0,8966
Modified ELECTRE III	0,8831	0,8966	1,0000

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[7] According to the solutions obtained using modified ELECTRE III method the Philippines belongs to the set of countries which are quite bad from the point of view of international expansion since the differences between the number of countries outranked by it and the number of countries that outranks it are in all cases non-positive.

8   Conclusions

In reality, the firm that formed the basis of our analysis of its international expansion has chosen India. It is not grossly at variance with the results we have obtained due to the fact that India is in the group of countries selected for further analysis. Within this group – as expected – emerging markets predominate as these countries are experiencing a brisk rate of economic growth and industrialization, leading to improved standards of living. They represent long-term market potential and sourcing opportunities because they offer access to young consumers with purchasing power as well as to cheaper resources. Unfortunately in the analysis conducted within the framework of this article the costs of resources were not taken into consideration as the necessary data were not available.

Additionally, it has to be emphasized that the outcomes of the analysis strongly depend on the dimensions and measures that are used in it. We do not know which criteria were applied at the time of conducting the original assessment in the company concerned. It is possible that India could have been ranked higher, had a different set of criteria been used.

Finally, it is worth mentioning that the MCDA methods based on the outranking relation (e.g. EXPROM II with veto threshold) can be used to solve the market selection problem for international expansion. In fact, applying these methods can enhance the evaluation process and improve decision-making since the assumptions on which they are based are in line with reality.

Appendix. Exprom method with veto threshold

EXPROM is a modification and extension of PROMETHEE method[8] that was proposed in Diakoulaki and Koumoutsos, 1991. It is based on the notion of ideal and anti-ideal solutions and enables the decision-maker to rank alternatives on a cardinal scale. Assuming that all criteria are to be maximized, the values of the ideal and anti-ideal solutions are defined as follows:

ideal alternative: $f_k(\mathrm{a}^*) = \max_{\mathrm{a}^i \in A} f_k(\mathrm{a}^i)$;

anti-ideal alternative: $f_k(\mathrm{a}_*) = \min_{\mathrm{a}^i \in A} f_k(\mathrm{a}^i)$ [9],

where $A = \{\mathrm{a}^1,...,\mathrm{a}^m\}$ is a finite set of m alternatives and $F = \{f_1, f_2,..., f_n\}$ is a set of n criteria examined.

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[8] The idea of PROMETHEE methodology is presented in Brans and Vincke, 1985 and description of PROMETHEE techniques can be found in Brans et al., 1986.

[9] The values can be also defined independently from the examined alternatives, representing – in the case of the ideal solution – some realistic goals and in the case of the anti-ideal solution – the situation that should be avoided.

After introducing the veto threshold to EXPROM method the procedure of ordering alternatives consists of the following steps:

1. Calculation of concordance indices for each pair of alternatives (a^i, a^j):

$$c(a^i, a^j) = \sum_{k=1}^{n} w_k \varphi_k(a^i, a^j),$$

where: $\sum_{k=1}^{n} w_k = 1$,

$$\varphi_k(a^i, a^j) = \begin{cases} 1, & \text{if } \ f_k(a^i) - f_k(a^j) > p_k, \\ \dfrac{f_k(a^i) - f_k(a^j) - q_k}{p_k - q_k}, & \text{if } \ q_k < f_k(a^i) - f_k(a^j) \le p_k, \\ 0 & \text{otherwise}, \end{cases}$$

w_k – coefficient of importance for criterion f_k,

$f_k(a^i)$ – evaluation of alternative a^i with respect to criterion f_k,

q_k – indifference threshold for criterion f_k,

p_k – preference threshold for criterion f_k.

2. Calculation of discordance indices for each pair of alternatives (a^i, a^j) and for each criterion:

$$d_k(a^i, a^j) = \begin{cases} 1, & \text{if } \ f_k(a^j) - f_k(a^i) > v_k, \\ \dfrac{f_k(a^j) - f_k(a^i) - p_k}{v_k - p_k}, & \text{if } \ p_k < f_k(a^j) - f_k(a^i) \le v_k, \\ 0 & \text{otherwise}, \end{cases}$$

where v_k – veto threshold for criterion f_k.

3. Calculation of credibility indices for each pair of alternatives (a^i, a^j):

$$\sigma(a^i, a^j) = c(a^i, a^j) \prod_{k \in D(a^i, a^j)} \frac{1 - d_k(a^i, a^j)}{1 - c(a^i, a^j)}$$

where: $D(a^i, a^j) = \{k : d_k(a^i, a^j) > c(a^i, a^j)\}$.

4. Determination of strict preference indices for each pair of alternatives (a^i, a^j):

$$\pi(a^i, a^j) = v(a^i, a^j) \cdot \sum_{k=1}^{n} w_k \pi_k(a^i, a^j) \quad ,$$

where:

$$v(a^i, a^j) = \begin{cases} 1, & gdy \quad \forall k : d_k(a^i, a^j) \le c(a^i, a^j), \\ 0, & gdy \quad \exists k : d_k(a^i, a^j) > c(a^i, a^j), \end{cases}$$

$$\pi_k(a^i, a^j) = \begin{cases} \dfrac{f_k(a^i) - f_k(a^j) - p_k}{f_k(a^*) - f_k(a_*) - p_k}, & if \quad \varphi_k(a^i, a^j) = 1, \\ 0 \; otherwise. \end{cases}$$

5.   Calculation of total preference index for each pair of alternatives (a^i, a^j):

$$\omega(a^i, a^j) = \min\left\{1; \ \sigma(a^i, a^j) + \pi(a^i, a^j)\right\}.$$

6.   Calculation of outgoing flow $\phi^+(a^i)$ and incoming flow $\phi^-(a^i)$ for each alternative:

$$\phi^+(a^i) = \sum_{j=1}^{m} \omega(a^i, a^j)$$

$$\phi^-(a^i) = \sum_{j=1}^{m} \omega(a^j, a^i) \quad .$$

In EXPROM I a final partial ranking is obtained as follows:

$$\begin{cases} a^i P a^j, & if \quad \begin{cases} \phi^+(a^i) > \phi^+(a^j) & i \quad \phi^-(a^i) < \phi^-(a^j) & or \\ \phi^+(a^i) = \phi^+(a^j) & i \quad \phi^-(a^i) < \phi^-(a^j) & or \\ \phi^+(a^i) > \phi^+(a^j) & i \quad \phi^-(a^i) = \phi^-(a^j); \end{cases} \\ a^i I a^j, & if \quad \phi^+(a^i) = \phi^+(a^j) \quad i \quad \phi^-(a^i) = \phi^-(a^j); \\ a^i R a^j, & if \quad \begin{cases} \phi^+(a^i) > \phi^+(a^j) & i \quad \phi^-(a^i) > \phi^-(a^j) & or \\ \phi^+(a^i) < \phi^+(a^j) & i \quad \phi^-(a^i) < \phi^-(a^j); \end{cases} \end{cases}$$

where P, I and R stand for preference, indifference and incomparability, respectively.

In EXPROM II a final complete ranking is constructed according to the descending order of the net flows $\phi(a^i)$, where $\phi(a^i) = \phi^+(a^i) - \phi^-(a^i)$.

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