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## DIVERSIFICATION: THE SYNERGETIC EFFECT OR THE MULTIPLIER OF COMPLEMENTARY

UDC 338.33

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The synergistic effect of the conglomerated diversification at the enterprises is investigated. Herein the existing methods of calculating the synergistic effect are reviewed and it is shown that it is impossible to use them for pre-calculating the synergistic effect in combining the enterprises. A supposition that the synergistic effect occurs when there is a complementary relationship between goods and services

produced by the combining enterprises is substantiated. A fundamentally new approach for determining the synergistic effect based on the multiplier of complementarity is proposed.

*Key words:* conglomerate diversification, synergistic effect, strategic management, multiplier of complementarity, effectiveness of diversification, discount method.

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## ДИВЕРСИФІКАЦІЯ: СИНЕРГЕТИЧНИЙ ЕФЕКТ АБО МУЛЬТИПЛІКАТОР КОМПЛЕМЕНТАРНОСТІ

УДК 338.33

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Досліджено синергетичний ефект під час проведення конгломератної диверсифікації на підприємствах. Розглянуто існуючі методи розрахунку синергетичного ефекту, показано, що на їх основі неможливо заздалегідь розрахувати синергетичний ефект при об'єднанні підприємств. Обґрунтовано припущення, що синергетичний ефект виникає при наявності комплементарного зв'язку між товарами і послугами, які випускають підприємства, що об'єднуються. Запропоновано принципово новий підхід визначення синергетичного ефекту на основі розробленого мультиплікатора комплементарності.

*Ключові слова:* конгломератна диверсифікація, синергетичний ефект, стратегічне управління, мультиплікатор комплементарності, ефективність диверсифікації, метод дисконтування.

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## ДИВЕРСИФИКАЦИЯ: СИНЕРГЕТИЧЕСКИЙ ЭФФЕКТ ИЛИ МУЛЬТИПЛИКАТОР КОМПЛЕМЕНТАРНОСТИ

УДК 338.33

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Исследован синергетический эффект при проведении конгломератной диверсификации на предприятиях. Рассмотрены существующие методы расчета синергетического эффекта, показано, что на их основе невозможно предварительно рассчитать синергетический эффект при объединении предприятий. Обосновано предположение, что синергетический эффект возникает при наличии комплементарной связи между товарами и услугами, которые выпускают объединяющиеся предприятия. Предложен принципиально новый подход определения синергетического эффекта на основе разработанного мультипликатора комплементарности.

*Ключевые слова:* конгломератная диверсификация, синергетический эффект, стратегическое управление, мультипликатор комплементарности, эффективность диверсификации, метод дисконтирования.

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Diversification and the synergistic effects are the core interest aspects in contemporary economics. A vast number of scientific papers are dedicated to further

studying of synergism and diversification issues – that certainly come as no surprise, as the very purpose of achieving synergistic effect that serves as the basis for

economic decisions made in the area of diversification as the strategic goal of business development. In most cases synergism is regarded, first and foremost, as the process of amplifying the efficiency of using the company's resources.

I. Ansoff remarked that the primary goal of diversification was to attain the synergistic effect. The same point was emphasized by F. Trotwein, who used to say that the majority of practical recommendations found in various business administration literature regarding company acquisition held true only when the synergistic potential is fully realized.

Scientific investigation into the nature of synergistic effect is reflected in a number of papers by both Ukrainian and foreign researchers. A considerable contribution in developing separate theoretical and methodological foundations of the concept of synergistic effect was made by such scientists as: D. Aaker, I. Ansoff, E. Campbell, Druzhynin A. V., W. Gregor, Golovina G. P., H. Itami, Lyakhov A. V., Neil V. K. Harper, E. Struk, Tereshchenko O. O. and a great number of others.

The purpose of this paper is to unify the worldwide experience in implementing diversification, as well as to single out and justify the most influential factor in terms of determining the success of diversification.

The basic premise behind the synergistic effect states that producing multiple types of goods within a single well-integrated enterprise is much more profitable than creating the same goods separately in smaller-scale specialized enterprises – meaning that it integrally follows the process of their diversification. However, this is not a universally established correlation, although it can be applied to many enterprises of various types [1].

Those who study the synergistic effect say that, among the best business administration strategies utilized by successful companies, diversification is in the lead. Businesses that managed to undergo effective diversification do not only survive as a result, but also can significantly increase the profits of their shareholders [2]. However, the questions of when and how this strategy should be deployed are left unanswered.

Conversely, unneeded diversification can inflict major financial damage on businesses. After numerous studies D. Aaker arrived at the conclusion that within the first months after a takeover was announced, the "target" company's share value increased by an average of 22 %. But in 60 % of cases such takeovers caused substantial diminishment of a company's net worth – most of the time for a term of up to 12 months [3].

E. Struk concluded that 70 % of mergers and takeovers couldn't actually achieve the synergistic effect intended [4].

Let us look more closely at the most famous occurrences of diversification gone wrong.

In 1994 p. Quaker Oats company purchased the rights to produce the "Snapple" soft drink for 1.6 billion dollars. Acquisition of The Learning Company – the developer of popular children development systems (such as "Reader Rabbit", "Learn to Speak" and "Oregon Trail") – by the Mattel corporation, a renowned manufacturer of

children's toys (Barbie dolls in particular), was a perfectly logical step. However, only half a year after the 3.5-billion-dollar deal Mattel passed its ownership of The Learning Company, virtually giving it away, simply to rid itself of the expenses that were piling up.

Another example would be the conglomerate created by Sears through acquiring the Coldwell Bankers real estate agency and the Dean Witter broker company in order to add them to their insurance firm Allstate Insurance, Allstate Savings and Loan, as well as 25 million active users of the company's payment system. However, Sears never managed to utilize the synergistic effect properly: the merger caused all of the top experts on mortgages and banking at Dean Witter to quit, as they were dissatisfied with the company's corporate culture [3].

The experience of Italian Fiat Group is a textbook example of unsuccessful integration during the conglomerate diversification. Until the early 2000's Fiat held sway of the European market of automobiles and had an annual goal of 4 million vehicle sales well within its grasp. Market analysts name unsuccessful diversification as the primary reason behind the company's ensuing failures, as the process was characterized by needless dispersion of its resources and assets. Its disjointed inconsistent investment activities (investing in Italy's banking, insurance, chemical and aerospace industries, media and telecommunications, as well as defense) prevented allocation of additional funding to the company's primary segment – automobile production. Logically, a decrease in the quality of vehicles followed, and as a result – a drastic downfall in sales [5].

The merger of Daimler-Benz and Chrysler was meant to result in a significant synergistic effect. However, the burden of accommodating two vastly different organizational structures, systems and cultures under unified management not only proved to be too impractical to carry out, but also produced additional problems. The following steep and rapid decrease in market value of the newly established company group exceeded 36 billion dollars that Daimler-Benz had paid for acquiring Chrysler.

There are many similar examples. For instance, Avon suffered a fortune in financial losses after acquiring Tiffany & Co and the perfume company by the name of Giorgio Beverly Hills, partly due to overpaying for both of them. The same can be said with regards to the acquisition of Snapple by the Quaker company and a plethora of other cases [3].

Financial giants, like American Express, BankAmerica Corp, Citicorp, Merrill Lunch, Prudential and Sears Roebuck reacted to the changes in economic environment of the 1970 s and 1980 s by undertaking a wide diversification of their activities. Achieving synergism through diversifying their range of services (from banking to insurance and credit card services) was their main purpose. Researchers state that the results attained by those six companies were quite humble and none of them managed to outperform their more specialized competitors during the period of 1977 – 1986. The companies that allocated the most resources and management efforts to achieving the synergistic effect failed as a result, proving

themselves unprofitable and strategically inconsistent where the new areas of business were concerned.

Diversification undertaken by those companies through breaking into banking and investment spheres yielded profits that were below the average industry standard. For example, profits on the assets of those corporations that had undergone diversification averaged 10 % less than they were four years prior. Additionally, profits on investment capital decreased by 24 % [6].

Thus, the question arises as to the reasons behind unsuccessful diversification. The assumption that the management of the above-mentioned companies had simply acted baselessly, on intuition, with no reference to fundamental economic research done by in-company specialists and external consultants, would be shallow and inadmissible. It would also contradict the conventional practice of commissioning economic studies to various research groups based on several reliable methods of assessing diversification. Let us analyze the most widely used methods for evaluating the synergistic effect of diversification. It worth noting that they do, in fact, have one characteristic in common – that is, virtually all scientists assert that these methods cannot reliably predict the synergistic effect.

For instance, A. Druzhynin remarked that the synergistic effect on enterprise level can be assessed only by using the data about its functioning, the result of interaction between four types of synergy: sales, investment, management and general efficiency, which define the structure of any company's economic activities [7]. We hold the view of synergy as an integral concept, capable of manifesting itself through different types of business activities. However, the impossibility of evaluating the synergistic effect preliminarily has been confirmed through both theory and practice.

M. Porter asserted in one of his articles that the only successful diversification strategy was the permitted generalization and unification of a company's practices, as well as a carryover of skills from sphere to sphere.

Economics researchers suggest different methods for quantifying the synergistic effect. The overall effect from carrying out the diversification strategy, which includes the synergistic effect that demonstrates itself in income increase and cutting of current costs due to the expansion of business activity, can be expressed with the following formula:

$$E_{\text{сard}} = \sum_{t=1}^{T_d} \frac{[(\Delta D_{dt} + K_{dt} + A_{dt}) - (B_{dt} + \Pi_{dt} + \text{ББ}_{dt})]P_t}{(1+r)^t} - \sum_{t=1}^{T_d} \frac{\Pi K_{dt}}{(1+r)^t} + \sum_{t=1}^{T_d} \frac{\text{EB}_{dt}}{(1+r)^t} \quad (1)$$

wherein  $\Delta D_{dt}$  is the increase in income (revenue) through the realization of the diversification strategy, received in the 1st-year due to the expansion of production, thousand hryvnias;

$T_d$  is the term of applying the diversification strategy (the impact of the diversification factor), years;

$K_{dt}$  is the bank credit opened in the 1st-year, which is necessary for diversification, thousand hryvnias.

$A_{dt}$  is the annual amortization cost for the 1st-year, due to installation of new equipment needed for diversification, thousand hryvnias;

$B_{dt}$  is the current expenses in the 1st-year on producing additional goods as a result of diversification, thousand hryvnias;

$\Pi_{dt}$  is the income tax on revenue from diversification, thousand hryvnias;

$\text{ББ}_{dt}$  is the interest rate for the credit that was needed for diversification, paid in the t-year, thousand hryvnias;

r is the discount rate, adjusted for possible inflation, %.

$P_t$  is the amount of credit due in the 1st-year, thousand hryvnias;

$\Pi K_{dt}$  is the probability of selling the newly manufactured goods as a result of diversification (the probability of acquiring the revenue planned);

$\text{EB}_{dt}$  is the savings on current costs that arise due to lowering the share of quasi-fixed costs; possibly, the new goods are created in the same facilities using the same equipment, kept in the same storage rooms and handled by the same personnel as the "usual" products, thousand hryvnias [8].

The revenue approach to assessing a company's value consists of several methods, discounted cash-flow, or DCF-method being the one that is most frequently used. The discounted cash-flow method is based on the concept of current value of the assessed company's future revenue stream, broken up in separate periods [9]. According to it, the value of any company can be calculated through applying the following ration:

$$V = E + D = \sum_{i=1}^{\infty} \frac{\text{FCF}_i}{(1+r)^i} \quad (2)$$

wherein V (Value) – the value of the enterprise in question;

E (Equity) is the current cumulative value of a company's shares;

D (Debt) is the short-term and long-term debt owed by a company,

i is the number of years;

FCF (Free Cash Flow) is the free revenue stream of the enterprise in the 1st-year;

r is the discount rate [10].

According to DCF, the actual value of a company equals the sum of all costs it will generate in the span of its existence. The discounting formula is as follows:

$$\text{NPV} = \sum_{i=1}^n \frac{\text{CF}_i}{(1+r)^i} \quad (3)$$

wherein q is the discount rate;

CF is the cash flow in the 1st-year [11].

As to assessing a company's market worth, traditional approaches usually disregard the possibility of

management taking flexible measures in the changing the indefinite internal and external environments. Those conventional ways have their particular limitations. For instance, when using the expense approach, it is common to face the following contradiction: if the assessment of net assets shows that company's value deteriorates into negative numbers, the market price of its shares can still remain very high in spite of this.

At the same time, income-orientated approaches are prone to underestimate the value of those enterprises that operate under very dynamic and uncertain market conditions. This leads to the objective necessity to formulate new methods of assessing the value of businesses – ones that would take the dynamic development and the investors' expectations into account. Real options valuation method, or ROV, is one of them.

The preferred models to use in the context of the real options valuation method are the binomial model and the Black-Scholes model. At the moment ROV has not yet been universally recognized, so its capabilities and possible application are a subject to heated debate.

It's worth noting, however, that the real options valuation method offers something that other methods don't – the ability to evaluate the relevance of various management strategies and the potential of a company to perform effectively under changeable economic conditions. This, in turn, facilitates in obtaining a more objective assessment of an enterprise. The amount of attention paid to ROV by experts on business analysis warrants the conclusion that it broadens the possible applications in business environment of the data obtained through such evaluation. According to the real options valuation model, the value of a company is represented by its call-option, which is in turn comprised of the company's assets and liabilities.

The Black-Scholes dynamic model is especially relevant when attempting to assess the market worth of a company with assets and liabilities that fluctuate in value and permit a quantitative comparison. The real options valuation method based on the Black-Scholes model can also be used for evaluating commercial banks, because their assets and liabilities are often virtually equal to the way such businesses operate – mainly, by taking in external capital. Under present conditions this particular model is often used for business evaluation.

Unlike many of the more traditional approaches, the options method is not as time-intensive: collecting and processing a great volume of financial data is not required. For this reason it becomes an instrument of choice for conducting express-analysis of banking activities, particularly when a shift in the financial market occurs or a typical management decisions are made. Obviously, if one can accurately monitor the dynamic of changes in the value of a bank, one can also draw conclusions about the results of its activities [12].

The majority of methods mentioned above are built on the use of discounting. However, this approach dictates that all variables are very time-dependent. Which means it's extremely difficult to assess how much time it is actually going to take for the synergistic effect to manifest

itself. This period can take anywhere from a couple of months to several years – which means that these methods are very approximate and have limited predictive value. Moreover, various researchers have come to a unanimous conclusion that the synergistic effect cannot, in fact, be pre-calculated, and can only be identified post-hoc, after a considerable amount of time has passed. Thus, the famous formula by I. Ansoff can be interpreted as " $x=5-(2+2)$ ". Precisely because the synergistic effect is so resistant to preliminary assessment we can observe so many cases of diversification gone away.

Let us revisit the above-mentioned examples. Obviously, the methods we have described so far fail to take into account a substantial factor that it is important for achieving additional – beneficial – economic effect. In our opinion, this factor is the complementarity effect. Truly, not a single case of mergers and acquisitions described above occurred between enterprises producing complementary goods – such that would add to the value and function of one another. Moreover, the management systems of those companies proved impossible to unify for the purpose of using their cumulative experience and know-how's. It would seem that combining Daimler-Benz and Chrysler under a single management was doable, but their products (automobiles) were substitutes of one another, and not complementary goods. Thus, we can assert that the complementarity factor is one of the defining elements that determine whether diversification process will end in success or failure. We don't necessarily mean the complementarity of products and services, but also supply and sales' structures, as well as management models.

The idea of incorporating the concept of complementarity into diversification strategies was first suggested by the Japanese scientist H. Itami. He described the synergistic effect as consisting of two elements – the complementarity effect and the synergy itself. He maintains that the complementarity effect arises when material assets are used, and it strives to fully utilizing the resources available, whereas the synergistic effect uses the intangible resources and assets [13]. From our point of view, the concept of complementarity becomes too narrow if formulated like that, which can lead to grave mistakes when implementing diversification.

Diversification is, basically, a business survival strategy. When one industry is in crisis and the other is not, or when drastically different levels of industry profitability exist. Complementarity assumes something different – coherency in the final goal of production. Synthesizing these two approaches in the manner of integration (enterprise agglomeration) can yield a positive synergistic effect. Pure diversification that doesn't take complementarity into account may prove unprofitable. Of course, complementarity itself can have a very general interpretation, even in the "industry-banking" system. In other words, complementarity is the source of synergistic effect.

The most vivid example of the complementarity effect taking action (at least in the automobile industry) is that of Volkswagen Käfer model. Its sales didn't start off

very well in USA until the company made an ingenious advertising move. Volkswagen Käfer was marketed as the second household car, or "the wives' car". Thus, the Volkswagen management made their car complementary to all the business-class vehicles of any other brand. Volkswagen became one of the most popular car brands, and the rest is history

Let us look at another two closely related businesses that underwent an unsuccessful merger. General Foods, a canned goods manufacturer, bought Burger Chief – a fast-food chain comprising 700 restaurants. It would seem that the companies could find common ground, both of them operating in the food industry. However, the complementary connection simply wasn't there – canned goods and restaurant business didn't have a common link, save for using famous brand names. Therefore, the synergistic effect could not occur. Conversely, Yamaha provides an example of two radically different industries – motorcycles and musical instruments – synergizing exceptionally well; they do have a certain complementarity: many bike aficionados also feel passionate about hard rock and heavy metal music.

Therefore we assert that the complementarity criterion is essential when determining the necessity of diversification of goods or services – and success thereof. Enterprises don't have to operate in similar industries: for instance, a car manufacturer can break into the market of motor oils or tires. In such case, in spite of many differences in production areas and technological aspects the complementarity effect will be achieved and such a conglomerate will prove sustainable

For more reliable preliminary calculations of the synergistic effect that is expected from diversification, we suggest using a multiplier as our chief instrument. Multipliers are used primarily in macroeconomics and are almost never applied to microeconomics and strategic management. In our opinion, there are historical reasons for this; as I. Ansoff, the founder of strategic management, defined his attitude to macro- and microeconomics "Microeconomics as the primary part of economic theory that formulates the goal of profit-maximization – did not take on a more generalized interpretation for two reasons. Firstly, it is a stable theory that only holds true under the conditions of equilibrium, and therefore provides for no differentiation between short-term and long-term perspectives. Secondly, in the microeconomic theory there is no distinction between investments that yield current and future revenue" [14].

Such a negative position resulted in abandonment of the functional mathematical apparatus developed within this theory, as it was considered useless for the purposes of strategic management.

We suggest using the multiplier for preliminary assessment of the impact of diversification based on the indicator of cross-elasticity of goods X, Y.

$$E_{xy} = \frac{\Delta Q_x}{Q_x} \div \frac{\Delta P_y}{P_y}, \quad (4)$$

wherein  $Q_x$  is demand for product X;

$P_y$  is a price of product Y.

It is impossible to use the elasticity coefficient directly. The problem, apart from its value becoming negative when evaluating complementary goods, is also its ability to equal less than one or more than one – regardless of the goods in question. Based on the elasticity coefficient, we suggest introducing the complementarity multiplier ( $M_k$ ) that would equal more than one for complementary goods, one – for goods independent of each other, and from zero to one – for substitute goods. With some degree approximation, it can be achieved as follows.

$$\text{if } E_{xy} < 0, \text{ then } M_k = 1 - E; \quad (5)$$

$$\text{if } E_{xy} > 0, \text{ then } M_k = 1/(1+E); \quad (6)$$

$$\text{if } E_{xy} = 0, \text{ then } M_k = 1. \quad (7)$$

Thus, in case of a company merger, a preliminary assessment can be conducted to find out if the demand for goods will increase: the existing demand is multiplied by the complementarity multiplier. However, an important nuance must be considered – cross-elasticity of demand is often asymmetrical. This means that oftentimes raising the price of product Y will lead to product X decreasing in demand; on the other hand, upping the price of product X can have no effect on the demand for product Y, or affect it disproportionately. Cars and petrol are a good example: decrease in car prices automatically causes the demand on both vehicles and fuel to go up. Conversely, increasing the petrol prices may lead to compact, fuel-efficient cars becoming more popular. The Giffen paradox can also affect the formula.

The multiplier we suggested can be appropriately used to assess pairs of goods: every product or service of an existing business is compared to that of an enterprise, which is acquired or merged with it. Then the cumulative effect is analyzed and a synergy check is performed: it is estimated, whether the synergistic effect will occur as a result of a merger or acquisition. If the projections for possible profit exceed the combined value of two products sold by both enterprises, it means that synergy is possible. If not, then a further re-evaluation of the diversification strategy – its relevance and sustainability – is needed.

Of course, the approach suggested in this article can't give a 100 % accurate answer – simply because adequate statistical data for measuring cross-elasticity aren't always available. One often has to resort to the method of expert assessment. In addition, a number of nuances need to be considered in calculations that are related to cross-elasticity. Undoubtedly, the complementarity multiplier alone can't compensate for lack of standard financial analysis of all those indicators that are relevant for assessing diversification. If we account for the complications that come into play when using the complementarity multiplier, we can arrive to the conclusion: it were used for evaluating the above-mentioned cases of failed diversification, it would become abundantly clear that none of them could have achieved the synergistic effect, even in theory. The impending failure of diversification process in all of the previous real-life examples could have been identified well in advance.

Thus, we have offered a new criterion of evaluating the relevance of diversification for a company based on the complementarity multiplier. Utilizing it will enable businesses to avoid significant financial losses due to erroneous managerial decisions with regards to diversifying their enterprises.

This multiplier has been developed and tested for assessing concentric diversification. Nonetheless, from our point of view, it can be applied successfully to predict the economic effect of other types of diversification. We intend to make it the subject of our further studies. The complementarity multiplier can become an effective instrument of assessing the economic value and relevance of diversification for a company. In our opinion, for the purpose of predicting the synergistic effect, it provides the best and the most precise results to date.

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## PROBLEMS AND TERMS OF THE IMPLEMENTATION OF OPTIMAL FLOW PROCESSES MANAGEMENT

UDC 658.71

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The relevance of the logistics concept while dealing flow processes optimal control problems of industrial enterprises has been discussed in this article. The notion of "variability" has been proposed as the fundamental reason of inconsistency. The current management of an enterprise should take into consideration integration and innovation aspects of economy, as well as it should be based on consistency and compliance of flow processes of an enterprise. The conditions for implementation of optimal (logistics) management of flow processes have been outlined.

*Key words:* flow processes, management, logistics, logistics supply chain.

## ПРОБЛЕМИ ТА УМОВИ РЕАЛІЗАЦІЇ ОПТИМАЛЬНОГО УПРАВЛІННЯ ПОТОКОВИМИ ПРОЦЕСАМИ

УДК 658.71

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Розглянуто актуальність використання концепції логістики при вирішенні проблем формування оптимального управління поточковими процесами промислових підприємств. Досліджено причини неузгодженості поточкових процесів. Запропоновано використання поняття варіабельності як фундаментальної причини неузгодженості процесів. Показано, що сучасне управління підприємством повинно враховувати інтеграційно-інноваційний аспект економіки, базуватися на узгодженості та відповідності поточкових процесів підприємства і носити попереджувачий характер. Окреслено умови реалізації оптимального (логістичного) управління поточковими процесами.

*Ключові слова:* поточкові процеси, управління, логістика, логістичні ланцюги поставок.