

# INNOVATIVENESS RATIO ANALYSIS BASED ON COMPANIES' ANNUAL REPORTS

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**Abstract:** The article presents a possibility of extending business ratio analysis which traditionally focuses on liquidity rating, liabilities and profitability, to the area of innovativeness evaluation. In this context informative value of companies' annual reports was investigated referring to the criteria for evaluating innovation found in literature. Additionally, indicators enabling such evaluation were isolated. The culminating point of the article presents a sample innovation analysis that was carried based on specific indicators with the reference to selected companies listed on Warsaw Stock Exchange.

**Keywords:** innovativeness, innovation, annual report, ratio analysis.

## 1 Introduction

Nowadays, when the role of innovations as a factor giving resources new possibilities of creating added value to different interest groups, proper innovations management is regarded as the basis of a company's success on the market and as indispensable factor for realisation of its development objectives. Thus, it can be said that as beneficial situation regarding current solvency makes a company a going concern, the innovation determines its competitiveness and capacity for generating profit.

In literature innovativeness is defined in various ways, most frequently, however, it is associated with *the organisational ability to continuous search for implementation and disseminating of innovation* [Pomykalski, 2001, p. 15]. Amongst many other definitions, taking into account various aspects of this term, we should mention two more. The first formulated by J. Macias, who said that *"innovativeness represents the term that reflects the results of a company's or a group of companies innovative activity in particular time"* [Macias, 2008, p. 37]. The second, by E.M. Roger's, explains *"innovativeness means the tendency of an individual or a group to implement new ideas prior to others"* [Rogers, 1995, p. 252]. Taking into account the views of different authors on innovativeness, it is worth mentioning that in case of companies innovativeness can be associated with widely understood potential for innovation or with the actual results of innovative activity. Therefore one can distinguish between *potential innovativeness* and *resultant innovativeness*. The first one applies to widely understood assets forming the company's innovation potential (resources approach) and to increased investments in these assets (investment approach). The second innovativeness refers to both quantitative (the number of innovations implemented or introduced to the market) as well as qualitative (the degree of novelty, complexity or the technological advancement of innovations implemented or introduced to the market) results of companies' innovative activities. [Nawrocki, 2008, p. 124].

In the last decades, with the growth of importance of innovation for economic development, one can notice a regular advancement in research methodology and in methods of monitoring innovation. However, due to various differences in defining this term, several approaches towards its evaluation are encountered. It is worth mentioning that in majority of cases application of these approaches entails carrying out laborious surveys in order to find out specific information about innovative activity of tested subjects and its widely understood effects. Taking into consideration obvious drawbacks of such data collection [Turek, Jonek-Kowalska, 2010, p. 75-80], the main aim of this article is to indicate possible ways of conducting the analysis of companies innovativeness based on feasible criteria suggested in popular research methodology evaluation, using annual reports, as a main source of information.

## 2 Criteria of company innovativeness evaluation versus informative value of annual reports

In general, taking into consideration various approaches proposed by literature, with the reference to company's innovativeness evaluation, three main groups can be distinguished (table 1).

**Table 1 Different approaches to enterprises' innovativeness evaluation**

Approach and its source	Data collection recommendations in relation to innovativeness evaluation and criteria for the enterprises' innovativeness evaluation	
<b>OECD and LBIO Methodology</b>		
<i>Frascati Methodology</i> [OECD, 2002, p. 108-118]	<ul style="list-style-type: none"> <li>- the number of hired employees in research and development activity and their structure (age, education, ...);</li> <li>- costs involved in research and development activity</li> </ul>	
<i>Oslo Methodology</i> [OECD/European Communities, 2005, p. 73-112]	<p><i>Subject approach</i> (company's point of view):</p> <ul style="list-style-type: none"> <li>- innovative activity expenditures;</li> <li>- results of conducted innovative activity, mainly the number of implemented innovations;</li> <li>- the influence of company's innovative activity on its revenues, expenditures, and financial results;</li> <li>- general indicators relating to a company's innovativeness, particularly capital intensity ratio regarding innovative activity (account of expenditures to sales revenue).</li> </ul> <p><i>Object approach</i> (point of view of a particular innovation):</p> <ul style="list-style-type: none"> <li>- descriptive data, including: general description, type of changes, the degree of novelty, and source of innovation;</li> <li>- quantitative data, including: expenditures, impact on innovative activity, the length of particular stages of innovation life cycle;</li> <li>- qualitative data including: innovation benefits, source of information and notions used in innovations, possibility of diffusion.</li> </ul>	
<i>LBIO Method</i> [OECD/EuroStat/KBN, 1999, p. 115-117]	<ul style="list-style-type: none"> <li>- innovation complexity;</li> <li>- type of innovation;</li> <li>- innovation properties;</li> <li>- origin of innovation.</li> </ul>	
<b>Methods based on resource approach</b>		
<i>eg. Diagnosis of innovations potential and company's competitiveness</i> [Pawlowski, 2005, p. 62-68]	<ul style="list-style-type: none"> <li>- technical and technological potential;</li> <li>- financial potential;</li> <li>- potential structural capital;</li> <li>- employees' intellectual potential;</li> <li>- business intelligence;</li> <li>- product potential.</li> </ul>	
<b>Methods based on time factor</b>		
[Fell, Hansen, Becker, 2003, p. 348-350]	<i>Historical method</i>	Implementation of an innovative solution into practice
	<i>Cross-sectional method</i>	The number of innovations put into practice at a particular point in time
	<i>Complex method</i>	Compilation of historical and cross-sectional methods

The first one consists of various methods used by different international and national institutions (e.g. EuroStat, Central Statistical Office of Poland) to investigate periodic innovative phenomena. For European countries, the OECD methodology, that has been developed for over forty years, is regarded as the basis of the study. Within this framework we can differentiate *Frascati Manual* (recommendations regarding evaluation of companies' engagement in research and development) and

*Oslo Manual* (recommendations regarding collecting and analysing data in reference to widely understood innovative activity). The LBIO method (*Literature-Based Innovation Output Indicators*) which consists of recommendations relating to the evaluation of innovative market solutions based on the information published by technical and commercial magazines, is a supplement to the mentioned above methodology. The second group involves methods based on the resource approach, which includes the concept of strategic management, with the focus on investigating organisation's resources and skills. The example of this approach is *the diagnosis of innovative potential and company's competitiveness* by J. Pawłowski which concentrates on recognition and evaluation of causative factors relating to innovation and competitiveness of enterprise's resources. The third group consists of methods focusing on time factor, specifically emphasizing the moment of implementing an innovation in relation to the competition. Important examples of the third group are *Roger's historical method, cross-sectional and complex methods*. Clearly, apart from the above mentioned methods, there are others that can be traced in the bibliography [Jin, Hewitt-Dundas, Thompson, 2004, p. 260; Bielski, 2000, p. 156-157; Wang, Lu, Chen, 2008, p. 349-363], however, they are merely modifications or compilations.

Taking into consideration the previously made distinction between potential and resultant company's innovativeness, as well as all presented ways of its evaluation, it should be noted that *object approach of Oslo methodology, LBIO method, and methods based on time factor* focus on the resultant aspect, whereas *subject approach of Oslo methodology, Frascati methodology and methods based on resource approach* focus mainly on its potential aspect.

Having discussed the general situation related to different methods of a company's evaluation, and the data necessary for the application of their sub-criteria, we can now move on to the analysis of informative value of annual reports. An annual report is the most extensive and regular source of information about an enterprise's activity; and its scope, form and publication dates are statutorily defined [Journal of Laws of the Republic of Poland, 2005, No 209, item1744]. Also, national and international accounting standards, used by a particular company, as well as its information policy have a great impact on the usefulness of the information disclosed in the report. Due to the latitude given by regulators with respect to the presentation of particular elements of an annual report, information regarding the same area (most often it concerns financial reports and explanation notes) can be presented by particular subjects in various ways – different clarity and details of disclosed information. Moreover, the distinction mostly applies to presentation of information relating to the scope of innovative activity and its final results [Nawrocki, Żabka, 2011, p. 3-12].

Out of all constituents of an annual report the most informative value, when we take into account the criteria of innovation evaluation presented in Table 1, have: „*chairman's letter*”, „*annual financial statement*” as well as „*management report on the issuer's activity in the annual report period*” [Nawrocki, 2012, p. 74].

In the first and in the last above mentioned element, we can find mainly descriptive information which concerns:

- products found in issuer's offer;
- organisational structure;
- work connected with extending issuer's market product range;
- issuer's technological partners and applied technology;
- investments incurred (including expenditures on research and development activity)
- main financial report points, statement of comprehensive income;
- the number of employees and their occupational structure;
- changes within issuer's organisation operational activity.

On the other hand, the middle point presents quantitative information referring to assets and sources of funding, obtained in the period sales revenues, costs incurred and cash flows. It should also be noted that from the perspective of the previously mentioned criteria for the innovativeness evaluation, a particularly valuable constituent of an annual report, are explanation notes in additional information, especially those which refer to:

- within financial report (balance sheet):
  - detailed classification of all the assets and the shareholders' equity and liabilities;
  - detailed range of changes in values of specific generic group relating to fixed assets and intangible and legal assets (including changes connected with current depreciation and accumulated depreciation);
- within total income statement (profit and loss account):
  - the structure of net income sales;
  - generic costs;
  - projected and incurred expenditures on fixed assets, intangible assets and legal values (including expenditures on research and development activities).

Taking into consideration the above information present in an annual report, it should be noted that although it does not allow for conducting a complete evaluation of a given subject's innovativeness, it still offers a useful source of data.

With the reference to the evaluation of potential innovativeness, annual report information enables for implementation of investment criteria extracted from *OECD methodology (innovation activity expenditures and capital intensity ratios for research and development activity)* as well as *innovative activity*) and also resource criteria derived from *OECD methodology (the number of employees involved in an innovative activity)* and diagnosis methods of competitive and innovative enterprise potential (*financial potential, structural capital potential, technical and technological potential, employees' intellectual potential*). On the other hand, as far as resultant innovativeness evaluation is concerned based on annual report information, it is possible to use first of all the basic quantitative criterion, based on *Oslo methodology and cross-sectional method (the number of innovations introduced to the market or implemented by the company at a particular point in time)*. Also descriptive and qualitative criteria can be used with the *Oslo methodology (the degree of novelty from market's point of view, diffusion possibility and innovation characteristics)* and *LBIO method (complexity level, type of changes and the origin of innovation)*.

### 3 Business innovativeness indicators

If we concentrate just on the quantitative indicators of innovativeness evaluation, based on typical relations used in financial ratio analysis [see: Bednarski, Borowiecki, Duraj, Kurtyś, Waśniewski, 2003, p. 263-294], that can be applied on the basis of annual report information, and if we omit all financial evaluation criteria, we can distinguish 9 main innovativeness indicators within three groups:

- indicators of innovation potential inherent in company's resources (5);
- companies' involvement indicators in innovative activity (3);
- companies' resultant innovativeness indicators (1).

The knowledge in the form of intangible and legal values is the main financial company's asset that influences company's innovation potential. It applies to all the licenses, concessions, patents and capitalised costs connected with development work as well as machinery and technical equipment. Hence, the most general indicator referring to company's innovative potential, except for balance value of the above financial recourses, is their *share in total assets*:

$$SinA_t = \frac{Bvt}{A} \cdot 100\%, \quad (3.1)$$

where:

$i$  – particular asset, important from innovative potential point of view (for *licenses, concessions and patents*  $i = LCP$ ; for *capitalized costs of development work*  $i = CDW$ ; for *technical equipment and machinery*  $i = TEM$ );

$SinA_i$  – share of  $i$ - constituent in assets;

$Bv_i$  – balance value (net)  $i$ -of the asset;

$A$  – total assets.

Fundamentally, the greater participation of the above mentioned components in assets in general, the higher evaluation of innovative potential of a particular enterprise. It should be noted that for the company in order to function effectively, apart from pointed financial resources, other tangible and current assets are needed. Therefore, total participation of the above mentioned resources in assets of the companies does not exceed 60-70 %.

Taking into account the fact that both knowledge in the form of intangible and legal values, as well as technical equipment and machinery, are subject to depreciation, according to accounting standards, in order to allow for loss in value, due to usage and time, another important indicator informing about innovation potential can be mentioned in a form of *the degree of novelty* in relation to mentioned assets. In general this indicator can be represented as:

$$DofN_i = 1 - RI_i = 1 - \frac{R_i + Nwd_i}{Gv_i}, \quad (3.2)$$

where:

$DofN_i$  – the degree of novelty of  $i$ -asset;

$RI_i$  – redemption indicator of  $i$ -asset;

$R_i$  – redemption (accumulated amortization) of  $i$ -asset;

$Nwd_i$  – net write-downs due to update of  $i$ -asset value;

$Gv_i$  – gross value of  $i$ -asset.

The calculated novelty degrees of the particular components of knowledge in the form of intangible and legal values as well as technical equipment and machinery, are supplement to redemption indicators. The range of their values is between 0 and 1, where 0 refers to complete amortization and 1 refers to total newness of the particular asset and large innovative potential at the same time.

Apart from intangible and tangible assets, based on annual report information, in the evaluation of a company's innovative potential, human resources can be accounted for. The basis for the evaluation is the main qualitative criterion within OECD methodology, that is *the number of employees involved in an innovative activity*. It should be noted though, that detailed presentation of employment structure is not a common practice within companies, and the actual capabilities of using this criterion are often limited. Therefore, in this case, *evaluation of human capital*, is regarded as the more useful measure of innovative potential. Based on expense approach [Czarnecki, 2011, p. 63; Bombiak, 2011, p. 91]. Such evaluation per employee can be calculated using the following formula:

$$HC_p = \frac{S+B}{E}, \quad (3.3)$$

where:

$HC_p$  – the human capital evaluation (employees resources) per employee,

$S+B$  – employees' salaries and benefits,

$E$  – number of employees

Obviously, from company's innovative potential point of view it is essential for the evaluation of human capital (per employee) to represent the highest possible level.

As far as the second group of indicators is concerned (companies' involvement indicators in innovative activity) except for *expenditures* on mentioned earlier financial resources, two relative indicators can be distinguished, presenting relation of expenditures to different economic categories, characteristic for the company – the intensity of expenditures and renewal of assets.

*Expenditures intensity ratio*, like expenditures, refers to the group of the basic criteria, of company's innovation evaluation mentioned in Oslo methodology, however as opposed

to expenditures, its values are not directly conditioned by the size of the tested subject. This indicator can be presented with the following formula:

$$EXint_i = \frac{EXn_i}{S} \cdot 100\%, \quad (3.4)$$

where:

$EXint_i$  – the expenditures intensity ratio per  $i$ -asset;

$EXn_i$  – net expenses (increase – decrease) incurred per  $i$ -asset,

$S$  – net proceeds from sales of products, goods and materials.

The presented above relation shows how much of obtained net proceeds from sales is used by the company for innovative activity as far as particular resources are concerned (research and development work; licenses, concessions, patents; technical equipment and machinery). Therefore the greater values of expenditures intensity ratio, the better company's involvement in the development of innovative potential in the specific area.

The second mentioned indicator – renewal of asset constituent – is a supplementation to the formerly described two criteria relating to company's involvement evaluation in innovative activity. It is regarded as the real measure of changes relating to financial resources and it is represented by the following formula:

$$Re_i = \frac{In_i - (De_i - Am_{De_i})}{Am_i + \Delta Nwd_i}, \quad (3.5)$$

where :

$Re_i$  – the renewal indicator of  $i$ -asset;

$In_i$  – gross increment value of  $i$ -asset in a given period;

$De_i$  – decrease in gross value of  $i$ -asset in a given period;

$Am_{De_i}$  – amortization relating to  $i$ -asset, whose gross value decreased in a particular period;

$Am_i$  – amortization of  $i$ -asset in a particular period;

$\Delta Nwd_i$  – net write-downs (increase – decrease) due to loss in value of  $i$ -asset in a particular period

Generally speaking, fixed asset renewal indicator, shows to what extent the company renovates particular asset components due to their physical and economic use. If values of the indicator are higher than 1, it means the company renew particular asset in a wider range than it is used, which is positive and as far as involvement in innovative activity is concerned. On the other hand, indicator values below 1, particularly below 0, are characteristic when assets are used faster than they are renewed which is regarded as a negative situation.

As far as resultant notion of company's innovation evaluation is concerned based on annual reports, a single indicator can be presented – *the number of innovations implemented, or introduced to the market, by the investigated subject at the particular time* (within Oslo methodology it applies to three year period). At the same time, the mentioned indicator can be used separately to investigate various effects of company's innovative activity such as products, processes, organisational and marketing results.

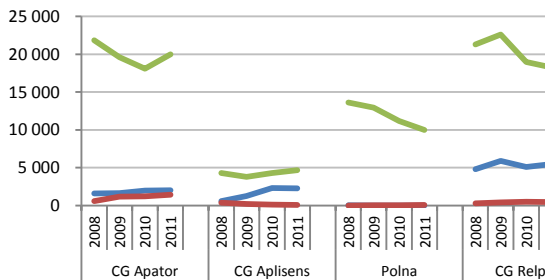
Summing up the discussion about company's innovation indicators, one should remember that like in case of relation within financial ratio analysis, their values can substantially vary according to investigated industry.

#### 4 Innovativeness ratio analysis on the example of selected companies listed on Warsaw Stock Exchange

The practical application of innovativeness' indicators discussed in the previous part of this article was presented on the example of five electromechanical companies listed on Warsaw Stock Exchange, which concentrate their activity on the production of testing and measuring equipment as well as transmitters. They are: *The Apator S.A. Group* (CG Apator), *The Aplisens S.A. Group* (CG Aplisens), *The Automation Machinery Plant „Polna” S.A.* (Polna), *The Relpol S.A. Group* (CG Relpol) and *The Sonel S.A.* (Sonel). The innovation analysis of the mentioned subjects was conducted based on published annual reports referring to the period of 2008-2011. In case of companies, that are organised in the form of capital group, consolidated reports were the source of data. In addition, as a complementary source

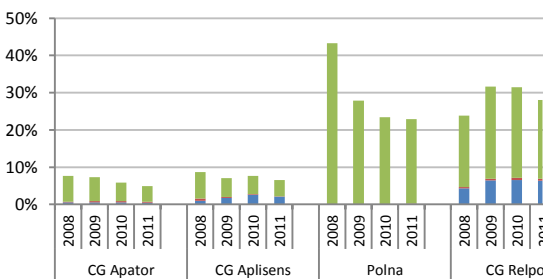
of data for resultant innovativeness evaluation, public database of Polish Patent Office was used [PPO database, access: November 2012].

The results of the analysis were presented in the following diagrams in the order of formerly discussed groups of innovativeness' indicators. Due to the limitations of article's volume their interpretation was presented at the end of this point.



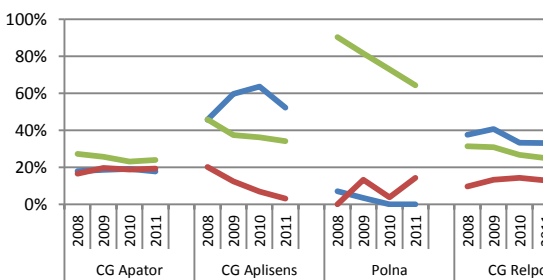
**Fig.1 The balance value (thousand PLN) of development work capitalised costs (CDW), licences, concessions, patents (LCP) and technical equipment and machinery (TEM).**

Source: own work based on the data from investigated companies' annual reports.



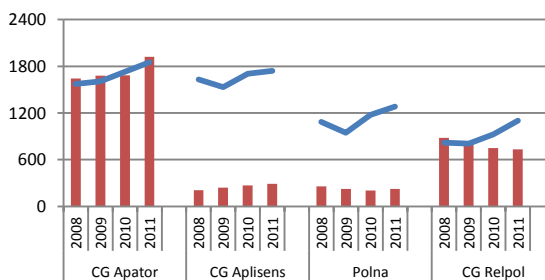
**Fig.2 The share of development work capitalised costs (SinA CDW), licences, concessions and patents (SinA LCP) and technical equipment and machinery (SinA TEM) in total assets.**

Source: own work based on the data from investigated companies' annual reports.



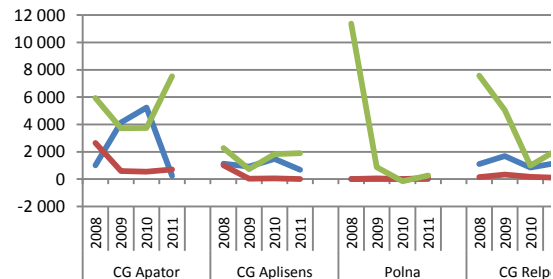
**Fig.3 The degree of novelty of development work capitalised costs (DofN CDW), licences, concessions, patents (DofN LCP) and technical equipment and machinery (DofN TEM).**

Source: own work based on the data from investigated companies' annual reports.



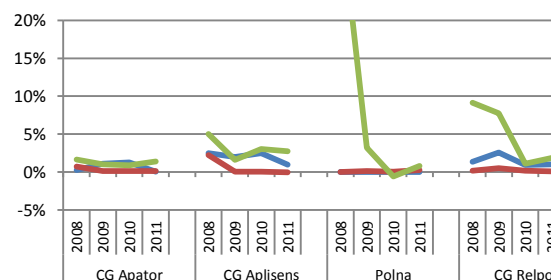
**Fig.4 The number of employees and human capital evaluation per employee (HCp).**

Source: own work based on the data from investigated companies' annual reports.



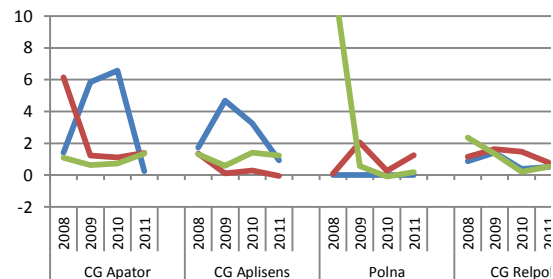
**Fig.5 The net expenses (PLN) on research and development work (Exn R+D), licences, concessions, patents (Exn LCP) and technical equipment and machinery (Exn TEM).**

Source: own work based on the data from investigated companies' annual reports.



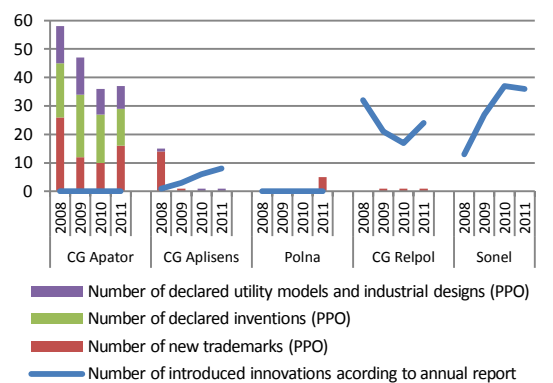
**Fig.6 The expenditures intensity ratio of research and development work (EXint R+D), licences, concessions, patents (EXint LCP) and technical equipment and machinery (EXint TEM).**

Source: own work based on the data from investigated companies' annual reports.



**Fig.7 The renewal of research and development work (Re R+D), licences, concessions, patents (Re LCP) and technical equipment and machinery (Re TEM).**

Source: own work based on the data from investigated companies' annual reports.



**Fig.8 The effects of innovative activity of investigated companies.**

Source: own work based on the data from investigated companies' annual reports and database of Polish Patent Office.

After examining the results several conclusions can be made referring to investigated companies in the particular areas of analysis:

- Balance values of featured assets and their proportion in total assets show evident superiority of technical equipment and machinery over knowledge of intangible and legal values (which is regarded to be inconsiderable as far as licenses, concessions and patents are concerned). Sonel and CG Relpol are the only exceptions.
- The novelty degrees of particular assets indicate over 50 % redemption of investigated companies. Therefore it is difficult to note here a considerable innovative potential. The best position in this area is presented by Sonel and CG Aplisens, however there is a downward trend observed.
- Of all the investigated companies, CG Apator presents the most significant human capital, where a large number of employees relates to their high quality evaluation. Only Sonel shows slightly better results in this area and CG Aplisens results are comparable to CG Apator.
- As far as research and development activity involvement indicators are concerned, all surveyed companies present poor results – expenditures incurred are unstable in time and of low standards. Sonel is the small exception however some considerable downward trends have been observed recently in this company.
- In relation to effects of innovative activity, CG Apator and Sonel's work has been positively evaluated, followed by CG Relpol. By far the worst are Polna and CG Aplisens by hardly presenting any achievement information.

Summing up, it can be concluded that Sonel company indicates the best results in innovativeness ratio analysis however it should show more involvement in innovative activity to achieve even better effects. The innovativeness of CG Apator, CG Aplisens and CG Relpol is fairly satisfactory. By far the worst results in all the areas of innovativeness analysis presents Polna.

## 5 Conclusions

The proposal of extending business ratio analysis towards its innovativeness was introduced in this article. It is a compromise between a complete evaluation of this notion based on methods found in literature, and the possibilities of obtaining information from companies' annual reports. It should be mentioned that the clarity of some annual reports is rather poor as far as information is concerned, however it has been improving every year. It can be suggested that the reports will become a more concise and reliable source of information with the reference to companies' innovative activity. It will be useful in the process of evaluation if more indicators could be applied. However, nowadays the amount of information obtained from annual reports allows for the analysis of the companies' innovation within three main dimensions – innovative potential, involvement in innovative activity and the results of such activity. Though it is not the complete analysis, at the same time its scope is sufficient enough to obtain certain knowledge in this area in investigated companies.

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**Primary Paper Section: A**

**Secondary Paper Section: AE, AH, JB**