Optimization of Portfolio Marketing Strategy Based on Data Science Technologies

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Abstract

The article contains the results of Data Science realization for pharmaceutical market. The main goals of research are modelling the sales of three key brands of one of the Ukrainian pharmaceutical companies based on regression analysis as a main method and to make conclusions for portfolio marketing strategy optimization and effective brand management. Estimation the influence of key elements of the marketing mix on brand's share of market make basis for ROI calculations and optimization of media budget allocation between brands in portfolio. The article contains recommendations for analytical system construction.

Keywords [1]

Marketing strategy, pharmaceutical industry, optimization, modeling, marketing mix, Data Science, regression

1. Introduction

The pharmaceutical market is one of the key sectors of Ukraine's economy that is able to meet the basic needs of consumers, especially in terms of COVID-19. Today, the Ukrainian pharmaceutical market is extremely competitive and more and more companies are looking for ways to find effective marketing strategy management to maximize market success. At the present stage, there is an urgent need for business entities to ensure consistency between market management practices, marketing activities and their effectiveness.

Under the influence of global trends, the conditions of the pharmaceutical business are changing and companies are faced with the need to implement new market strategies, methods of product range and pricing, media support, reassessment of principles and directions of economic development, radical changes in approaches to enterprise management, formation of a new system management based on marketing support [1].

Strategy is a general program of action that identifies the priorities of problems and resources to achieve the main goal (goals). The strategy forms the key goals and the main ways to achieve them in such a way that the company gets a single course of action. Development of strategy of the enterprise is carried out in conditions uncertainty. The external environment is characterized by the instability of the factors that force the organization to change. Marketing strategy is a system of enterprise action in which the internal environment is balanced with the external. The analysis of the criteria on the basis of which specific marketing decisions are made, showed that they are multifaceted, determined by a significant number of indicators. Therefore, there is a need to develop and implement a marketing strategy that can increase the efficiency of the enterprise [2].

Marketing support acquires special importance in the work of a pharmaceutical company. It is able to bring to the activities an understanding of consumer needs and creative thinking, which makes it possible to be customer-oriented and provide high profits. At the same time, marketing decisions must be substantiated with analytical and commercial clarity, correspond to the corporate strategy, innovative directions of development and promote the implementation of efficient, stable and profitable operation of the enterprise. In today's highly competitive market, pharmaceutical companies cannot operate without the use of Data Science technology and in-depth work with data to develop an effective marketing program, well-planned and organized marketing activities, which makes this study actual and practical [1]. The aim of the study is to optimize portfolio strategy through formation of effective

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marketing strategy for each brand in accordance to return on investments (ROI) of each product, media channels, marketing mix elements efficiency. Modeling and analysis based on Data Science technologies help to prioritize brands in portfolio, which generate opportunities for brand performance growth. The secondary goal is forming information-analytical basis for marketing strategy development, implementation and its evaluation.

2. Literature review

Theoretical and practical researches of many experts in this field are devoted to aspects of development of effective marketing strategies. Leading foreign scholars G. Armstrong, F. Kotler, P. Drucker, W. Wong, J. Lamben, O. Walker, J. Ansoff, D. Saunders and others studied the issues of strategic management in marketing, the formation of competitive marketing strategies, their separate elements, marketing support, etc. The development of theoretical, methodological and practical bases for the formation of marketing strategies for the development of enterprises in Ukraine are engaged in such domestic scientists as O. Kendyukhov, N. Butenko [3], N. Kudenko, A. Starostina and others.

The use of marketing in the activities of enterprises is considered in the works of such authors as N. Demchuk, I. Tubolets, O. Kuzmenko, V. Pavlova, V. Polyakh, V. Pisarenko, T. Zaporozhchenko, E. Sergeeva and others. The leading position in the research of the above scientists is to justify the feasibility and necessity of using marketing research and data analysis in the activities of enterprises to harmonize modern market requirements, as well as the needs and behavior of consumers [4]. Marketing capital and R&D capital have a direct and positive impact on maintaining sales leadership. A sales leader that gradually spends 1% of its average five-year sales revenue on marketing and research activities can increase the likelihood of maintaining sales leadership by 50% [5].

Given the need to justify the costs of doing a business and their proper distribution among products, companies are very interested in measuring the effectiveness of marketing. Adopting effective marketing strategies is a difficult task, especially in a highly competitive market, which includes complex and multifaceted marketing planning, methods and mechanisms to determine the best plan of action in the current environment and find optimal solutions to achieve the best results.

The effectiveness of the firm depends on many elements. Marketing opportunities and strategies for brand portfolio development make a significant contribution to the company's efficiency. Research [6] develops and tests a framework for understanding the relationships between marketing opportunities, marketing strategy, and marketing implementation. Understanding the relationships between these variables can help managers implement a marketing strategy to maximize effectiveness. The main results of the study show that the effectiveness of the marketing strategy positively mitigates the impact of marketing opportunities on market efficiency and financial results [6].

The article [7] argues for the relationship between investment in marketing innovation, i.e. the way in which products are developed, priced, distributed and promoted, and the performance of a new firm product. Market activity and competitors' strategies create a significant influence on the choice of the appropriate marketing strategy. M. Abedian et al. investigate the development of a mathematical methodology based on the game theory approach to plan the optimal strategies of the marketing complex in dynamic competitive markets, taking into account strategic forecasting and interaction effects [8]. R. Sellers-Rudio et al. [9] examine the analysis of the effectiveness of investment in advertising in the media using a two-stage analysis of the coverage of data with double loading to the resources allocated to various advertising tools. The authors then explore the determinants of advertising effectiveness in terms of the number of brands in the portfolio and the combination of advertising tools used. The results show a certain level of waste on advertising media spending, as well as the fact that both the size of the brand portfolio and advertising have a positive effect on efficiency.

C. Ten Caten et al. [10] offer a functional classification of enterprise product portfolio for use in business planning, containing four functional classes: concept products, special purpose products, profit-generating products and products in the mix composition. Based on this approach, managers must identify the main features of their products and outline strategies that are unique to the business and marketing goals of both individual products and the product portfolio as a whole. Classification is based on two aspects, namely the share in the structure and margin. Thus, business planning, which involves matching the product range with the expectations of customer behavior, allows the company to maximize its general results.

Expanding product and brand portfolios are effective marketing strategies to meet customer’s needs and create a competitive advantage in the market. However, product and brand portfolios can easily

spiral out of control, leading to a loss of market concentration and market share. A. Kirca et al. [11] explore how a product and brand portfolio and such decisions influence unit sales and market share as brand performance using a dynamic panel generalized method of moments estimation. The authors find critical management trade-offs between brand and product portfolio decisions, as brand and product portfolio decisions are intertwined, and careful research is necessary to maximize brand effectiveness.

The article [12] describes the implementation of a category management tool known as the Category Optimizer ™ in Foster's Wine Estates Americas, which has faced the challenge of managing a wine portfolio to increase profitability, improve competitive position and protect against a new competitor. The Category Optimizer has led to recommendations that initially seemed contradictory. The classic response should be to reduce prices to maintain share and volume, but it has been shown that combining price increases with the introduction of a new product that flanks volumes in the new channel will increase profits, increase revenue, protect and improve the market. High results were achieved after implementation. Profitability increased by 70% and revenue by 3%.

It is well known that consumer behavior can affect the development of new products and, consequently, the profits of firms. Therefore, companies must take into account consumer behavior when planning marketing strategies. In [13], the authors propose a new model of diffusion to create products, taking into account the diversity of their consumers and two key marketing elements: price and advertising activity. It is shown that the optimal trajectory of pricing is a concave curve and there is a threshold of the optimal trajectory of advertising. When customers are loyal, the best response from companies is to reduce advertising spending. In addition, the company is able to reduce advertising spending when the influence of word-of-mouth (WOM) advertising is high.

The aim of the study [14] is to assess the impact of pharmaceutical marketing strategies on the behavior of physicians in prescribing. The overall significant impact of the strategies of the pharmaceutical marketing complex on the behavior of physicians in prescribing was 55.9% (more than half of physicians noticed such an impact). The influence of advertising strategy, product, distribution and price strategy, perceived by doctors in their behavior when prescribing drugs, was 61%, 52%, 52%, 59%, respectively.

Portfolio management decisions are a key function of any drug company. The article [15] discusses what constitutes a sufficient portfolio of drugs for a firm and how it can be successfully managed. The authors explore the decision-making process from a variety of perspectives, including the importance of the drug portfolio, tools for portfolio analysis, and the optimal portfolio. Drug portfolio decisions using modern decision-making methods should be used much more widely in modern practice. Improvement of management of drug portfolio is key element of an overall success strategy.

The following domestic and foreign scientists have made a significant scientific contribution to the study of the problems of effective formation and implementation of marketing strategy: I. Alekseev, S. Garkavenko, G. Assel, V. Gerasimchuk, S. Ilyashenko, S. Kovalchuk, Z. Shershneva, G. Bagiev, D. Day, R. Fatkhudinov. In their works the issues of marketing management of business processes of the enterprise are considered; essence and content of the concept of "marketing strategy" and analysis of its elements. One of the factors that determine the effectiveness of marketing activities of enterprises, scientists recognize the in-depth analysis of market data to find hidden patterns in them and the formation of effective marketing decisions [2]. M. Stone and others investigate the impact of modern interactive marketing on customer information and marketing research, in particular how radically changed the ways of collecting and using customer information to develop and implement marketing strategies and individual elements of the marketing mix. Researchers note the development of platforms that allow companies to manage their information and interaction with customers in radically different ways through the development of business intelligence [16].

D. Johnson et al. [17] explore the experience of marketing departments that are completely guided by data in decision-making. The survey data confirm that Big Data Analytics consists of four main activities: gaining knowledge, improving the quality of data, testing and disseminating the results of data analysis. This study shows that the shift to analytics improves the quality of resources available to the marketing department and provides a model for improving the quality of marketing information and improving data-based decision-making.

Marketing mix modelling is the most commonly used method, which helps to determine the efficiency of marketing mix elements and consists of building a regression (econometric) model based on historical data to describe business performance indicators (sales or market share) as a functional dependence from different factors, such as distribution, price, advertising activity (number of impressions, target ratings, etc.), seasonality, macroeconomic factors, competitor’s activity and so on. The contribution of classic machine learning methods like regression analysis to marketing decision-

making is quite important, but there are alternative methods. J. Dawes et al. [18] research evidence-based methods that have been shown to be useful for forecasting. Y. Jin et al. [19], S. Zhang and J. Vaver [20] recommend using Bayesian hierarchical modelling. According to research D. Chan and M. Perry [21], the potential of marketing mix modelling may be limited by the lack of detailed and qualitative data. To solve this problem, they propose to develop better data and models, as well as test them, using simulations as the main instruments of improvement for marketing mix modelling. Pharmaceutical market has a lot of high-quality data, so marketing mix modeling is a method, which show good performance in solving of business tasks and is extremely important.

R. Birn and M. Stone explore the evolution of marketing information systems and the need for companies to use marketing information to understand the needs and behavior of potential customers, as well as to monitor it. The authors provide advice on key issues related to how marketing research helps companies make decisions, information on classic marketing research methods, and what methods companies need to grow, solve problems, and manage their portfolios effectively. The issue of forecasting marketing results is also covered. The authors argue that the development and management of customer analysis systems and marketing information is a critical tool for managing the company's portfolio, which is used to support marketing strategy and marketing solutions [22].

But many questions about the peculiarities of marketing strategies of enterprises remain insufficiently studied, in particular the peculiarities of forming an effective portfolio marketing strategy through determining the ROI of each product and their prioritization, as well as some issues of forming information-analytical basis for marketing strategy development and implementation, its evaluation needs further development [2].

3. Methodology

The main goal of the research is to find effective recommendation for marketing strategy of key brands in portfolio of one leading pharmaceutical company in Ukraine.

As the aim of the study is to optimize portfolio strategy, the system analysis was used. To achieve the objectives, general scientific methods were used in this scientific paper. Logical generalization – to identify trends in the brand's development; comparison – to analyze differences in marketing performance by different brands in portfolio, compare Return on Investment (ROI) by brands; induction – to define the main beneficial Data Science methods in marketing based on previous researches; analysis and synthesis – to analyze the theoretical and practical models used in marketing researches for pharmaceutical companies in terms of increasing its profitability; methods of multicriteria analysis and modeling - econometric modeling - for understanding and quantifying the impact of marketing mix elements and market conditions on sales level of key brand of one of the Ukrainian pharmaceutical companies based on regression analysis (Data Science and machine learning technologies in general), as well as the recommendations formation for improvement the efficiency of marketing activities of the companies on the pharmaceutical market and optimizing the business results depending on the chosen marketing strategy of a separate product and for all product line in general.

To achieve this goal were used regression analysis and economic and mathematical modelling (based on machine learning technologies) of the dependence of volume and value market share (sales level) of certain medications on the such factors as: penetration of pharmacy stores (number of pharmacy stores, where such drug is available for potential brand consumers, and share of these stores in general pharmacy network in Ukraine), price policy (the rate of the drug's price compared to its market/category competitors), brand's and its competitors' advertising activity in all communication (media) channels (television, digital, radio, out of home advertising and press), recommendations of doctors and pharmacists and others [23]. Pharmaceutical companies have specific marketing mix (in comparison to Fast Moving Consumer Goods market) as include work with doctors and pharmacists and realize necessary penetration of pharmacy network.

Data on all indicators for the period from 2017 to 2021 were collected in a weekly breakdown for all drugs in the relevant categories (database was collected on the basis of data of the pharmaceutical company from Proxima Research [24], as well as the Industrial Television Committee [25] and Nielsen Ukraine [26]). Data about media activity and other marketing variables (sales, penetration, price, etc.) was collected from special monitoring softwares Markdata and Morion respectively on the basis of SQL requests for each specific category. Due to confidentiality, all data in the article will be indexed from 0 to 1. All data was collected in excel file, which was integrated in R-Studio software for modeling.

For the constructed multiple regression (econometrics) models for each brand, which were estimated by the method of least squares using R-Studio software, main hypotheses about the adequacy of the models, the significance of the coefficients for all factors, the presence of heteroskedasticity and autocorrelation were tested. Also, for the formation of recommendations for optimal price policy, an approach based on machine learning technologies (coefficients from constructed regression models and additional data-based calculations) was developed to estimate the optimal range of price index (drug's price in comparison to the average category price of competitors) to maximize market share in volume or market share in value depending on the company's goals.

Estimation the impact of media factors by each brand, comparison of such influence by brands in terms of profitability help to develop recommendations for media strategy of these drugs, prioritize brands by media support and marketing budget allocation and as a result increase ROI of media/marketing investments for each brand separately and for portfolio in general [18].

For day-by-day integration of Data Science into marketing strategy planning we realize informational and analytical system based on Power BI interactive dashboard with integration of previously accumulated knowledge based on econometric modeling. Such informational and analytical system was called "Brand's Marketing Management System".

Project was deploying accordingly to the most widely-used analytics model CRISP-DM [27, 28]. CRISP-DM describes the process through 6 stages: "Business Understanding, Data Understanding, Data Preparation, Modelling, Evaluation and Deployment" [28]. In this project, the overall process was implemented through step-by-step analysis and modeling, as shown in the Figure 1.

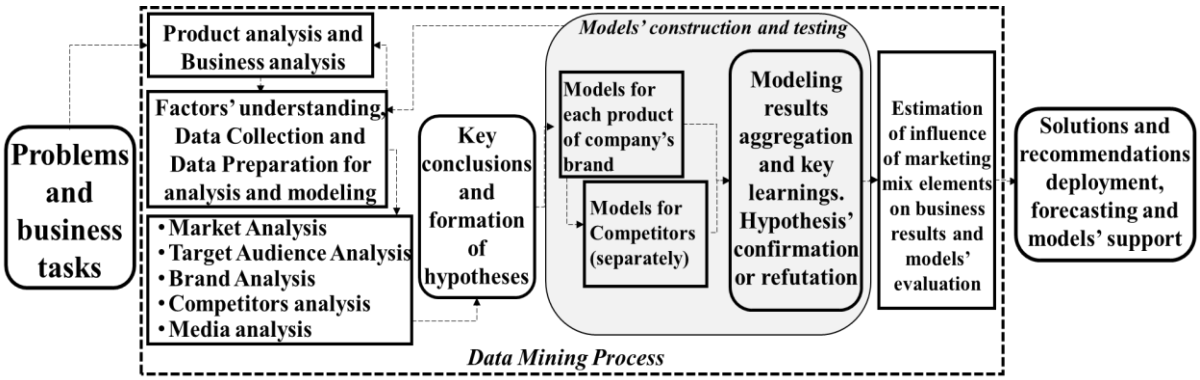

Figure 1: Proposed concept of modelling marketing mix project realization

The process includes the ability to flexibly change the order of the stages, going back when the need arises. Data mining has cyclical nature, as the process of finding solutions continues throughout the project and after it has been deployed. The main learnings, experience and knowledge of the previous cycle can create new, deeper business issues that have a strong positive influence on future data mining processes [28].

4. Results

Data Science is a relevant tool for searching effective business solution for portfolio marketing strategy optimization. The research of marketing activities of several pharmaceutical brands in Ukraine in three product categories will show how on the basis of economic-mathematical modelling (regression analysis) and other Data Science technologies we can analyze what factors and to what extent affect the business results of the company (sales or market share in the relevant category).

Understanding the influenced factors enables to calculate the elasticity of sales to each factor and as a result to distinguish the optimal range for each of them taking into account their marginal utility (for example, calculating price elasticity and finding the optimal value of the price index - the ratio of brand price and average price of competitors or determining the optimal level of media pressure in each communication channel). In addition, understanding the effectiveness of each communication channel make it possible to develop an effective media strategy and tactics for each brand.At the first stage of working with a business task, it is necessary to study in detail the features of the brand and the category for which the analysis is implemented to determine all the factors that influence on the final performance of the business. In this study, we examine three brands that are the one of the main players in the

categories of diaper dermatitis, pain and spasmolytics, tablets and lozenges for Cold&Flu respectively. Brands actively use TV and Digital support to promote these products for potential consumers.

For each brand of drug, we will construct the multiple regression model, which looks like this:

$$SOM = Constant + a_1 * Penetration_1 + a_2 * Penetration_2 + a_3 * Price_{index} + a_4 * Doctors + a_5 * Pharmacists + a_6 * Adstock(TV_1) + a_7 * Adstock(TV_2) + \ldots + a_n * Adstock(TV_n) + c_1 * Adstock(Digital\_video) + c_2 * Adtock(Digital\_display) + b_1 * Adstock(TV\_Competitor_1) + \ldots + b_m * Adstock(TV\_Competitor_m), \quad (1)$$

where

- *SOM* – share of market in Volume (in %);
- *Penetration₁* and *Penetration₂* – penetration level for SKU 1 and SKU 2 respectively (in %)*;*
- *Doctors or Pharmacists* – level of brand's recommendations by doctors and pharmacists (in %);
- *TV₁* or *TV₂* or *TVₙ* – TV activity of brand by different creative materials (*TV₁* is for creative 1 and *TVₙ* is for creative n respectively in TRPs – target rating points in %);
- *Digital_video and Digital_display* – digital activity of brand in video and display formats in Internet respectively (in impressions);
- *TV_Competitor₁ or TV_Competitorₘ* – TV activity of competitor 1 or competitor 2 respectively (in TRPs);
- *Adstock* is the instant, prolonged and lagged effect of advertising activity on consumer purchase behavior, which indicate influence of TV activity (in TRPs) during a time.

$$Adstock(TV_t) = TV_t + a * Adstock(TV_{t-1}) \quad (2)$$

The first product category is newborn health care. The brand of this pharmaceutical company has strong position on the market (enter the TOP-5) and started media support since second half of 2020. The main specific of this category is high level of target audience's rotation on a monthly basis. Every month around 24 thousand of moms enter to the category and there is marketing task for brand to recruit it to the brand's consumption [29].

In general target audience is quite wide and we segment it by their behavior and consumer journey:

- Pregnant woman on third trimester;
- Moms with kids 0-3 months old;
- Moms with kids 4-6 months old;
- Moms with kids 6-12 months old;
- Moms with kids 13-18 months old;
- Moms with kids 19-36 months old.

Pregnant woman on third trimester and moms with kids 0-3 months old are newcomers. Main marketing tasks for this group of target audience are build awareness, drive product trial, so it relevant to regular media reach and recruiting. Moms with kids 0-18 months old are core of target audience and main marketing tasks are maintaining and switching from competitors. For group of moms with kids 18+ months old we need to drive product experience, establish credibility and support advocacy. This group is category's graduates and we need to turn it into brand ambassadors.

Based on econometric model for our brand we calculate different scenario forecasting to optimize architecture of media campaigns taking into account memory decay [30, 31]. Memory decay is *1-a* from equation (2) and estimate memory decay of advertising message among target audience. As a result of simulation four variants of media architecture (continuity – every week placement with low media pressure, pulse – one week on air and one week of break with high media pressure, pulse 2.1 – 2 weeks on air and 1 week of break and burst with 5-weeks flights) we recommend for this brand burst strategy with 5 weeks on air and 2 weeks of break, which helps to increase advertising effect (AdEffect) by 5% comparison with continuity strategy (Figure 2).

After the realization of such recommendation, we estimate the current efficiency from media activity based on econometric modeling and calculate ROMI (return on media investments) for this brand according to equations (3)-(5) [32].

$$ROMI\ general = Sales\ generated\ from\ media\ in\ UAH\ /\ General\ Media\ Investment \quad (3)$$

$$ROMI\ TV = Sales\ generated\ from\ TV\ in\ UAH\ /\ TV\ Media\ Investment \quad (4)$$

$$ROMI\ Digital = Sales\ generated\ from\ Digital\ in\ UAH\ /\ Digital\ Media\ Investment \quad (5)$$

Results of modeling show that media activity has strong positive influence on sales level and share of market. More than 25% of sales was accumulate in period after media support start in 2020-2021 years (Figure 3). In period of 2021 media boost is 22,3%.

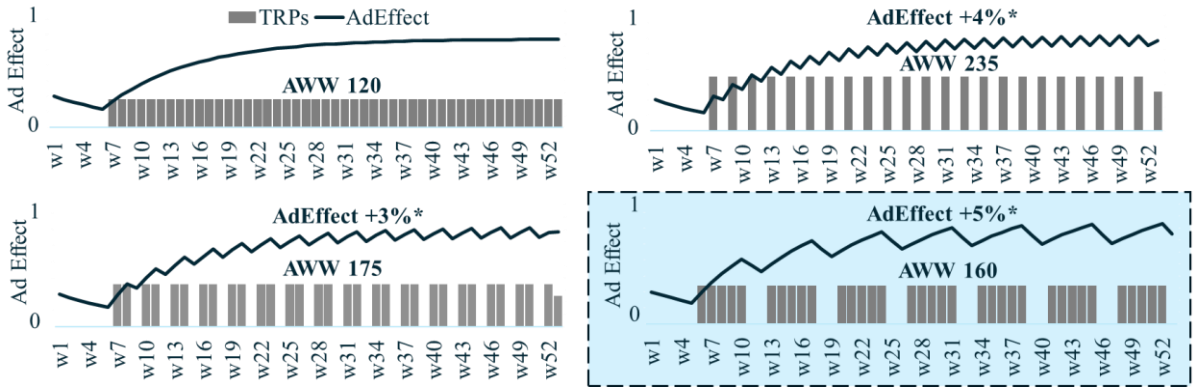

Figure 2: Result of scenario forecasting

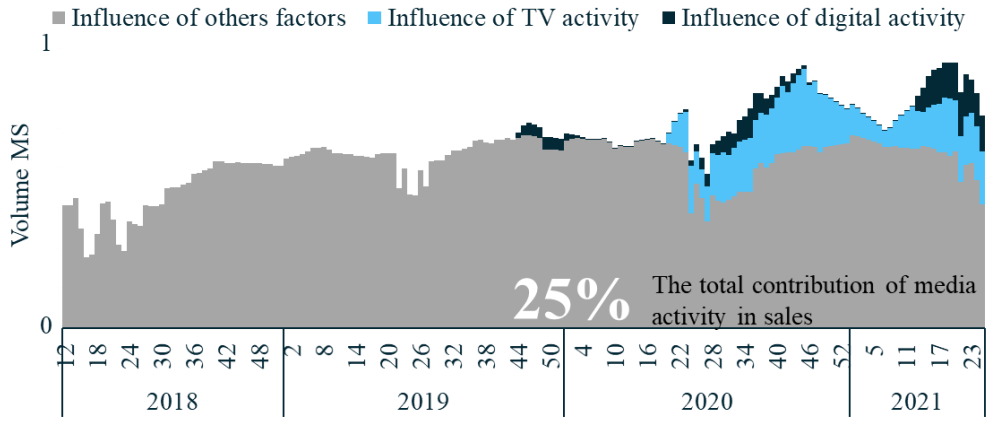

Figure 3: Model decomposition for brand 1

The next brand is one of the key players in pain and spasmolytics category, which is a quite clattered as presented on the market by more than 60 brands. Taking into account such highly competitive environment we need to find effective media strategy based on all available data on the market and Data Science technology [33]. We also construct econometric model for this brand and realize scenario forecasting for optimal media campaigns architecture and strategy. Since 2020 we change the media strategy from burst to pulse and there was a significant growth of media efficiency. Brand is in TOP-3 by brand awareness in this category and "week on – week off" strategy shows high efficiency for sales growth. In such conditions one week of break is not critical as a result of low memory decay for this brand. After such change of media strategy, we save more than 40% of investments and ROMI of media activity show significant growth. The contribution of media activity to sales doubled from 8% in 2018-2019 to 15% in 2020-2021 with simple level of investments (Figure 4).

The third brand is one of the key players in tablets and lozenges category, which is competing with others subcategory of Cold & Flu market. The main media task is to optimize marketing mix to increase return on marketing investment in general. We continued to construct econometric model for this brand also. The main specific was that we determine based on Data Science technologies strong synergy effect between two key elements of marketing mix (price and promotion). This brand use media activity on 2017 and 2019-2021, but media contribution in 2017 was very low (Figure 5).

The main reason of such changes is high level price sensitivity in category and strong influence of price on media response. In conditions of high level of price index (ratio of price per one brand's package to average price on the market in this category per one package), price become a barrier for consumer to make purchase and interested potential consumers after media support switch on cheaper competitors in pharmacy stores [34]. As a result, we stimulated only brand awareness, which didn't convert to sales. The absolute influence of price index also quite significant during a modeling period and shown as negative factor on the Figure 6.

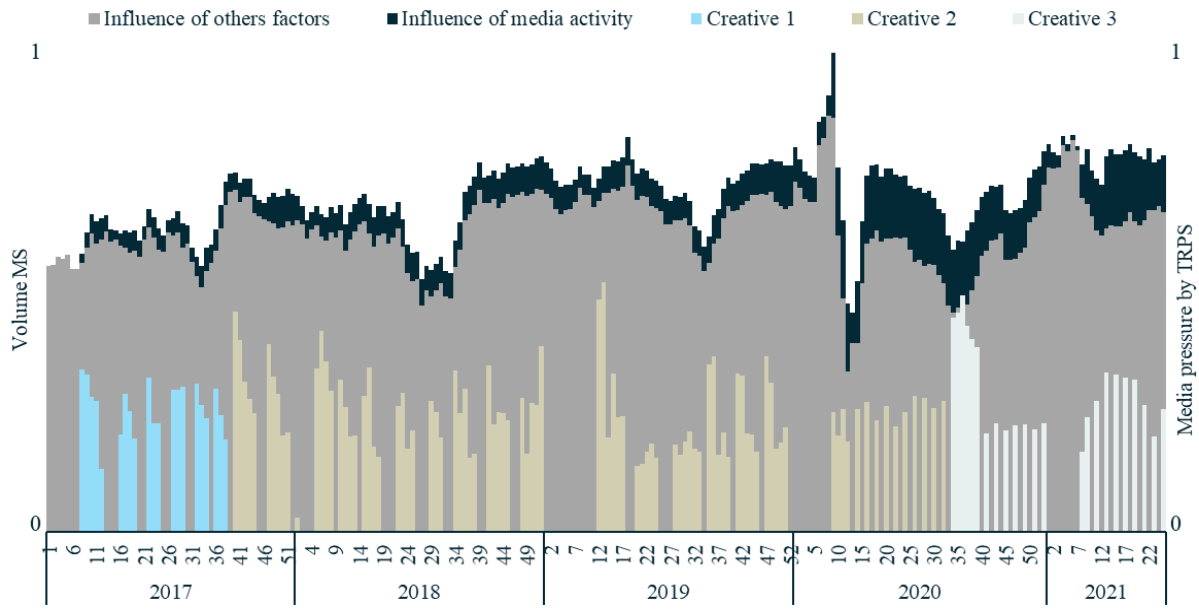

Figure 4: Model decomposition for Brand 2 and media impact in 2017-2021 years

In general, for brands in category there are strong influence of price to sales and media response. So, the Figure 6 shows the price sensitivity influence on media efficiency. Brand 1, brand 2 and brand 3 are the cheapest brands and have the highest efficiency from media activity. Brand 8, 9, 10 are the most expensive and their media activity generates the lowest effect on sales. It is necessary always analyze current price sensitivity to optimize brand's marketing strategy [35].

On the basis of the constructed economic and mathematical model of the drug's sales, we can estimate the curves of value share of market (money) and volume share of market (packages) depending on the level of price index, as the coefficient of model at the price index indicates how share of market in volume will change with rising price index by 1 unit (the character of the connection is linear or non-linear in the case of a linear or non-linear regression respectively).

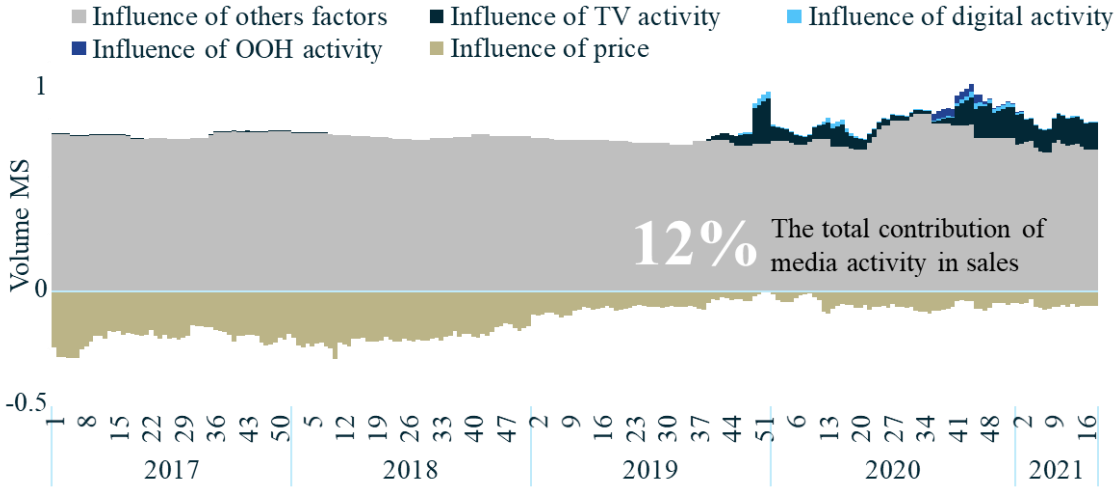

Figure 5: Model decomposition for Brand 3 and media impact by 2017-2021 years

The share of market in money and the share of market in packages are linked by a price index. Value market share is volume market share multiplied by price index. Due to the fact that the rate of change of share of market in volume (linear in our case) doesn't coincide with the rate of price index change (also linear, but with another growth rate), there is a non-linear relationship between the price index and share of market in monetary terms (value market share), which leads to an optimization zone depending on business goals. On the case of our brand of drug, the optimal value of the price index to maximize value market share is from 1.8 to 2.3 (Figure 7), which means that the drug should be more expensive up to +80-130% to average prices on the market to obtain the maximum level of profit. Depending on the business' objectives, this methodology becomes a flexible and convenient tool for

the price policy specialists, as it is possible to form a recommendation for price level to achieve the goals of both value share of market and volume share of market.

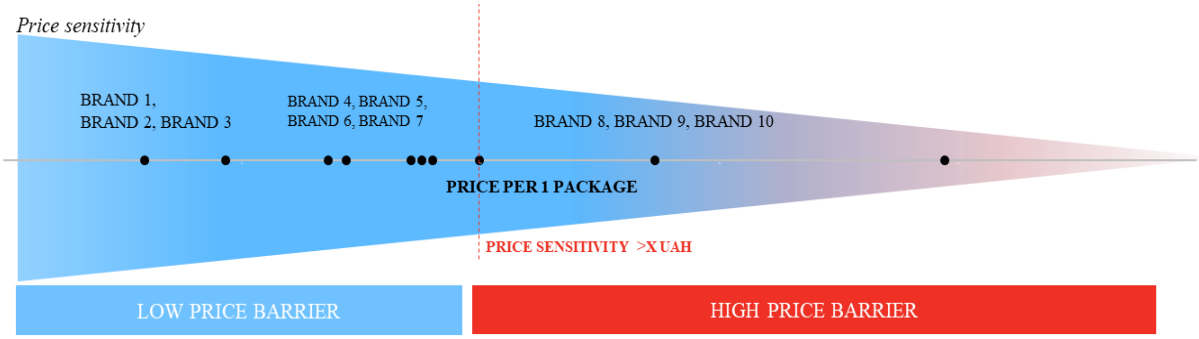

Figure 6: Price sensitivity in category and their influence on media response

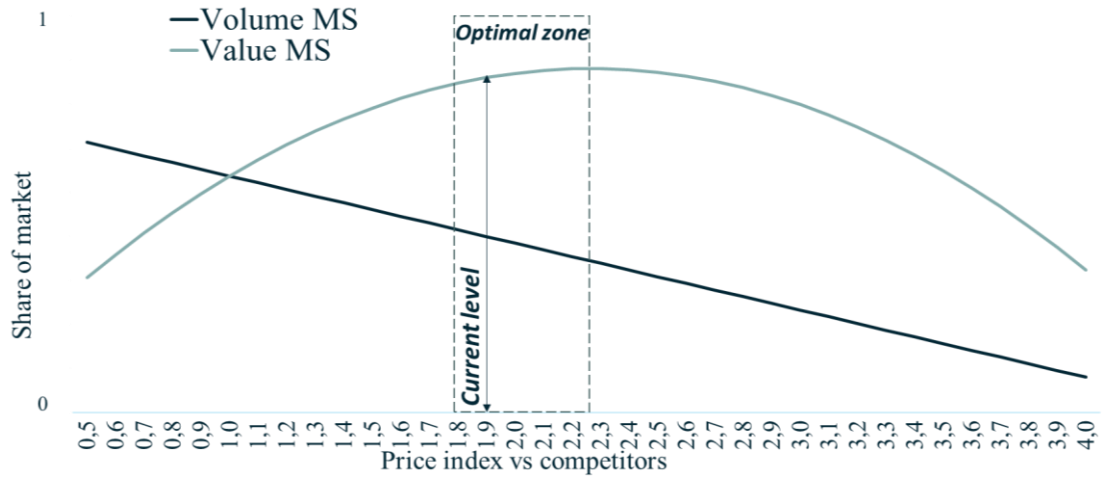

Figure 7: Optimal level of price index in terms of growth of share of market in value for Brand 3

In terms of media factors contribution, TV activity is a main sale generated channel with highest ROMI. High performance shows Out of Home advertising (OOH), which brand used at the end of 2020 to regional sales support. General media contribution to sales in 2020-2021 is 12%, which is a little bit higher than average market benchmarks. In period of 2021 media boost is 18,9%. Among media channels contribution is distributed by the next proportions: 79% of media effect is accumulated by TV, 11% by digital and 10% by OOH advertising.

For these three brands the results of portfolio strategy are summarized in the Table 1, which shows the media boost in percentages and Brand Priority Index in company portfolio. Media boost indicates the share of sales generated by media activity. After converting such indicator into sales in monetary terms and comparison with realized media investment via equations (3)-(5), we may to prioritize brands in portfolio according to their general media performance indicated by ROMI.

Table 1

Brand Portfolio Strategy Results

Parameter	Brand 1	Brand 2	Brand 3
Media boost, % 2021 YTD	22,3%	16,2%	18,9%
Brand Priority in Portfolio	2	1	3

To maximize the brands' efficiency, we recommend to implement Data Science instruments into day-by-day brand management. The effective concept of such implementation of modelling marketing mix project is cyclic process, which accumulates next stages:

- Obtaining data on the sales and marketing mix elements and forming a single database;
- Updating the model, evaluating the effectiveness of previously made decisions and analyzing current results;

- Formation of recommendations for the strategy and forecast of business indicators for the next periods;
- Optimization of investments taking into account business KPI / checking the implementation of sales plans (forecasting);
- Implementation of media and business solutions.

In case of regular support of marketing mix modeling projects for company's portfolio we may to determine business tasks depending on different time intervals (weekly, monthly quarterly). Main tasks for each time intervals are structured in the Table 2.

The next steps of Data Science integration into marketing strategy planning are to realize informational and analytical system with integration of previously accumulated knowledge based on econometric modeling. For these brands was developed such informational and analytical system called "Brand's Marketing Management System" with structure, which presented in the Table 3.

Table 2
Marketing Mix Modeling and Data Science tasks in accordance to time intervals

Weekly	Monthly	Quarterly
1. Forecasting of business KPIs 2. Reporting and information exchange 3. Fast response to any changes and risks in order to manage business results	1. Monitoring the implementation of sales plans 2. Tracking the dynamics of indicators 3. Recommendations based on the current market situation	1. Media placement strategy (media mix, period and weight), taking into account minimizing costs while achieving goals and maximizing efficiency 2. Evaluating the effectiveness of previous campaigns, evaluating and comparing creatives

Table 3
Structure of informational and analytical system "Brand's Marketing Management System"

Business review	Media review	Econometric modeling	Portfolio strategy
• Market and brand dynamics • Market structure analysis • Sales vs media analysis • Regional analysis	• TV, Digital, • OOH, Radio, • Press	• Modeling results • Price elasticity • ROI by media channel • Seasonal ROI	• Portfolio analysis • Media Boost by brands • Forecasting

5. Conclusions

Such results for three main brands in portfolio of pharmaceutical company become a basis for portfolio strategy optimization as we clearly understand and quantitatively estimate the current and potential effect from all elements of marketing mix complex. Portfolio marketing strategy optimization based on data-driven decisions has strong impact on business performance due to high quality and great validity of decision-making process.

Thus, the modelling and continuing process of deeply data analysis become a convenient and an effective tool for making effective strategic and tactical marketing and media decisions:

- regularly evaluation an optimal price taking into account the level of competitors' prices and its effect on sales;
- monitoring the efficiency of the advertising campaign in all media channels;
- forecasting of general sales level and sales level by separate brand at different scenarios of advertising activity;
- forecasting of sales level for different combinations of marketing factors (realizing of scenario forecasting);
- calculation of optimal level of each factor taking into account the marginal efficiency of each of them and ROMI comparison by channels, brands, periods, etc.;
- effective allocation of marketing budgets between brands, instruments, periods, etc.;
- analysis of the influence of factors on brand sales, evaluation of winnings and losses.

Taking into account information from the Table 1, the Brand 2 have the highest priority as generates the largest ROMI. The next one is Brand 1 and third priority is for Brand 3. The marketing task is to allocate marketing budgets accordingly to this priority, which helps to increase general profit of pharmaceutical company. TV is a main sales driver for all pharmaceutical brands, but Digital and OOH also show good performance with positive ROMI.

Technologies of Data Science is an effective tool for sales management, as they create the opportunities to quantify the influence of each factor on sales, estimate their optimal mix for achievement of business KPIs and improvements the company's position in the market, effective marketing or media budgets allocation and scenario forecasting. Regular model support makes it possible to increase the return on each factor, improve ROMI and ensure the achievement of business goals in the most efficient way. Data Science creates the basis for making effective marketing solutions and forming an effective business development strategy.

Implementation of Data Science projects has significant economic effect on business efficiency as helps to improve return on marketing investment by more than 5% and forecast future business KPIs with average error less than 5%. Such models and informational and analytics system are recommended to applicate in real business practice of Ukrainian and international pharmaceutical companies for finding hidden insights in category and product development, optimization of allocation of marketing budget per portfolio and increasing of business KPIs. Data-driven marketing improve the efficiency of marketing decision on day-by-day basis as we currently work in very dynamically developing conditions on the market. The next stages of scientific research in such area are deeply analysis and mathematical modeling of business results strategy of main competitors for each brand in portfolio depending on marketing and media for finding additional insights, which can be effectively implemented into future marketing activities.

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