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Value focused pharmaceutical strategy determination with multicriteria decision analysis techniques ☆

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ABSTRACT

The size of the pharmaceutical market and its contribution to the regional, national and international economic development is widely recognized. This fact indicates that supported and efficient decision making in the sector is a matter of paramount importance. This paper proposes a multicriteria assessment system to support top management of a real multinational pharmaceutical company over the investment on new pharmaceutical products. The evaluation criteria are extracted from three points of view, namely: (i) current market situation, (ii) development of the sector over the recent years, and (iii) comparison with other European countries. This research work results in the evaluation and ranking of 192 therapeutic categories for investment purposes in the Greek pharmaceutical market. The ranking of these categories is obtained through the application of an additive value model, which is assessed by the ordinal regression method UTASTAR. In the first phase, the decision makers are asked to rank a sample of these alternatives, inferring therefore implicitly a personal additive value system. In the second phase, all the alternatives are evaluated and a complete ranking is obtained. Finally, the robustness of the results is analysed and measured, given the imperfect determination of the model parameters. For this purpose, an extreme ranking analysis is implemented, calculating each alternative's best and worst possible position in the ranking.

1. Introduction and background

During the last years, the Greek economy is experiencing an economic crisis and recession in a scale unprecedented in the Eurozone. Even though the attempt to invest within an economic environment, with the aforementioned market characteristics, is highly risky, investments and investors will always emerge when opportunities are likely to appear. In such an economic turmoil, opportunities will certainly arise but the key element that will minimize risk, in terms of capital and of labor force loss, is diversification of the investment portfolio. In-depth analysis of the nature of the market, where the investments will take place, is also essential.

The Greek pharmaceutical market is a major pillar of the national economy, contributing greatly to the economic development of the country. Nevertheless, lately, it has suffered a considerable downsize, in terms of gross revenue and labour force reduction [1,30]. A recent review on the effects of the Greek economic crisis on the interrelated sector of health and healthcare has been published by [27].

Despite the latter, the pharmaceutical sector, which consists of the companies that manufacture or import drugs or non-pharmaceutical products, still constitutes a key player in the Greek industry. According to the [25], the expenditure on pharmaceutical products represents 2.5% of the national GDP from 2007 onwards. Furthermore, pharmaceutical products constituted 5% of the gross exports of the country and more than 6% of the gross imports in 2010 [1].

The contribution of the pharmaceutical sector in the domestic economy is not restricted to a commercial aspect, as it also affects the labour factors considerably. According to the data provided by the Division of Labour force of the Hellenic Statistics Agency in 2011, approximately 13,600 people were employed in pharmaceutical manufacturing, a number which renders the sector a main player in the overall labour market of the Greek economy [3].

The on-going downturn of pharmaceuticals since 2009 at a rate of approximately 12% (CAGR—Compound Average Growth Rate) per annum, with the situation being exacerbated during the last two years (see Fig. 1), should not be interpreted as an indicator that current market specific investment programmes should be halted. Within this environment, companies are required to build a balanced scorecard and carefully assess their investment targets.

Having entered the Big Data era that utilize multitudinous data sources, not only relating to sales transactions but also customers,

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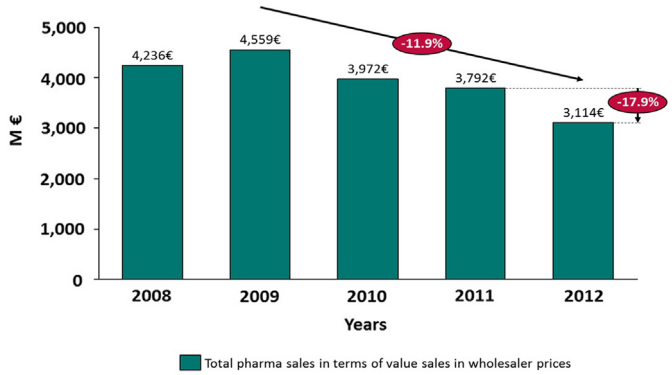

Fig. 1. Pharmaceutical sector—value sales evolution (Data *source*: IMS Hellas).

to extract non-trivial knowledge through all kind of available data is a great challenge. The greatest hurdle is not so much the analysis of data, by calculating formulae or the fabrication of various mathematical models, which react to market results, but the rapid and pro-active provision of insights to support top-management decisions.

This need is addressed in this paper, where quantitative techniques are used to provide the appropriate tools and methodologies to assist the managers of a pharmaceutical company in investing in new pharmaceutical products. This paper proposes an integrated multicriteria decision aid (MCDA) methodology to extract and imprint the preferences of the decision makers-managers of a pharmaceutical company. The study examines the involvement of two real experts in the pharmaceutical market taking the role of decision makers. In the end, a personalised ranking of the possible therapeutic categories for investment emerges, from which the company selects from the top ranked ones in order to form its investment portfolio. Furthermore, the solidity of the parameters of the preference model is analysed, to check for deviations over the results, providing the top management with an additional valuable index, prior to forming a final investment decision. The measurement of the robustness of the results is of high importance, since the alternatives to be evaluated are numerous, and the interference between the evaluation criteria is very complex and sensitive, which cannot be unambiguously determined by the DMs.

In the case of a pharmaceutical company, there is a plethora of major decisions that top management is obliged to take. Depending on the significance, impact, risk and the unstructured nature of the decision, the need to provide managers/DMs with the appropriate decision support tools becomes critical.

In this paper, the launch of a prototype drug in the Greek market by a real multinational pharmaceutical company, activated abroad, is analysed. Some of the drugs under examination have already been launched in other countries by the same firm, while others would be purchased from another company and then imported in the Greek market before getting launched. Past experience, stemming from the launch of a specific drug in another country, bears the benefit of eliminating the risk relating to the development phase of the product, and the hazards that this might involve (on–off patent and product phasing papers), when launching the product to a new market.

The structure of the paper is the following: Section 2 outlines the modelling of the problem and describes the evaluation criteria system. Section 3 presents the methodological frame for the construction of the multicriteria evaluation model and the robustness analysis of the results. Section 4 implements the preference model and presents the results, followed by the paper's Conclusion and direction for future work.

2. The strategic decision support framework

2.1. Problem statement

The importance of measurement and benchmarking pharmaceutical therapeutic categories is rooted in analysing and identifying the optimal field for investing in the Greek market, on disease level. The success or failure of a new launch is affected by many different parameters and criteria, which differentiate according to the investment strategy the company is to follow. For instance, some would opt to target large therapeutic categories with low pricing, relying on their organised production and brand recognition, in order to eliminate competition head-on. Others may prefer investing in smaller therapeutic categories, where competition is less dynamic and precise [11]. The continuous annual business plans of pharmaceutical companies, targeting the increment of their profitability and market share, reveal the need for making ad-hoc decisions that incorporate various factors.

In their first steps, companies had been trying to analyse trends, without acknowledging their needs, with simple next-day forecasting models, based on analogues and naïve estimations of market trends. This kind of analysis was out of scope, though. There were no similar situations worldwide and the financial situation in Greece was changing by the day. As a result many business plans failed and many companies did not react properly in this demanding environment. This was the point, when a new period of decision making was triggered, through the use and evaluation of a multitude of already collected data over the previous years.

Frameworks, based on transparent computational procedures and continuous monitoring of various KPIs (Key Performance Indicators), were established, transforming decision making into a very complex task. Initially, companies attempted to combine the information from heterogeneous sources. However, the complexity of the procedure revealed the necessity for the development of advanced mathematical models. The need for such mathematical models, within the pharmaceutical sector, forced top management to adopt methodologies and models from other sectors like banking, fast-moving consumer goods (FMCGs) and other highly volatile industries.

Multicriteria Decision Aid (MCDA) techniques are lately being used tentatively in the field. However, as expected this is not a one-size-fit-all methodology. Accordingly, analysis teams from companies and outsourcing consulting groups have been trying to integrate the existing methodologies into pharmaceutical business decision problems.

In the case of the decision support experience presented in this paper, a review of the alternative products, to invest in, is initially performed. Besides the scope, under which the decision makers set their preferences, the main purpose of this simulation is the assessment of therapeutic category alternatives [6] of level three (ATC-3s, see Fig. 2 for more details), through a number of evaluation criteria to be modelled in the following paragraph. Consequently, the preferences of the DMs can be prioritised on a scale of importance, in order to select the therapeutic category they will mostly be interested to invest in. The total number of ATC-3s, exhibiting non-zero retail sales in 2012, is 267. However, the categories, the total value sales of which did not exceed 500,000 in 2012, are sorted out and are therefore not included in the evaluation. In the end, 192 ATC-3s are selected to be evaluated and ranked through the preference model.

This study provides pharmaceutical top management the opportunity to rationalise and assess various criteria/objectives and incorporate their preferences into the final decision. It is based on a real decision problem, under realistic market parameters. In