

Ministry of Education and Science of Ukraine
**ODESSA NATIONAL ACADEMY OF
FOOD TECHNOLOGIES**

International Competition of
Student Scientific Works

BLACK SEA SCIENCE 2018

PROCEEDINGS



April, 4, 2018
ODESSA, ONAFT 2018

Ministry of Education and Science of Ukraine
Odessa National Academy of Food Technologies

International Competition of Student Scientific Works

BLACK SEA SCIENCE 2018

Proceedings

April 4, 2018

Odessa, ONAFT 2018

Міністерство освіти і науки України
Одеська національна академія харчових технологій

Міжнародний конкурс студентських наукових робіт

BLACK SEA SCIENCE 2018

Матеріали

4 квітня 2018 року

Одеса, ОНАХТ 2018

UDC 001(262.5):378.4.091.27(08)
BBC 421D221
B64

Editorial board:

Prof. B. Yegorov, D.Sc., Rector of the Odessa National Academy of Food Technologies, Editor-in-chief

Prof. M. Mardar, D.Sc., Vice-Rector for Scientific and Pedagogical Work and International Relations, Editor-in-chief

Dr. I. Solonytska, Ph.D., Assoc. Professor, Director of the M. V. Lomonosov Technological Institute of Food Industry, Head of the jury of «Food Science and Technology»

Dr. O. Kalaman, Ph.D., Assoc. Professor, Director of the G. E. Weinstein Institute of Applied Economics and Management, Head of the jury of «Economics and Administration»

Prof. V. Volkov, D.Sc., Head of the Department of Applied Mathematics and Programming, Head of the jury of «Automation»

Prof. S. Artemenko, D.Sc., Head of the Department of Computer Engineering, Head of the jury of «IT Technologies and Cybersecurity»

Prof. B. Kosoy, D.Sc., Director of the V. S. Martynovsky Institute of Refrigeration, Cryotechnology and Ecoenergetics, Head of the jury of «Renewable Energy Sources and Environmental Protection»

Prof. L. Morozyuk, D.Sc., Professor of the Department of Cryogenic Engineering, Head of the jury of «Refrigerating Machines and Equipment»

Dr. V. Kozhevnikova, Ph.D., Assistant Professor of the Department of Hotel and Catering Business, ONAFT, Technical Editor

Black Sea Science 2018: Proceedings of the International Competition of Student Scientific Works, April 4, 2018, Odessa / Odessa National Academy of Food Technologies; B. Yegorov, M. Mardar (editors-in-chief.) [*et al.*]. – Odessa: ONAFT, 2018. – 827 p.

Proceedings of International Competition of Student Scientific Works «Black Sea Science 2018» contain the works of winners of the competition.

The author of the work is responsible for the accuracy of the information.

ISBN 978-966-289-181-2

Odessa National Academy of Food Technologies

УДК 001(262.5):378.4.091.27(08)
ББК 421D221
В64

Редакційна колегія:

Єгоров Б.В. – д.т.н., професор, ректор Одеської національної академії харчових технологій, відповідальний редактор

Мардар М.Р. – д.т.н., професор, проректор з науково-педагогічної роботи та міжнародних зв'язків, відповідальний редактор

Солоницька І.В. – к.т.н., доцент, директор технологічного інституту харчової промисловості ім. М.В. Ломоносова, голова журі напрямку «Харчова наука і технологія»

Каламан О.Б. – к.е.н., доцент, директор інституту прикладної економіки та менеджменту ім. Г.Е. Вейнштейна, голова журі напрямку «Економіка і управління»

Волков В.Е. – д.т.н., професор, зав. кафедри прикладної математики і програмування, голова журі напрямку «Автоматизація»

Артеменко С.В. – д.т.н., професор, зав. кафедри комп'ютерної інженерії, голова журі напрямку «ІТ технології та кібербезпека»

Косой Б.В. – д.т.н., професор, директор інституту холоду, кріотехнологій та екоенергетики ім. В.С. Мартиновського, голова журі напрямку «Відновлювані джерела енергії та охорона навколишнього середовища»

Морозюк Л.І. – д.т.н., професор кафедри кріогенної техніки, голова журі напрямку «Холодильні машини і установки»

Кожевнікова В.О. – к.т.н., асистент кафедри готельно-ресторанного бізнесу, технічний редактор

Black Sea Science 2018: Матеріали Міжнародного конкурсу студентських наукових робіт, 4 квітня 2018 р., Одеса / Одеська національна академія харчових технологій; Б. В. Єгоров, М. Р. Мардар (відп. ред.) [та ін.]. – Одеса: ОНАХТ, 2018. – 827 с.

Збірник включає матеріали робіт переможців Міжнародного конкурсу студентських наукових робіт «Black Sea Science 2018».

За достовірність інформації відповідає автор публікації.

Organizing committee:

Prof. Bogdan Yegorov, D.Sc., Rector of Odessa National Academy of Food Technologies, Head of the Committee

Prof. Maryna Mardar, D.Sc., Vice-Rector for Scientific and Pedagogical Work and International Relations of Odessa National Academy of Food Technologies, Deputy Head of the Committee

Prof. Stefan Dragoev, D.Sc., Vice-Rector on Research and Business Partnerships of University of Food Technologies (Bulgaria)

Prof. Baurzhan Nurakhmetov, D.Sc., First Vice-Rector of Almaty Technological University (Kazakhstan)

Prof. Andrzej Kowalski, Dr. habil., Director of Institute of Agricultural and Food Economics (Poland)

Dr. Olivera Djuragic, Ph.D., Director of Scientific Institute of Food Technology of University of Novi Sad (Serbia)

Prof. Mircea Bernic, Dr. habil., Vice-Rector on Research and Doctorate of Technical University of Moldova (Moldova)

Prof. Jacek Wrobel, Dr. habil., Rector of West Pomeranian University of Technology (Poland)

Prof. Michael Zinigrad, D.Sc., Rector of Ariel University (Israel)

Dr. Mei Lehe, PhD, Vice-President of Ningbo Institute of Technology, Zhejiang University (China)

Prof. Plamen Kangalov, Ph.D., Vice-Rector on Education of “Angel Kanchev” University of Ruse (Bulgaria)

Dr. Alexander Sychev, Ph.D., Assoc. Professor of Sukhoi State Technical University of Gomel (Belarus)

Dr. Hanna Lilishentseva, Ph.D., Assoc. Professor, Head of the Department of Merchandise of Foodstuff of Belarus State Economic University (Belarus)

Prof. Heinz Leuenberger, Ph.D., University of Applied Sciences and Arts Northwestern Switzerland (Switzerland)

Організаційний комітет:

Сторов Богдан Вікторович – д.т.н., професор, ректор – Одеська національна академія харчових технологій – голова оргкомітету

Мардар Марина Ромиківна – д.т.н., професор, проректор з науково-педагогічної роботи та міжнародних зв'язків – Одеська національна академія харчових технологій – заступник голови оргкомітету

Драгоєв Стефан Георгієв – д.т.н., професор, проректор з наукової роботи і бізнес партнерства – Університет харчових технологій (Болгарія)

Нурахметов Бауржан Кумаргалієвич – д.т.н., професор, перший проректор – Алматинський технологічний університет (Казахстан)

Ковальські Анджей – доктор-хабілітат, професор, директор інституту економіки сільськогосподарської та харчової промисловості – Інститут сільськогосподарської та продовольчої економіки (Польща)

Дюрагіц Олівера – доктор, директор інституту харчових технологій – Університет в м. Нові Сад (Сербія)

Бернік Мірча – доктор-хабілітат, професор, проректор з наукової роботи та докторантури – Технічний університет Молдови (Молдова)

Вробель Яцек – доктор-хабілітат, професор, ректор – Західнопоморський технологічний університет (Польща)

Зініград Михайл – доктор наук, професор, ректор – Аріельський університет (Ізраїль)

Леке Мей – доктор, віце-президент – Технологічний інститут Нінбо Чжэцзянського університету (Китай)

Кангалов Пламен – професор, доктор, проректор з навчальної роботи – Русенський університет «Ангел Канчев» (Болгарія)

Сичев Олександр Васильович – к.т.н, доцент, проректор з навчальної роботи – Гомельський державний технічний університет ім. П. Й. Сухого (Білорусь)

Лілішенцева Анна Миколаївна – к.т.н, доцент, зав. кафедрою товарознавства продовольчих товарів – Білоруський державний економічний університет (Білорусь)

Леунбергер Хайнц – доктор, професор – Університет прикладних наук і мистецтв Північно-західної Швейцарії (Швейцарія)

CREATING A VALUE DRIVER TREE AS AN ELEMENT OF INFLUENCE ON THE INDICATORS OF THE FINANCIAL STATE OF THE ENTERPRISE

Author – Dashchenko O.

Supervisor – Kasianova A.

Kyiv National University of Trade and Economics

This article contain information about current ways of using value driver tree as way to influence on the indicators of the financial state of the company. Identified how the using of value drivers tree are useful to increase the efficiency of the company by combining value drivers that are decomposed into key performance indicators.

Assessment of the financial status of the enterprise is one of the important elements in the management system and the adoption of various business decisions. It is of interest to investors, lenders, suppliers of logistics, government agencies and production managers [1]. One of the important financial tasks at the enterprise is to make the system of evaluation, analysis and decision making simpler, more convenient and technologically efficient. The decision tree is a vivid example of solving this problem.

Among the scholars who considered the theoretical and practical aspects analysis and the search for effective financial solutions using the tree of factor estimation there are Rappaport A., Meier M, Sinzig W, Mertens P., Brandenburg R. Akkiraju and R. Zhou, I. Herman, G. Melancheon, and M. S. Marshall. Also it's worth to emphasize the impact of those scientists as A. Kerren, H. C. Purchase, and M.O. Ward. The development of scientists and practitioners in the field of tree management of factor estimators, in particular C. Tian, R. Cao, W. Ding, H. Zhang , and J. Lee et al.

The purpose of writing this article is to analyze the Value driver model as a way of visualizing and analyzing the flow of value from one part of particular organization to another, regardless of an industry. Based on the purpose of the study, we have set the following objectives: to explore the diversity of models; to identify the advantages, disadvantages and possibilities of applying value tree drivers to an enterprise. The article uses the analytical methods of the study, as well as the method formalization, modeling, value driver tree approach, applied Gordon model

In corporate finance, value driver trees (VDTs) are used as an instrument in value-based management. Value-Based Management is a concept which enables to enhance the techniques through which corporate value is improved.

An important part of VBM is a deep understanding of the performance variables that will actually create the value of the business – the key value drivers. Such an understanding is essential because an organization cannot effect value directly on value. It has to act on things it can influence – profitability, customer satisfactions, cost, capital expenditures, etc. Moreover, it is those drivers of value through which senior management learns to understand the rest of the organization's performance and to establish a dialogue about what it expects to be accomplished [2].

Accordingly, relying on [3], we can generalize the main keypoints which characterize and give further explanation of value drivers as a value-based phenomenon.

Value drivers are:

- those attributes that distinguish successful companies and set them apart;
- they reduce risks perceived in owning a business;
- they increase the prospect and likelihood of future growth;
- they create and drive sustainable value;
- they make a company more valuable than another;
- they enhance value and provide justification for a premium price [3].

According to A. Rappaport [1], who was the first to highlight this topic in literature in 1986, business value depends on the seven value drivers: sales growth rate, operating profit margin, income tax rate, working capital investment, fixed capital investment, cost of capital, and forecast duration. While these drivers are critical in determining the value of any business, they are too broad. To be useful for many operating decision is needed establish for each business the micro value drivers that influence the seven financial or macro value drivers [2].

Figure 1 demonstrates the tree of micro and macro value drivers which was elaborated by A. Rappaport and extended by the author regarding to the realities of Ukrainian enterprises and the aims that they set to their performance.

An assessment of these micro value drivers at the business unit level allows management to focus on those activities that maximize value and to eliminate costly investment of resources in activities that provide marginal or no potential for creating value [1]. Isolating these key micro value

drivers enables management to target business unit operations that have the most significant value impact and those most easily controlled by management.

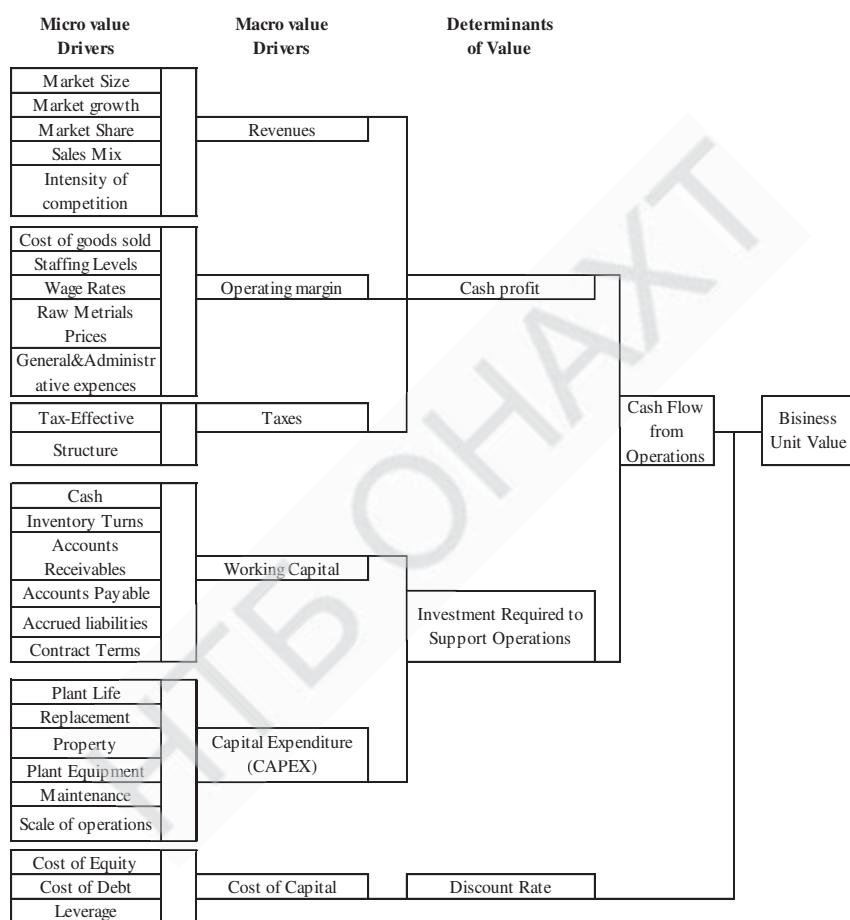


Figure 1. Extended by the author on the basis of the model Micro and Macro Value Drivers of A. Rappaport [1]

A business unit value driver analysis is accomplished in three steps [1]:

- The first step is to develop a value driver "map" (value driver tree) of the business. This involves identifying the micro value drivers that impact sales growth, operating profit margins, and investment requirements.

- Armed with a better understanding of micro value driver relationships, the next step is to identify the drivers that have the greatest impact on value.

- The third step in the assessment of the value drivers is to isolate drivers that management can influence [2].

So, value driver trees (VDTs) are used to model (parts of) a business and visualize the calculation of a business's value drivers, i.e., key performance indicators measuring the value added by a company's business activities.

Originally, this type of representation was used in DuPont analysis (orig. DuPont-System of Financial Control) to evaluate a company's return on equity (ROE), its profitability on investment and growth. From this, the VDT has been extended to incorporate a whole range of analysis models to support decision making and understand the relationships and components that make up a business's revenue and profitability. As a result, these trees now make up an essential tool to allow the comprehension of a business as a system model [8].

Based on the researches [4, M. Brandenburg] we can resume the purposes of the VTD application:

- to identify where the biggest constraints are in an organization's ability to create value.

- in conjunction with sensitivity analysis to show which areas are at greatest risk for failing to deliver value.

- to value a range of different investment options to find the optimal combination for creating value.

- to provide transparency at the individual employee level to see how they contribute to the creation of value.

- allow you to benchmark operations that were previously too different to compare through traditional benchmarking methodologies.

One of the basic elements of corporate value is the operating cash flow. We can use it as an instance to visualize ability of VDT to be an element of influence on the indicators of an enterprise financial state.

Planning of future operating cash flows takes place using value drivers. A. Rappaport considers the following value drivers:

Cash Flow = Cash inflows – Cash outflows =
= [(Previous year's sales)*(1+Growth rate of sales) x Operational profit margin.

These are independent of the industry and type of business and are therefore classified as generic value drivers [1]. They can be augmented by business-specific value drivers that are particular to a firm. Using both together we can arrive at operational key figures for planning. The tree diagram (figure 2) helps visualizing the relationships between value drivers and key figures.

The figures (value drivers) that merit the most consideration are those over which the company has a large degree of control (influence) and which greatly influence the corporate value (effect).

So, using value drivers tree, we can select micro-key drivers and it will help analyze narrower branch of financial activity.

To apply the value-based models for influencing on the indicators of the financial state of the enterprise we can build decomposition of free cash flow based on financial statement of PJSC "Zhytomyr Butter Plant".

Figure 3 demonstrates the decomposition of the free cash flow according to the financial results of the company. As we can see, the amount of free cash flow is pretty low for this company.

To determine the causal relationship between a value driver and its children value drivers needs to be defined first. In certain cases, it is difficult to come up with quantitative relationships between a value driver node and its children nodes, because the empirical data for applying regression methods is not always available. So it's going to be in the case to use the Gordon model [5] that is based on estimating elasticity indexes of enterprise value.

It is necessary to assess the value of sensitivity to changes in its components to address the issue of effective levers of influence on the value of the company. For these purposes, it is convenient to consider the elasticity of cost in these variables.

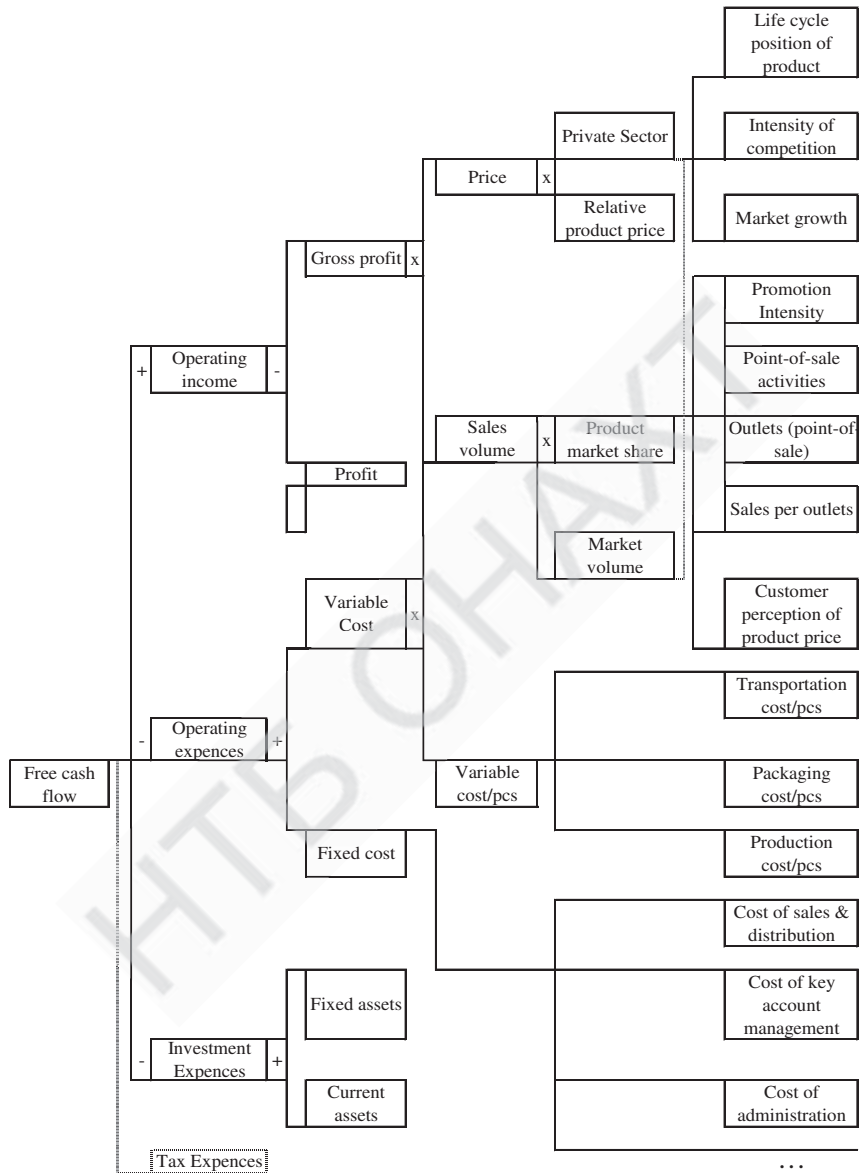
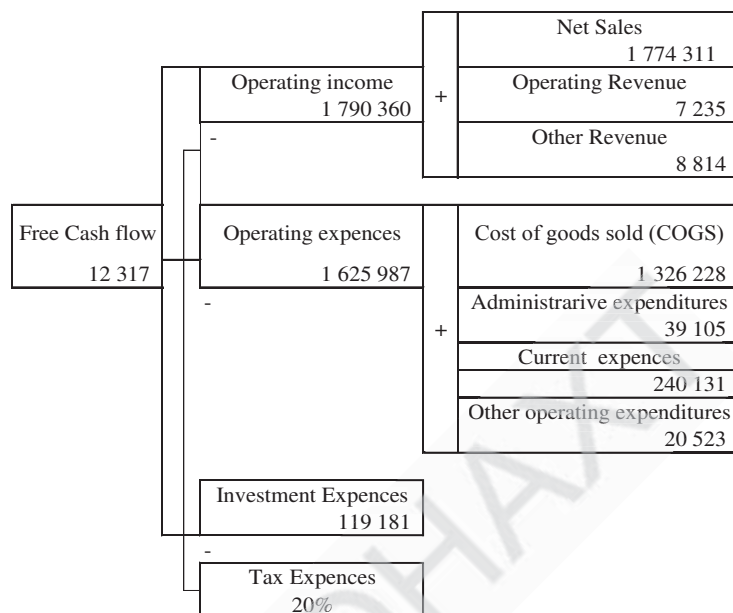


Figure 2. Extended by the author on the basis of the model Free Cash Flow Value Driver Tree of M. Brandenburg [4]



**Figure 3. Free Cash Flow decomposition map
(developed by the author)**

The term "elasticity" shows the percentage change valuation of the company if the cost of the investigated factors ceteris paribus change by 1%. And the cost of the company on the Ukrainian market increases when the financial condition of the enterprise improves.

Elasticity of the cost of the company at the cost of capital is calculated by the formula below:

$$E_r = -\frac{r}{r-g} \quad (1.1)$$

Applying the formula to the data on the company PJSC "Zhytomyr Butter Plant", we obtain the following equation:

$$E_r = -\frac{0,37}{0,37 - 0,29} = -3,08$$

The negative sign of elasticity in formula (1.1) means that an increase in capital costs, with other conditions remaining equal, leads to a decrease in the value of the company.

The elasticity of the cost of the company for the cost of goods sold is as follows:

$$E_c = -\frac{1-T}{FCF/C} \quad (1.2)$$

$$E_c = -\frac{1-0.2}{12317,4/1326228} = -86.1$$

So, the greater share of the cost is in sales (the lower the profitability of production), the more effective the company actions to reduce costs will be in order to improve the financial condition (if other conditions are not changed in process).

The elasticity of the value of cash flow by revenue is as follows:

$$E_S = \frac{1-T}{FCF/S} = \frac{1-0.2}{12317,4/1774311} = 115 \quad (1.3)$$

Equation (1.3) shows that an increase in sales revenue (other things being equal) leads to an increase in the value of the company, and the dependence is nonlinear, which means that the lower the profitability of sales, the stronger the percentage effect of revenue on the company's value change.

Elasticity on profit:

$$E_S = \frac{1-T}{FCF/EBIT} = \frac{1-0.2}{12317,4/164373} = 10.68 \quad (1.4)$$

From the expression (1.4) it follows that the increase in profits results in a proportional increase in the value of the company.

Elasticity of an enterprise by additional investments:

$$E_I = \frac{-1}{FCF/I} = \frac{-1}{12317,4/119181} = -9.68 \quad (1.5)$$

The negative sign of elasticity in formula (1.5) means that an increase in additional investments (with other conditions remaining equal) leads to a decrease in the value of the company.

According to the calculations of value elasticity of different factors we can see that the largest influence have such drivers as revenue and cost of goods sold. Thus, in order to boost the cash flow potential of a company

the most efficient will be company actions for optimizing the factors of revenue and cost of goods sold.

Conclusions

In summary, this case study was able to demonstrate the following: VDT model of the metrics and value drivers of the individual activities is a powerful means of understanding the true impact of decisions made on costs, production, and ultimately value. It exposes the business logic and, even more importantly, integrates all individual disciplines, activities, and variables across the full value chain so that the impact on value can be determined.

As noted above, building VDT allows to focus on key management points of the company. One of the most important factors in the growth of value is the ability of an enterprise to generate cash flows. An important component of cash flow management is their analysis. The offered method of analysis includes the division of drivers according to the levels of influence and the analysis of the elasticity of the influence of factors on the cost of the enterprise.

The study of the calculated coefficients allows to evaluate the efficiency of management of cash flows of the enterprise to establish positive and negative trends, as well as to create information base for the development of strategies for optimizing business processes in the course of financial and economic activity of the enterprise.

References

1. Rappaport A., *Creating Shareholder Value: A Guide For Managers And Investors* / A. Rappaport – 2013 – 112-115 p.
2. Meier M., Sinzig W., Mertens P., *Enterprise Management with SAP SEMTM / Business Analytics* / Meier M, Sinzig W, Mertens P. – 2016. – 118-120 p .
3. Akkiraju R. and Zhou R. Measuring service solution quality in services outsourcing projects using value driver tree approach. In Proc. SRII Global Conference, SRII '12, pp. 191–200. IEEE Computer Society, 2012. doi: 10.1109/SRII.2012.30
4. Brandenburg M., *Quantitative Models for Value-Based Supply Chain Management* / Brandenburg M. – 12 – 13 p.
5. Yesipov, V., Efimovich, M. *Business Valuation: Tutorial*. 3rd ed., 2016

6. HadlakS., SchumannH., and SchulzH.-J. A survey of multi-faceted graph visualization. In EuroVis-STARs. Eurographics Association, 2015.
7. Herman I., MelancG. on and Marshall M. S. Graph visualization and navigation in information visualization: A survey. *IEEE Trans. Vis. Comput. Graphics*, 6(1):24–43, Jan. 2000. doi: 10.1109/2945.841119
8. Kerren A., Purchase H. C., and Ward M. O., eds. *Multivariate Network Visualization*, vol. 8380 of *Lecture Notes in Computer Science*. Springer, 2014. doi: 10.1007/978-3-319-06793-3
9. Schulz H.-J. Treevis.net: A tree visualization reference. *IEEE Comput. Graph. Appl.*, 31(6):11–15, Nov. 2011. doi: 10.1109/MCG.2011.103
10. Tian C., Cao R., Ding W., Zhang H., and Lee J. Business value analysis of it services. In *IEEE Int. Conf. Services Computing (SCC 2007)*, pp. 308–315, 2007. doi: 10.1109/SCC.2007.36

STUDY AND FORMULATION OF THE ORGANIZATIONAL RECOMMENDATIONS: HOW TO REDUCE THE COST OF CUSTOMER SERVICE IN THE TAXI COMPANIES? Autor – Gniady M., Kowalczyk J., Kuśnierz J., Lichwała A., Mikołajczyk M., Supervisor – Okulicz-Kozaryn W.	414
TEPLODAR – CITY OF CRAFTSMEN Author – Zhikhareva N., Novikova O., Supervisor – Braiko M.	420
CREATING A VALUE DRIVER TREE AS AN ELEMENT OF INFLUENCE ON THE INDICATORS OF THE FINANCIAL STATE OF THE ENTERPRISE Author – Dashchenko O., Supervisor – Kasianova A.	440
RESEARCH METHODS FOR CALCULATION COMMERCIAL GOODS` PRODUCTION EFFICIENCY IN AGRICULTURE450 Author – Coleva D., Supervisor – Parmacli D.	450
3. AUTOMATION.....	459
DEVELOPMENT OF REMOTE CONTROL TO TRANSMIT AND DATA PROCESSING WEATHER INFORMATION IN REAL TIME Author – Romanchenko N., Supervisor – Palahin V.	459
ESTIMATION OF CRITICAL SPEED AND STABILITY OF MOTION IN THE AUTOMATED CONTROL SYSTEMS OF RAIL TRANSPORT Author – Kharchenko A., Supervisor – Zakovorotnyi O.	475
4. IT TECHNOLOGIES AND CYBERSECURITY	493
MULTIDIMENSIONAL WAVELET NEURON AND ITS LEARNING FOR PATTERN RECOGNITION TASKS IN THE INTERNET OF THINGS APPLICATIONS Author – Oskerko S., Lutsan V., Supervisor – Vynokurova O.	493
USING OF NLP TECHNOLOGIES FOR EVALUATING THE CRYPTOCURRENCY RATES Author – Gryekhvodov B., Supervisor – Kanishcheva O.	508
INVESTIGATION OF CODE-BASED CRYPTOGRAPHIC TRANSFORMATIONS AND DIGITAL SIGNATURE SCHEMES Author – Kiian A., Supervisor – Svatovskyi I.	525
RESEARCH OF INTELLIGENT NETWORK SERVICES TRAFFIC IN NGN Author – Kondratenko A., Kyslenko M., Supervisor – Kniazeva N.	540
SOFTWARE TRAINER FOR DEMONSTRATING VULNERABILITIES OF WEB APPLICATIONS Author – Babychuk V., Supervisor – Smyrnova K.	555

Наукове видання

Міжнародний конкурс студентських наукових робіт

BLACK SEA SCIENCE 2018

Матеріали

Верстка – Н.М. Ковальчук

Формат 60x84/16. Гарнітура Times New Roman.
Умовно-друк. арк. 48,07. Тираж 300. Замовлення № 0518-105.

Видавництво і друкарня – Видавничий дім «Гельветика»
73034, м. Херсон, вул. Паровозна, 46-а, офіс 105
Телефон +38 (0552) 39 95 80
E-mail: mailbox@helvetica.com.ua
Свідоцтво суб'єкта видавничої справи
ДК № 4392 від 20.08.2012 р.