Measuring the Economic Value of Investment Activities:
A Case Study of Ukrainian Telecommunications Companies

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Abstract: The research in the companies' Economic Value of Investment Activities (EVIA) show the most important problems in creating value for Ukrainian mobile providers are customers' value and differentiation of financing. These problems have appeared not only because of the companies' management mistakes but also there are general conditions on how to provide investment activities in the Ukrainian telecommunications market. A new approach to measure of a company EVIA, considering stakeholders' value metrics, and based on the Distance from a Benchmark Method (DBM) is proposed by authors. The DBM provides an opportunity to quantify such a category as EVIA and compare the key characteristics of several companies' activities simultaneously with the identification of factors that affect the efficiency of investment activities, since this process is based on a significant set of criteria and a multidimensional space. The application of the DBM approach to EVIA assessment, in the presented conditions, on the considered example of Ukrainian mobile operators, allows to identify the main problematic aspects of the level of efficiency of invested capital, customer value and differentiation of financing.

1   INTRODUCTION

On average, a company's investment activities are the defined set of its investment decisions. Every decision has different conditions by investment volume, interest rate, level of risk, and term of implementation.

Results of investment activities from capital and financial investments are implemented in a company's operating and financial activities. It influences the complexity of development tasks that are solved in economic activities of a company. This multi-aspect complicates the management of a company's investment activities, including the measure of investment activities efficiency.

To solve this problem, it is necessary to define and research the wide set of characteristics of economic activities. The paper proposes to do this by measuring a company's Economic Value of Investment Activities (EVIA). Why is this necessary?

In economic theory, Value is a balance between the benefit (result) and the costs associated with obtaining a good. Economic Value is the result of purposeful economic activity that combines the usefulness of a good for the consumer and the costs associated with obtaining it. While remaining a subjective category, the economic value of any object (process or phenomenon) largely depends on its usefulness and has a monetary expression in its market value or in the potential value that parties interested in this object of value are willing to pay. In this context, investment activity through investment costs is an object of management that forms and lays the basis for the development of economic activity of the enterprise on the basis of value.

Currently, Value is a key characteristic of a business. The measure of Value is the basis of a management decisions. An investor has many criteria to determine Value when making a choice on how to invest.

The relevant management concepts that are widespread in practice – Process Approach, Value-Based Management, Total Quality Management, and Balance Score Card are all based on Value.

A new view on the measurement of a company's EVIA opens new opportunities to raise the efficiency of investment activities management.

2 LITERATURE REVIEW

Research in economic value has become relevant over time. There is research that investigates many aspects of creation economic value, including the place of Value Theory in Economics [1]; the process how to create economic value of IT [2]; money's value [3]; the value creation on macro level based on functions between GDP and human and capital resources [4]; as well as the value of faculty working with eye tracking [5]; the value of strategy [6]; the value of artificial intelligence that provides the potential of technology for the economy and society [7] etc. Stefan F. Dieffenbacher [8] defines that in the process of creating value, enterprises should apply a comprehensive approach that focuses on key strategies and practices that ensure their continued competitiveness and relevance in a rapidly changing environment.

In addition, there are other attempts to measure economic value. Tsagkarakis K.A. & Katsikis I.N. [9] consider possible methods to measure the value in different ways. Hejazi R. et. al. [10] propose to find the monetary equivalent of the natural resources in response to a challenge between the environment and development. The article [11] notes that economic value is subjective and dependent on a person's intentions it cannot be directly measured. However, the question how to obtain the integrated score of the economic value has always been relevant.

Previous research [12] defines the theoretical and methodological basis of measuring a company's EVIA based on Value-Based Management (VBM), the Stakeholder Theory, and Benchmarking methods.

Value-Based Management is the strategic management approach. Its goal is to raise the business value for the owners (shareholders) over time [13].

At the same time, the Stakeholder Theory also has a significant following to raise a company's market value but not to measure a company's EVIA. The main position of the Theory is if a company is oriented to increasing value for the stakeholders, it has more chances to reach permanent growth [14, 15]. In fact, the term "stakeholder" first appeared an internal memorandum at the Stanford Research Institute in 1963 [14]: "those groups without whose support the organization would cease to exist."

As a criticism of Stakeholder theory, scientists [16, 17, 18] state that a main function of management is transformed from one factor (shareholders' value) to a multifactor function (stakeholders have different value measurements). This aspect makes the management process more complicated.

Measuring a company's EVIA provides for the estimation of qualitative and quantitative performances of investment, operating and economic activities. These are different by content and measurement units. Thus, it is proposed to measure a company's EVIA using the Benchmarking method.

According to the Benchmarking Theory, there are internal, competitive, functional, and generic benchmarking. Competitive benchmarking is the most useful type to measure a company's EVIA. It is a process of comparing a company's activities to that their primary competitors have been observed to demonstrate superiority in some important elements of performance [19, 20]. The methods of comparative economic analysis as a specific method group of competitive benchmarking are chosen with the aim of providing the possibility for the assessment of the different measurement's units of the metrics. The questions of how to apply these methods to measure a company' activities and to perform the complex economic analysis of economic systems are highlighted in the research [21, 22]. Their research forms the basis of measuring a company's EVIA.

3 MATERIAL AND METHODS

Methods that allow both evaluating results and making management decisions aimed at achieving certain goals include Strategic Management, Strategic Alliances, Benchmarking, the Balanced

Score Card (BSC), the Sum-of-Digits Method, the Sum of Rankings Method, the Taxonomy Method, etc. All these methods operate with multidimensional and complex structures, but not all of them use quantitative methods to make optimal decisions. And given that the management of an enterprise's investment activity is the management of a multidimensional and multicriteria system, we should focus on methods that largely determine the choice of the best solutions based on the economic value and the best result in a multi-stage investment process. And if we consider investment activity as a multidimensional cybernetic system, then the assessment of its effectiveness should be chosen to meet the criteria for optimal search for the best solutions.

One of the peculiarities of companies' investment activities is the dynamism and multi-stage nature of the investment process. It is the utilization of dynamic programming method that allows for optimizing decisions at each stage of the investment process because, as a rule, simple summation of results from individual stages does not yield the optimal solution. The control vector of dynamic programming systematically conducts step-by-step maximization of the total sum of the objective function, for instance, quarterly expenses are optimized to achieve the best outcome by the end of the period.

To address applied economic problems, particularly those related to measuring the EVIA, which reflects the multifaceted nature of investment activities, a modified method of goal programming is applied. This method belongs to quantitative methods and doesn't take into account the preferences of the person making management decisions. It is based on a combination of linear programming and the method of sequential narrowing of the distance from the benchmark. This method is mostly used to find optimal solutions in managing company activities, as the decision-making process is based on a significant set of criteria, the consideration of which requires appropriate compromises in defining a multidimensional space. Therefore, there are certain grounds to apply it in our research, under the generalized name - Distance from a Benchmark Method (DBM). All other methods based on the evaluation of preference functions, such as: a priori, a posteriori, and interactive (based on pairwise comparison of solutions) methods, involve introducing a linear programming problem into a multicriteria optimization system.

The application of DBM for measuring the economic value of a company's investment activities requires the development and justification of a system of quantitative indicators, the involvement of which will provide the possibility of comprehensive evaluation of value and formation of a multi-criteria vector – the results of the company's investment activities. By comparing such vectors in the set of vectors of other evaluation objects, the search for the optimal vector – benchmark is ensured, which consists of maximum values of criteria that collectively represent the optimal economic value of the company's investment activities according to defined objectives. The substantive content of quantitative indicators applicable for evaluation should consider the specificity of evaluation objects and modern requirements for evaluating the efficiency of a company's investment activities, particularly its economic value. Processing the results of quantitative evaluation and finding the benchmark among the set of objects requires managerial decisions aimed at improving the efficiency of the company's investment activities by determining deviations (distances) from the benchmark, thereby demonstrating an increase in economic value.

It is important to notice that the method can be used in both measuring a current score of an object and to get a forecast score of the object.

Despite the advantages, there are some disadvantages. There is a possibility to get contradictions of results without previous data analysis. It is necessary to have a high level of knowledge in the appropriate field to apply the method [22, 23].

The procedure of applying the DBM for measuring a company's EVIA can be defined in three stages:
1) Establish of a company's EVIA indexes and set a benchmark at the selected company.
2) Transform the indexes to the standard score.
3) Calculate the integrated score of a company's EVIA.

The establishment of a company's EVIA indexes is grounded on the characteristics and valuable aspects of a company's stakeholders.

The transformation of the indexes to the standard score. The calculation of the *standard score* for every single index. In this case, it is necessary to define the correspondence between the level of a factual singular index and its benchmark.

$$I_{EVi} = {SI_{EVi}}/{BI_{EVi}}, \qquad (1)$$

where I_{EVi} – a standard score for a singular index of economic value; SI_{EVi} – a factual singular index of economic value; BI_{EVi} – the benchmark for the singular index of economic value.

The benchmark for every singular index is the highest economic value that equals 100%. Therefore, its standard score is one. Every singular index of economic value receives its benchmark measure. The benchmark reflects the best level of an index that selected company reached during past seven years.

The *integrated score of a company's EVIA* is defined as a sum of the standard scores of the singular indexes of economic value, considering the weight of the singular index in the integrated score:

$$\text{EVIA} = \sum_{i=1}^{n} I_{EVi} \times w_{I_{EVi}}, \qquad (2)$$

where n – number of a singular index of a company's EVIA; $w_{I_{EVi}}$ – the weight of the singular index in the integrated score.

The weight of the singular economic value index in the integrated score defined by experts.

4 RESULTS AND DISCUSSION

The essence of EVIA is elaborated through links between its need, utility, and cost. These are the key notions of economic value [12].

EVIA reflects the significance of investment activities to save and develop a company's economic activities through an influence on its results, thus creating Economic Value Added (EVA).

A company's Need of Investment Activities (NIA) is the ability to create the basis to save and / or increase the economic activities value by the activation of value drivers, which are capital and financial investments

A company's Cost of Investment Activities (CIA) is a monetary extent of its economic value. That can be characterized in absolute terms by a total amount of factual or planned investment activities for a certain period of time, and in a relative measure as the share of investment activities in Income (Capex Ratio).

EVIA as an internal characteristic is studied through the conditions and efficiency of investment decisions, indexes of development of operating and financial activities, and summarizing performances of the economic activities by a stakeholders' value chain (Figure 1).
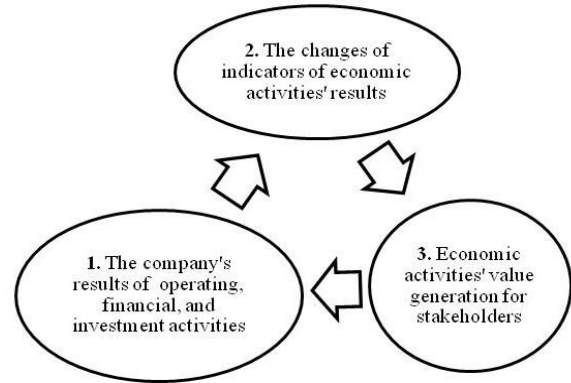

Figure 1: The stakeholder value chain of a company's economic activities.

This paper gives an example of the application of the DBM for measuring EVIA for telecommunications provider.

The NIA for a telecommunications provider is a scaling up of capital investment in new technologies and communications standards to provide the growth of a telecommunications network's capacity. This necessary growth stems from Information and Communication Technology (ICT) spreading through society.

The NIA for a telecommunications provider forms the basis of its existence. The Utility of Investment Activities (UIA) can be reflected in qualitative indexes of the development of capital and intangible assets of operating activities. There are indexes of an accessibility of services to customers such as a network coverage, technical indicators of capacity, bandwidth, and transmission speed. In addition, this utility can be reflected in energy efficiency, environmental friendliness of a network, etc (Figure 2).
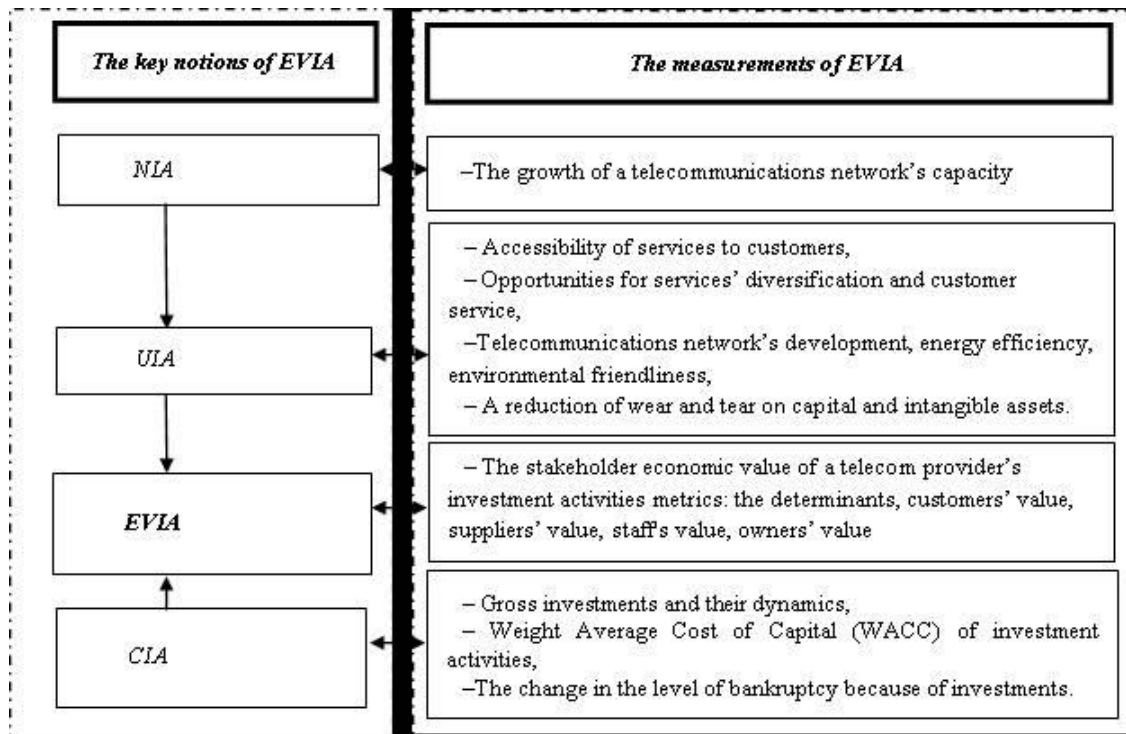
Figure 2: The links and content of key notions of a telecommunications company's EVIA.

Technical indexes of a telecommunications network development are indicators for stakeholders that characterize future prospects of the stakeholders' value changes. These value changes are connected with different facets of investment decision implementation and their influences on a telecommunications provider's economic activities. The important significance for UIA is the wear and tear on capital and intangible assets. It reflects whether or not there are enough investments in the renewal of assets.

The summary of the result of previous research [12] provides an opportunity to establish the list of EVIA indexes of a telecommunications provider:

1) The determinants: technological leadership, differentiation of services, return on invested capital (ROI), capex ratio, differentiation of financing; payback period.
2) Customers' value: saving of the subscriber base, upturn in the subscriber base, upturn in the average revenue per user (ARPU).
3) Government's value: increase in the internet-traffic, tax payments.
4) Suppliers' value: amount and change of material expenses, the share of the permanent suppliers.

5) Staff's value: wage Increase, staff's productivity.
6) Owners' value: dividends increase, competitiveness; EVA.

The indicators provided by the authors of the article have been chosen as those that most effectively reflect the efficiency of the investment activities of a telecommunications provider in terms of economic value. They reflect the technical and economic efficiency of a telecommunications provider's investment activities results. In addition, the features of telecommunications activities are reflected in the list of the singular value indexes. However, this list of indicators is not exhaustive; the number of indicators and metrics can be expanded or narrowed depending on the goals/object of comparison. Therefore, the authors of the article recommend considering the indicators as a conditional example set of EVIA indices for research purposes and demonstrating the application of DBM.

In order to set a benchmark, it is necessary to select a representative company and define benchmarks measurements. According to the data cited from Complex Statistical for the period 2015-2022 [24], as well as taking into account the

previous investigation [13] has shown that big non-Ukrainian companies that provide permanent investment police obtain better general economic results. Among Ukrainian telecommunications providers has approximately the same investment police only Private Stock Company (PrSC) "Kyivstar" [25]. It is also a leader in the Ukrainian telecommunications. For that reason, PrSC "Kyivstar" was chosen as the Benchmark Company.

The best level of PrSC "Kyivstar" EVIA indexes for 7 years and denote by convention the periods P1 - P8 are used as the benchmark. The list of the EVIA benchmark measures of a telecommunications provider is given in Table 1.

The measurement of a telecommunications provider's EVIA is taken from two the largest mobile providers of Ukrainian communications – PrSC "Vodafone Ukraine" and PrSC "Kyivstar".

Some aspects of a telecommunications provider's EVIA are considered next. Among the characteristics of an economic value, there are particular singular indexes. They require the used a special consideration as how to clarify an economic value benchmark standard of the telecommunications company's investment activities.

Table 1: The EVIA benchmark measures of a telecommunications provider.

The singular value index	Characteristic of standard benchmark measure	Benchmark Measure	Benchmark Standard	Weight
The determinants of EVIA				
1. Technological leadership, stations	Number of 4G base stations	7139	1	0,1
2. *ROI*, %	The efficiency of invested capital as a ratio between Net Operating Profit (*NOPAT*) and Capex	42	1	0,04
3. Capex Ratio, %	The ratio between Capex and company's Revenue	16	1	0,04
4. Differentiation of financing, %	The minimum *WACC*	8,3	1	0,05
5. Payback Period, years	The period of time between technology 3G to 4G in Ukraine	3	1	0,05
6. Differentiation of services, (the content of service list)	The maximum service types that are accessed to use at a mobile provider in Ukraine	1	1	0,09
Customers' value				
7. Saving of the subscriber base, subscribers	Subscribers loss of	0	1	0,05
8. Upturn in the subscriber base, %	The maximum upturn in the subscriber base	3	1	0,05
9. Upturn in *ARPU, %*	The maximum upturn in *ARPU*	14	1	0,04
Government's value				
10. Increase of the internet-traffic, %	The maximum yearly upturn	200	1	0,04
11. Tax payments, UAH billion	The place in the taxpayer list (first)	5 047,7	1	0,06
Suppliers' value				
12. Amount and change of material expenses, %	The increasing of material expenses	1	1	0,04
Staff's value				
13. Wage Increase, %	The increase of the company's average salary greater than the average in Ukraine	20	1	0,08
Owners' value				
14. Dividends Increase, %	The year upturn of the dividends	176	1	0,09
15. Competitiveness, %	The maximum share in the telecommunications market	50	1	0,08
16. *EVA*, UAH billion	*NOPAT – WACC*	3724	1	0,1

For example, according to the official data PrJSC "Kyivstar" Disclosure of Information: PrSC "Kyivstar" is the leader by the number of 4G base stations in Ukraine with 7139 stations in P_8 [25]. PrSC "Vodafone Ukraine" had 6058 4G base stations in P_8 [26]. So, the *singular index "Technological leadership"* of PrSC "Vodafon Ukraine" ($I_{TL.VF}$) is calculated thusly:

$$I_{TL.VF} = {NBS_{VF}}/{NBS_{BM}}, \qquad (3)$$

where NBS_{VF} – the number of 4G base stations of PrSC "Vodafone Ukraine"; NBS_{BM} – the benchmark measure, the number of 4G base stations of PrSC "Kyivstar".

The singular index "Differentiation of services" is a value index in the metrics "The determinants of the economic value" because capital investments in new technologies and equipment provide modern and qualitative services. The index shows the opportunities of a mobile company's customers to get any mobile service that is accessible in Ukraine.

The singular index "Saving of the subscriber base" can be measured through the existence or absence of the loss of customers. Therefore, if the telecommunications provider in the year of measured has the same or bigger subscriber base, the loss of customer is zero, and the benchmark standard of the index "Saving of the subscriber base" is one.

The singular index "Wage Increase" has a percent of average wage annual increase rate in Ukraine as a benchmark measure. Ukraine has a 20% average wage annual increase rate in P_8. If company has the same increase in wages or it is higher the singular index "Wage Increase" is one.

Table 2 presents the results of the economic value measure of PrSC "Vodafone Ukraine" and PrSC "Kyivstar" investment activities.

The results of measuring the companies' EVIA allow some conclusions. The EVIA integrated score of PrSC "Kyivstar" is 0,84. It is a high economic value level. However, such result shows that there are some problematic aspects. The most problematic aspect is customers' value. The indexes "Saving of the subscriber base" and "Upturn in the subscriber base" got a zero-standard score. It is a problem because they represent 10% of telecommunications provider's EVIA. In addition, a challenging characteristic is "Differentiation of financing". It is general for Ukrainian enterprises to have a difficulty in obtaining sufficient and timely funding. The company has enough high level of WACC and continues to apply traditional tools of financing.

Table 2: The EVIA measuring of PrSC "Vodafone Ukraine" and PrSC "Kyivstar".

The singular value index (measurement units for the singular value indexes see Table 1)	PrSC "Kyivstar"			PrSC "Vodafone Ukraine"		
	FM	SM	SMw	FM	SM	SMw
1. Technological leadership	7139	1	0,1	6058	0,85	0,09
2. *ROI*	39,5	0,9	0,036	10,6	0,25	0,01
3. Capex Ratio	16	1	0,04	21	1	0,04
4. Differentiation of financing	13,1	0,1	0,005	13,5	0,00	0,00
5. Payback Period	1,86	1	0,05	3,17	0,94	0,05
6. Differentiation of services	1	1	0,09	1	1	0,09
7. Saving of the subscriber base	-100	0	0	-1100	0	0,00
8. Upturn in the subscriber base	-	0	0	-	0	0,00
9. Upturn in the *ARPU*	18	1	0,04	17	0,94	0,04
10. Increase of the internet-traffic	150	0,75	0,03	200	1	0,04
11. Tax payments	5047,7	1	0,06	2439,1	0,48	0,03
12. Amount and change of material expenses	1	1	0,04	- 2	0	0,00
13. Wage Increase	29	1	0,08	29	1	0,08
14. Dividends Increase	176	1	0,09	- 29	0	0,00
15. Competitiveness	54,5	1	0,08	36	0,65	0,05
16. *EVA*	4356	1	0,1	-414,6	0	0,00
Integrated score of EVIA	-	12,75	0,84	-	7,46	0,51

FM – *a factual measure of a singular value index;* SM – *a standard measure of a singular value index;* SMw – *a standard measure of a singular value index considering the weight.*

The EVIA integrated score of PrSC "Vodafone Ukraine" allows the definition of the main problematic aspects of the level of invested capital efficiency, customers' value, and differentiation of financing. As a result, the company has a much lower level of EVIA.

5   CONCLUSIONS

This paper considered were approach to measure a company's EVIA. It presents a new understanding of the content of economic value that reflects relationships between investment activities and the financial results of a company's economic activities, considering the value characteristics of the stakeholders.

The developed approach to measure a company's EVIA is universal and, unlike existing ones, is based on six blocks of indicators of economic value (the determinants; Customers' value; Government's value: Increase in internet traffic, Tax payments; Suppliers' value; Staff's value: Wage Increase, Staff's productivity; Owners' value), each of which includes a range of indicators depending on the goals and the object of comparison and involves a combination of linear programming methods with the method of sequential narrowing of the distance from the benchmark, referred to in the paper as the DBM.

The measurement of the EVIA, demonstrated in the article using Ukrainian telecommunications companies as an example, proves the possibility of quantitatively assessing the subjective category of value as a dependence of the outcome (the utility of effective investment activities) on the costs incurred (invested capital, customers' value, and differentiation of financing). Employing the approach utilizing DBM, proposed by the authors of the article, will facilitate solving an applied economic problem related to measuring EVIA, reflecting both the multifaceted nature of investment activities and the ability to compare key characteristics of the activities of several companies simultaneously and identify factors influencing the efficiency of investment activities.

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