

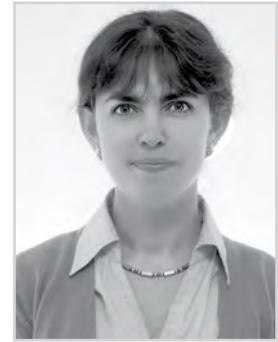


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Asset and cost management for innovation activity

Abstract. The paper provides results of a comparative analysis of the level of innovation activity in European countries based on official statistics. A cluster analysis of R&D expenditure share in GDP allowed the authors to identify five groups of countries with very high (Denmark, Finland, Germany), high (Belgium, France, Slovenia), middle (the United Kingdom, Ireland, Estonia), low (Portugal, Spain, Bulgaria) and very low (Malta, Serbia, Ukraine) level of innovation activity. The paper grounds cluster borders, discusses common features of the countries within each cluster and their changes for past decade and proves the need for borrowing the best practices of the EU member countries to increase efficiency of innovation management for countries with low and very low level of innovation activity.

The authors have made the proposals related to the ways of enhancing innovation management. The paper grounds the proposed approaches to the identification and accurate assessment of companies' expenses and intangible assets arising from commercialization of innovative implementations. The paper discloses the authors' position upon recognition of cost and expenses in financial accounting and management system, grounds benefits and suggests justified solutions for different cases depending on the nature of innovation process and requirements of the standards of accounting and financial statements.

Keywords: Cost Management; Innovation; Cluster; Internally Generated Goodwill; Intangible Assets

JEL Classification: M21; M41

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Управління активами та витратами інноваційної діяльності

Анотація. У статті представлено результати порівняльного аналізу рівня інноваційної активності в європейських країнах на основі офіційних статистичних джерел. Проведений авторами кластерний аналіз країн за рівнем витрат уможливив розробку рекомендацій щодо підвищення ефективності менеджменту інноваційної діяльності. У статті запропоновано підходи до ідентифікації й оцінки витрат та нематеріальних активів, що супроводжують процес комерціалізації інновацій у системі фінансового обліку та загальній системі менеджменту.

Ключові слова: управління витратами; інновація; кластер; внутрішньо генерований гудвіл; нематеріальні активи.

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Управление активами и расходами инновационной деятельности

Аннотация. В статье представлены результаты сравнительного анализа уровня инновационной активности в европейских странах на основе официальных статистических источников. Проведенный авторами кластерный анализ стран по уровню расходов на НИОКР послужил основой для разработки рекомендаций по повышению эффективности менеджмента инновационной деятельности. В статье предложены подходы к идентификации и оценке затрат и нематериальных активов, которые сопровождают процесс коммерциализации инноваций в системе финансового учета и общей системе менеджмента.

Ключевые слова: управление затратами; инновация; кластер; внутренне генерированный гудвил; нематериальные активы.

1. Introduction

Further development of the modern economic system of any hierarchical level is based on the constant pursuit of business entities to obtain competitive advantages for implementation of selected strategic objectives. The basis of these competitive advantages is the organisation of permanent innovation process as a major source of additional revenue generated in result of ownership on unique innovative product.

2. Brief Literature Review

The problem of organising efficient innovation activity has awoken great scientific interest of foreign and Ukrainian scholars, such as S. Brunswicker and W. Vanhaverbeke (2015) [1], Ch. Burmeister, D. Luettgens and F. Piller (2015) [2], O. Hrytsay (2010) [3], I. Steedman and S. Metcalfe (2013) [4], D. Teece, G. Pisano and A. Shuen (1997) [5], Fedulova, L. (2016) [6].

Despite the large number of studies on general definitions of «costs» and «charges», there is still no common approach to the interpretation of the main categories of innovation process. In the field of financial accounting, the problem leads to the absence of well grounded approaches to the identification of the cost of recourses expired in innovation activity, recognition and assessment of innovative products and assets, which constrains the implementation of innovations. Simon Kuznets (1973) in his Nobel Lecture underlines that innovation activity has numerous effects, and in majority cases innovation process has unexpected results, which may be positive or negative [7]. Thus, O. Hrytsay (2010) proposes the incremental method of innovation costs presentation for industrial enterprises, which involves determining an increase in equity by the cost of newly established innovative facilities that are classified as non-current assets [3]. Such a method requires an allowance for innovation expenses, and innovation expenses are recognised simultaneously with revenue recognition in the moment of innovative products sale. However, it should be noted that the use of the proposed approaches does not solve the general problem that lies in recognition of assets and expenses. Thus, a well-organised accounting system should have distinct methods for separating assets and expenses of innovation activity based on a well-justified scientific ground.

3. The purpose of this research is to analyse the level of innovation activity in European countries to suggest approaches to separation of innovation costs and assets based on the best experience and to improve the identification and valuation of intangible assets arising in the process of innovation in the system of accounting and cost control.

4. Results

The enhancement of international competitiveness on the basis of innovative processes and technologies in business, development of new products and the convergence of intellectual property are the priorities determining the harmonious entry of Ukraine into the global economy. At the same time, they create innovative changes in the economic system of the so-called internal energy economic growth [8]. These changes violate the achieved balance and equilibrium of economic systems of any hierarchical level, but provide a basis for economic growth and transition to a new qualitative state of the national economic system. The conducted analysis of modern trends in general indicators of development and innovations of national economies has revealed a steady increase in the gap between groups (clusters) of countries, depending on their levels of innovation activity, the amount of expenses for innovation changes and the type and quality of innovations. The general innovation vector of the country's development necessitates the formation of the national innovation environment. A detailed comparative analysis of national innovation environments in Ukraine and European countries is presented by the author (S. Labunska, 2014) [9], which gives grounds to conclude that Ukraine's national innovation environment does not provide sufficient incentives and economic instruments for the implementation of innovative changes. This conclusion is also confirmed by

the innovative position ratings of Ukraine, expressed by international experts (Figure 1).

In 2016, almost all the components of the Global Innovation Index had a positive trend, however their value, compared with the characteristics of the most competitive economies in the world, remain at a level that requires further improvement. In comparison with the EU member states in terms of the share of R&D expenditure, Ukraine demonstrates negative trends (Figure 2). In general, the R&D expenditure share in GDP increased by 16.67% for the EU member states during past decade, whereas for Ukraine fell by 58.7%.

Based on the data related to the R&D expenditure share in GDP in 2005 with linkage distance equal to 0.2, we can single out five clusters revealed, whereas in 2015 we have ten clusters within the same distance, therefore in order to have five clusters the linkage distance should be increased up to 0.3 (Figure 3, Table 1). The EU (28 countries) belongs to the high level cluster both in 2005 and in 2015.

The *K*-means clustering results (Table 2) show changes in the character of revealed clusters, which has been observed during the past 10 years. The mean values have increased for all the clusters: in the group of countries with a very high rate of R&D spending the mean value has risen by 11.4% (from 2.78 to 3.1), however in the groups with low and very low rates mean values have increased by 36.4% (from 0.96 to 1.31) and 38.6% (from 0.6 to 0.83), respectively. The mean value in the group of countries with a low rate of R&D spending in 2015 reached 1.74%, simultaneously the mean value in the group of countries with a middle rate deviated from 1.76% in 2005 to 2.175% in 2015.

The results of the clustering analysis justifies the conclusion about significant changes in the rates of R&D spending even within the cluster limits (Table 2). For example, a country with the R&D spending rate equal to 1.7 may be classified as a middle-rate country in 2005 and a low-rate country in 2015.

A vivid example of changes in cluster limits impacting the country's position is Malta. Its R&D spending rate increased from 0.53% in 2005 to 0.77% in 2015. If the cluster limits had been left without changes, the country would have been reclassified to low-rate R&D spending in 2015; yet as the cluster limit has increased more significantly Malta is still included in the group with a very low rate of R&D spending.

During the past 10 years, the following countries have been moving between the clusters:

- Norway, Slovenia and China (except Hong Kong) increased their R&D spending rate by more than 30% and moved up to the high rate cluster;
- Ireland increased its R&D spending by 26.8%, thus with the rate of 1.51% the country moved up to the middle rate cluster;
- the Czech Republic has demonstrated significant growth (by 66.7%) and moved from the low rate cluster to the high rate cluster;
- Turkey, Greece, Poland and Bulgaria have increased their R&D spending rates by 71.1%, 65.5%, 78.5% and 133% respectively and moved up from the very low rate cluster to the high rate cluster.
- Slovakia has had the most rapid changes, as its R&D spending rate has increased by 2.4 times; however, this allowed the country to progress only from the very low rate cluster to the low rate cluster;

Only 6 out of 39 counties have demonstrated a decrease in R&D spending rate:

- Croatia has slightly decreased (by 1.16%), and its low rate cluster has remained unchanged; a similar situation is observed for Sweden (3% fell to 3.26% in 2015) and Finland (12.9% fell to 2,9% in 2015) who remained within the very high rate cluster;
- Luxembourg has cut its R&D spending rate by 18% and with the rate of 1.32% moved down from the middle rate cluster to the low rate cluster;
- Iceland has decreased its R&D spending rate by 19% and moved down from the very high rate cluster;

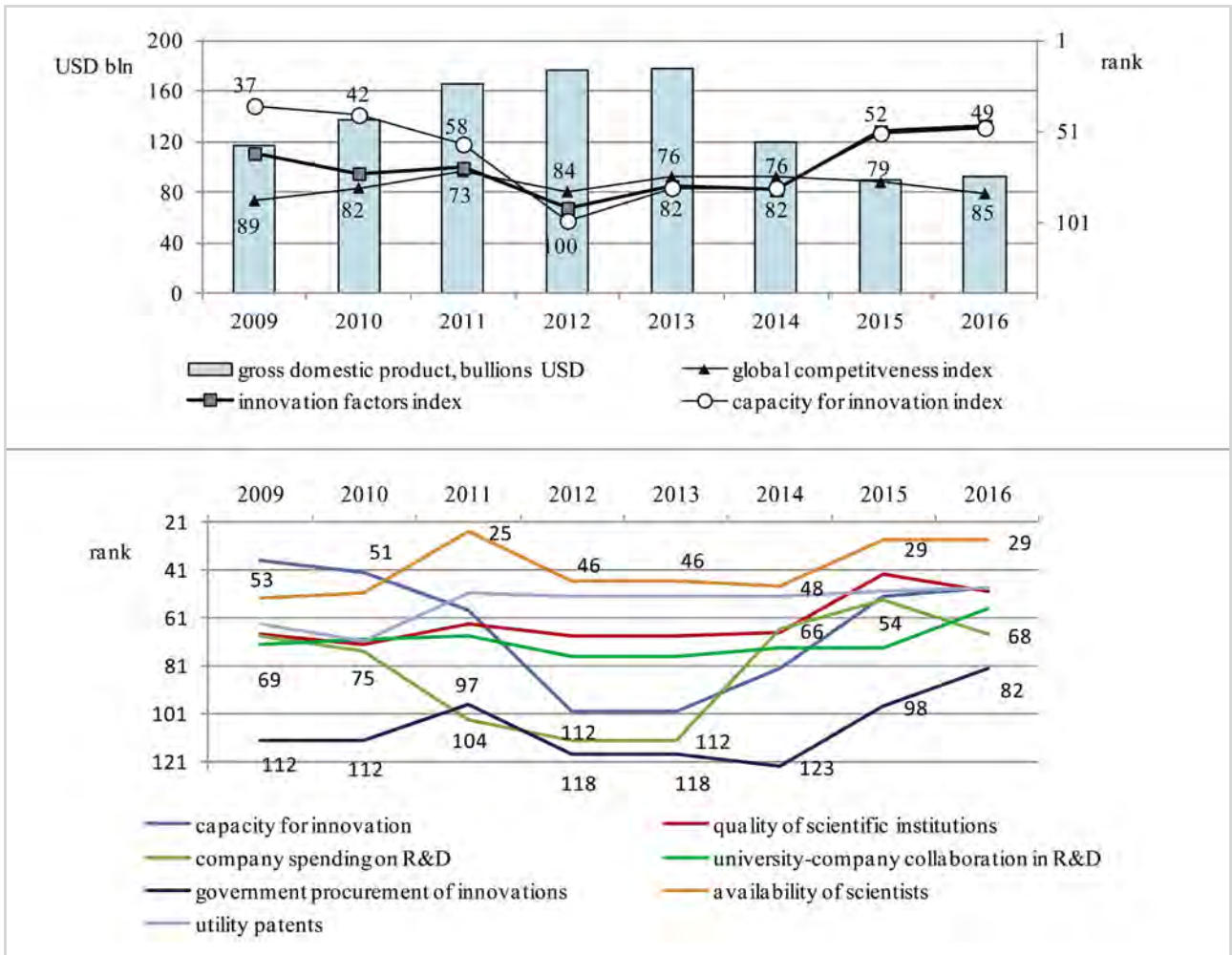


Fig. 1: Global ratings of Ukraine on innovative factors of competitiveness of the country's economy
Source: Compiled by the authors based on [9]

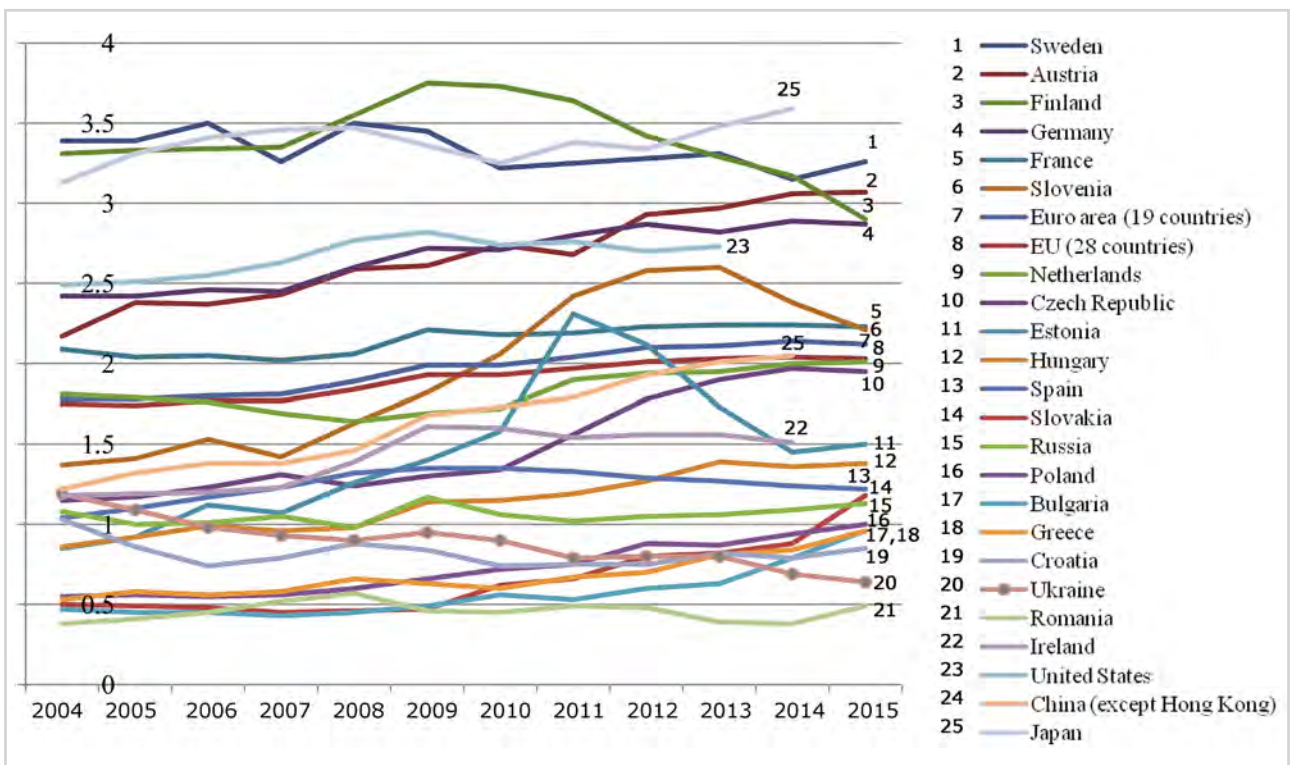


Fig. 2: Dynamics of R&D expenditure share in GDP
Source: Compiled by the authors based on [10-11]

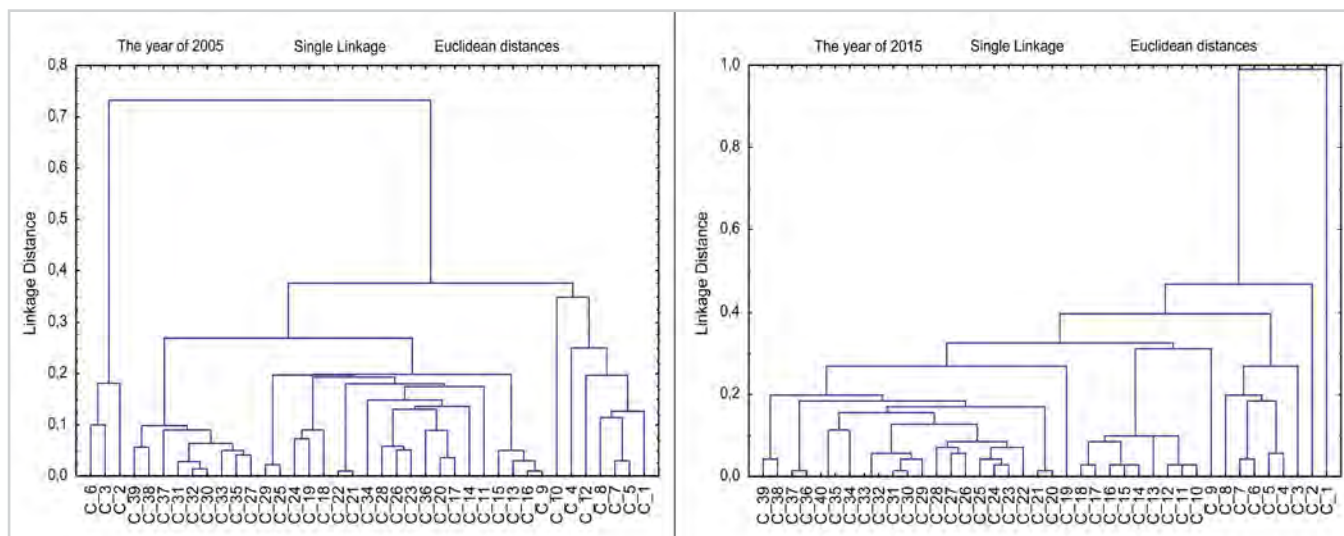


Fig. 3: Dendrograms of R&D expenditure share in GDP
Source: Calculated by the authors

Tab. 1: Results of cluster analysis of R&D expenditure share in GDP

Level	Countries in 2005	Countries in 2015
Very high	Sweden, Finland, Japan, Iceland, South Korea, United States, Germany, Denmark, Austria	South Korea, Japan, Sweden, Austria, Denmark, Finland, Germany, United States
High	France, Netherlands, Belgium	Belgium, France, Slovenia, Iceland, China, Netherlands, Czech Republic, Norway
Middle	Luxembourg, China, Norway, Slovenia, United Kingdom	United Kingdom, Ireland, Estonia
Low	Ireland, Czech Republic, Spain, Ukraine, Italy, Russia, Estonia, Hungary, Croatia, Portugal, Lithuania	Hungary, Italy, Luxembourg, Portugal, Spain, Slovakia, Russia, Lithuania, Turkey, Poland, Greece, Bulgaria, Croatia
Very low	Turkey, Greece, Poland, Latvia, Malta, Slovakia, Bulgaria, Romania, Cyprus	Malta, Serbia, Ukraine, Latvia, Romania, Cyprus

Source: Compiled by the authors

Tab. 2: Statistics of cluster analysis of R&D expenditure share in GDP

Rate	2005		2015	
	Limits of cluster	Number of countries in cluster	Limits of cluster	Number of countries in cluster
Very high	(2.04; 3.39]	9	(2.73; 4.29]	8
High	(1.78; 2.04]	4	(1.93; 2.73]	10
Middle	(1.32; 1.78]	6	(1.5; 1.93]	3
Low	(0.75; 1.32]	11	(0.85; 1.5]	13
Very low	(0; 0.75]	9	(0; 0.85]	6
Total	-	39	-	40

Source: Calculated by the authors

- Ukraine's decrease is considered most significant of 39 countries (by 41.28%); its R&D spending rate fell from 1.09% in 2005 to 0.64% in 2015.

According to the State Statistics Service of Ukraine, in 2015 the amount of business funds spent on innovation increased by 2.05 times, reaching EUR 474.58 million with the share of 97% in the total costs (Figure 4). In 2016, the government increased spending to EUR 3.2 million, however it was not enough to compensate a reduction in business spending (by EUR 67 million). Hence, the total innovation funding decreased significantly.

Thus, in the context of crisis in the Ukrainian economy, when possibilities of the overall systemic support of innovative enterprises by the state are substantially limited, enterprises' own funds become the main source of funding for the renewal of economic processes and introduction of innovative products. This highlights the problem of effective management of the entity's own innovative assets and expenses, as well as the possibility of attracting foreign investments to introduce innovations.

The solution to the first part of the problem is based on adequate identification and evaluation of innovation activity costs in the business management system, with the application of well-grounded management accounting approaches. This allows determining the so called real costs due to applying discounted and non-discounted cost estimation methods, depending on the time of innovation project implementation [13] and involving methods of broader interpretation and recognition of innovative resources as innovative assets. Such an approach is based on understanding the nature of innovation activity as a process determined by certain results. Innovation results may be classified on the basis of the possibility of commercialisation:

- innovative product (results of innovation activity can be commercialised regardless of the life cycle stage of innovation resource);
- innovative ideas (results do not have the form of an innovative product and need further elaboration);
- innovative experience (acquired competencies during R&D and commercialisation processes may be further used to develop innovative ideas).

It should be noted that innovative experience is gained also in case of unsuccessful R&D projects, when impossibility of conversion of innovative ideas to innovative product is revealed or falsehood of innovative ideas is proved. Innovative experience, as well as innovative ideas, leads to emergence of internally generated goodwill (IGG) of the enterprise, which increases its value as a business unit.

The solution to the second part of the problem is based on the well-grounded approach to assessment and identification of innovation activity «assets» and «expenses». This approach insures capture and estimation of growth of the company's stockholders equity caused by innovation activities and enables further reliable identification of the investment attractiveness for potential or actual owners of the entity based on financial statements. Financial statements have to correspond to National and International Accounting Standards (IAS), as well as Corporate Valuation Standards (or Business Valuation Standards), which gives possibilities to report the results of innovative activities as assets only in case of reliably determination in the monetary unit based on primary accounting documents. Thus, expenditures on innovative ideas cannot be included in the cost of assets and are defined as expenses, which lead to a decrease in financial results. Such principle of profit estimation in the period of development of innovative ideas and accumulating of inno-

vative experience strongly influences decisions on investments and, in majority cases, constrains investments.

In this vision, a well-grounded delimitation of «expenses» and «costs» is crucial for the cost management system. The delimitation may be conducted on the basis of meaningful generalisations, depending on the purpose, different approaches to their assessment and the definition of real value in the accounting system and the overall system management. Thus, the total actual cost estimated by management, takes into account the value of the company's resources, which cannot be recognised in accounting as assets or expenses based on documented assessment (Table 3). This applies particularly to identification and assessment of information and intellectual resources, which can be done by an expert. Thus, the concept of the company's expenses for innovations should be understood as monetary value of all types of resources spent, including those that are not recognised an asset but provide future opportunities for business.

Despite the rationality of the proposed approach, the authors caution that its application is not indisputable. On the basis of institutional and system paradigms in modern management practices, an enterprise as an economic entity should be considered as an open dynamic system functioning in the legal field and characterised by flexible links with other economic entities (separate institutional units), and by constant links between functionally oriented internal subsystems. Such an approach necessitates convergence of approaches to the identification and assessment of innovative costs for making decisions upon the appropriateness of innovation activities and assessing the profitability of business.

To accomplish this task, the authors propose a methodology for identifying and assessing the effectiveness of certain innovative costs that cannot be reported as assets but are locomotives to increase the company's internally generated goodwill (IGG). In accordance with the International Financial Reporting Standards (IFRS), IGG is reported as an asset in case of future economic benefits that cannot be attributed to specific tangible or intangible assets or are a result of synergy in the use of assets, such benefits should be measureable. However IFRS deals only with goodwill acquired due to successful purchase of assets or business mergers. IFRS 38 requires to report R&D expenses that do not lead to creation of tangible or intangible assets (TA or ITA) as period expenses. In practice, the innovation process provides the enterprise with unique information resources which may be directly related to innovative product or other results of innovation activities, namely generation of new ideas, generalisation or structuring of certain information signals, acquisition of innovation experience, etc. In present conditions, possession of a unique informational resource determines the success of most of the company's business processes. The authors of the article support the position expressed by A. Cammarano, M. Caputo, E. Lamberti, F. Michelino, H. Lin and J. Su that innovation activity is a set of consistent, purposeful actions on the implementation of innovative processes based on attraction and use of a unique informational resource, which is characterised by diffusion in the process of consumption [14-15]. So, the position of IFRS 38 (that internally generated goodwill is

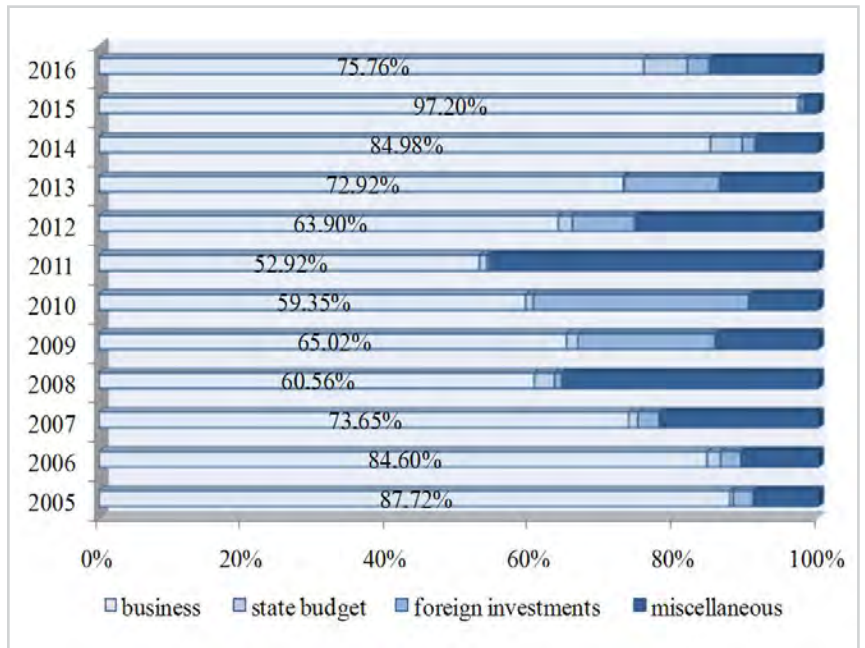


Fig. 4: Changes in structure of spending on innovation by source of funding in Ukraine

Source: Compiled by the authors based on [10]

Tab. 3: Identification and evaluation of expenditures for process and product innovation in management accounting system

Innovation cost focus	Identification	Assessment
Fundamental R&D expenses, Applied R&D expenses,	in case of probability of future economic benefits for company information resources as «idea» -innovation or IGG	total costs of process and product R&D expert estimate, adjusted by discount factor
Commercialisation expenses	in case of increased fair value of the product/process	by the amount of costs that are assigned to particular innovation product/process adjusted by discount factor
	in case of no impact on product/process fair value	Expenses of the period by the amount of expenses incurred in commercialisation process
Acquisition costs	at any stage of commercialisation of innovations Tangible or intangible innovation assets	fair value of the asset adjusted by discount factor

Source: Compiled by the authors

not recognised as an asset since it is not an identified resource) should be further developed to capture changes in innovation business (Table 4).

Reliable assessment of innovative IGG may be proposed to be conducted based on the procedure for determining the value of intellectual property rights as defined in the National Standard No. 4 «Appraisal of Intellectual Property Rights» (in particular, the income approach, which involves the use of indirect capitalisation methods) considering peculiarities of innovation activity. To develop this technique, it may be proposed to report IGG as the balance sheet asset simultaneously with recognition of increase in additional capital in the same amount. In addition, IGG generated by innovation activity is limited in recognition by the time interval associated with diffusion processes that characterise the use of information resources. Thus, the balance sheet should report the residual value of IGG, adjusted in time by diffusion processes in dependence with the type of innovation, the stage life cycle, the content of information resource, etc. A decrease in residual value of IGG is accompanied by reduction of the company's additional capital; the methodology for determining the residual value requires a clear definition in the accounting policy of the entity.

Tab. 4: Identification and evaluation of expenditures for process and product innovation in financial accounting system

Innovation cost focus	Innovation result	Identification	Assessment	
Fundamental R&D expenses	at any stage	IGG	expert estimate	Income Approach, Profit Benefit Method, and Additional Income Method, simultaneously with period expenses
Applied R&D expenses,	in case of probability of future economic benefits	Innovation product	TA or ITA	by total amount of documented expenses in accordance with NAS 7-9
	in the case of unsuccessful R&D projects	IGG	expert estimate	Income Approach, Profit Benefit Method, and Additional Income Method, simultaneously with period expenses
Commercialization expenses	in case of increased fair value of the product/process	Innovation product	TA or ITA	by total amount of documented expenses in accordance with NAS 7-9
	in case of no impact on product/process fair value	IGG	expert estimate	Income Approach, Profit Benefit Method, and Additional Income Method, simultaneously with period expenses
Acquisition costs	at any stage of commercialization of innovations	Innovation product	TA or ITA (depending on type and stage of innovation)	by the purchase price (excluding VAT), and other costs in accordance with NAS

Source: Compiled by the authors

5. Conclusions

Since businesses' own funds have become the main source of financing of innovations in Ukraine, it is necessary to improve the methodology of identification and evaluation of objects of management of innovative activity of the enterprise with the aim of optimisation of innovation costs, and to develop approaches to refining the identification and evaluation of innovative results in accounting and financial reporting. Evaluation of internally generated goodwill in the

overall management of the company is proposed to implement depending on the type of innovation and economic content of different types of costs during the period of his management. The procedure for determining the value of intellectual property may be a methodical basis for this. Thus, it is proposed to determine the value of internally generated goodwill based on estimates of the size of the increase in (benefits) profit from innovation compared to the conditions of its absence. The proposed method can be used in the case of spending on research and development, which does not obtain marketable forms of innovation asset but has a positive impact on the company's performance.

The proposed approach clarifies the procedure for identifying, evaluating and distinguishing objects of managerial influence in innovation cost management and system of accounting and the formation of the financial statements. Separation of innovation costs, depending on the impact on formation of internally generated goodwill, makes it possible to increase the effectiveness and efficiency of management impact and reduce time management decisions, on the one hand, and to justify the selection of methods and tools for managerial influence, on the other. The proposed approaches allow the estimation of innovative assets of the enterprise that generate additional competitive advantages for an economic entity and increase the objectivity of determining its investment attractiveness.

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