# The Effectiveness of Innovations in the Polish Printing Industry

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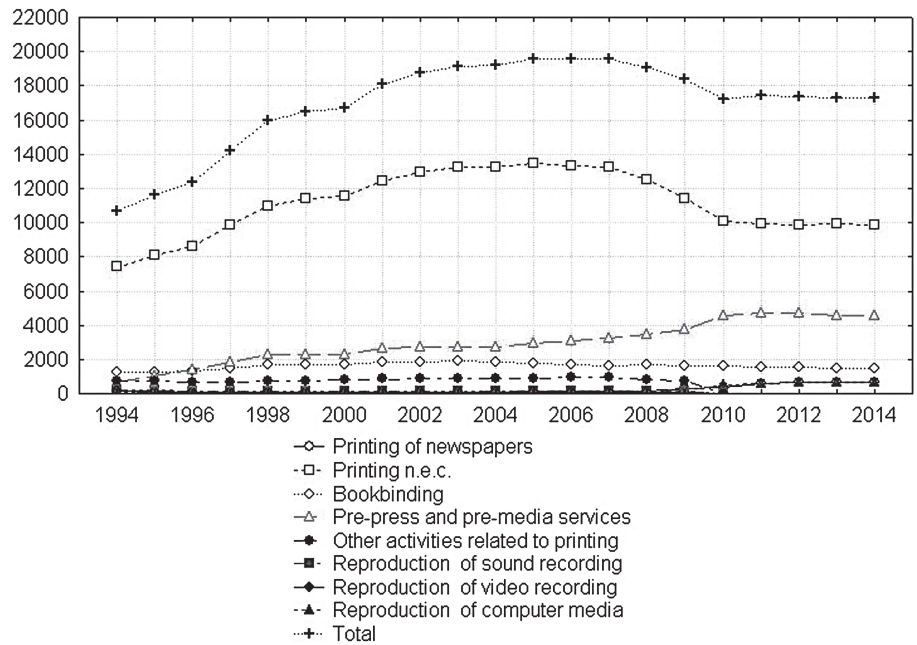
## Introduction

1989 marked the end of the state printing industry in Poland. The transformation process included 34 state enterprises under the Ministry of Culture and Art and 20 companies under other central ministries (the Ministry of Defence, the Ministry of the Interior, the Ministry of Finance), 16 which were owned by RSW „Prasa, Książka, Ruch", and 40 plants functioning as cooperatives. Apart from these generally large printing companies, it is worth

**Figure 1.** The number of printing companies operating in the years 1994-2014




Source: *Own calculations based on the data of REGON*

noting the approx. 1500 private printing companies, which possessed printing business licences of the Ministry of Culture and Art. Looking at the changes in the number of printing companies, we can observe structural transformations occurring in the industry (Figure 1).

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With reference to the changes in the printing industry in the years 1989-2014 illustrated by the figures we can distinguish the following periods (Cetera, 2015):

- the rapid development of printing entrepreneurship (1989 - 1995);
- the maturity and stabilisation of the printing sector (1996 - 2004);
- investments and the consolidation of competitive advantage (2005 - 2009);
- the reduction and restructuring of the sector (2010 - 2014 and later).

**In the years 1989 - 1995** printing companies were established spontaneously primarily due to the availability of means of production (printing machinery and devices). Most printing equipment came from the secondary market – from printing plants under liquidation, belonging to large companies and social organisations. It was often the case that existing machinists-printers „privatised" the machinery on which they were working and established their own businesses. The demand for printing services increased much faster than their supply. The market belonged to printing companies.

**In the following years, 1996 - 2004**, quality became another requirement of the market regarding printing. The requirements of customers were increasingly greater. Companies offering multi-colour printing on single-colour machines gradually disappeared from the market. Printing plants started to invest in equipment. This was mostly Czech, Slovak and German equipment. Customers expected good quality products that were made on time. The number of single-person enterprises declined in this period. Printing companies developed, creating customer service and sales departments. It has become obvious that possessing only printing competencies is not enough. At the same, Polish companies were entering Western European markets. They offered quality comparable to European companies and low prices for their services. The relatively small costs (among others due to the low salaries of employees) were the basis of competitive advantage (W. Cetera 2015 (2))

**Without a doubt, the years 2005 - 2010** were the period of the largest investments for the printing industry. EU funds and open European markets after Polish accession to the European Union were the driving force for the development of this sector of the economy. Companies received considerable resources of new means of production. New technologies were also expected to be the source of reduction in labour costs (more efficient machines, shorter set-up times).

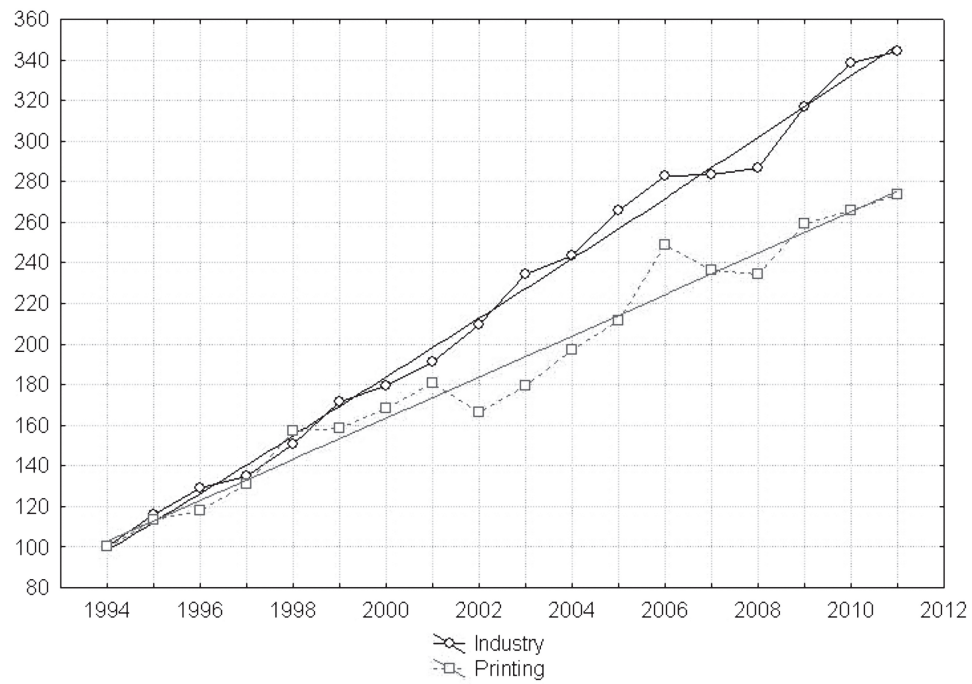
Not without significance was the change in reading habits and the increasing use of electronic media. At the same time, competitors from countries with low production costs, especially in Asia, were able to meet the European standards of quality and exerted strong pressure on prices. As a result, the import of printed products from China into the EU increased in the period 2000 - 2009 more than fourfold (W. Cetera, 2009). This caused a significant reduction in the demand for printed products and the increase of reluctance of financial institutions to lend to small and medium-sized printing enterprises (the vast majority of the sector), who lost their liquidity. The opportunities arising from the development of technology and the application of new business models require new competencies, supplementing them with skills which current employees often do not possess.

The development of electronic media and technology are supported by building closer relationships with customers and creating more added value through service differentiation, e.g. providing printing combined with the management of databases and innovative processes. The integration of communication and media services not only increases the range of products, but also the attractiveness of the sector, both for customers and employees.

**The last highlighted period begins in 2010.** The Polish printing industry was faced with radical restructuring. The changing structure of demand has launched processes of change on the supply side of services. The structural changes in the sector are also determined by changes in the media market (A. Albarran, 2010; W. Cetera, 2015).

Negative processes have also occurred in the printing sector. For example, labour productivity growth per employee measured by the volume of output sold during the whole transformation period showed values lower than the growth for the whole economy (Figure 2). As a result, in 2012 productivity per employee measured by sold output compared to 1995, which was adopted as the base year, was in the printing sector significantly lower than in industry (by approx. 20%)!

■ **Figure 2.** Growth of labour productivity measured by output sold per employee (1994 = 100)




Source: own study based on the data of the Central Statistical Offic

Although the printing sector has experienced significant changes, thanks to which it has reached the European level of technology, it does not look good in comparison to Polish industry as a whole (Cetera, 2015).

Polish printing companies are building competitive advantage by investing in the implementation of technological, organisational and marketing innovations. From the point of view of the strategy selection of companies and the search for sources of competitive advantage, it is important to identify which projects are conducive to success. Case studies and analyses of statistical data from the Central Statistical Office are making it easier to identify the most favourable solutions. A manager, on the other hand, would find indications provided by an econometric model helpful. The answer to questions such as how much and how to invest in innovation would be the holy grail of entrepreneurship. The aim of the conducted research and analyses is to determine the relationship between the different areas of innovation – technological, organisational and marketing innovations.

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## 1. An objective and the hypotheses

Designed researches should indicate the differentiated efficiency of technological, organizational and marketing innovation. Determining of the appropriate relations between the expenditures on their implementation will allow for the formulation of the optimal strategies of the planned activities.

The obtained results should verify the hypothesis indicating the highest efficiency of expenditures on the organizational and marketing innovations in relation to the expenditures on the technological innovations.

## 2. Methodology

Innovations and the innovative process in the company dynamism its operation, while introducing of an element of a risk [Glinka, Gudkova 2003]. The expensive innovations require an efficient management, and at the same time they might fail.

Moreover, the competitive advantage obtained as a result of the introduction of the innovations can be quickly offset by the followers. Therefore, as it was suggested by J. Kaya (1996), gaining a competitive advantage through the implementation of innovative processes should be supported by strengthening of a reputation and the architecture of a company. An innovativeness as a process is not a sufficient condition (although, according to the author, it is necessary) to achieve a success. Organizations with a good reputation and the

appropriate architecture are thereby more likely to introduce the innovations. At the same time, an architecture (understood as the relationship between the organization and its environment) and a reputation (these distinctive capabilities) are characterized by the high inertia.

There is no single classification of the innovations. Researchers use different criteria for a division, appropriate for the purposes of this research. The existing classification of innovations was presented by Penc J. (1999). The most frequently used division of innovations is due to:

- the field of the knowledge (technical, artistic, scientific innovations, etc.);
- the field of an activity (functional, objective, technological, organizational, environmental innovations);
- the criterion of an originality (creative, imitation innovations);
- a technological and capital intensity („light", „heavy" innovations);
- the criterion of a complexity (non-conjugated, conjugated innovations);
- a place of origin (national, international innovations);
- the scale of the size and an extent of the effects (strategic, tactical innovations);
- psychosocial conditions of implementing of the innovations (reflective, non-reflective, intentional, unintentional innovations);
- a mechanism of stimulating of the innovations (supply, demand innovations);
- Assess the impact and the resulting effects (innovation process, product – this division has been called).
- a scope of an impact and the obtained effects (process, product innovations – this division has already been mentioned).

The term „innovations" used in this study was unified in „The Oslo Manual" publication[1].

The years of the transformation testify to the fact that an innovativeness of the enterprises is the most effective method of gaining a competitive advantage in a market economy [Adamkiewicz-Drwiłło 2002, Daszkiewicz, 2004]. In the struggle a market success can be achieved by those that quickly react to the changes in the environment and those who are able to quickly adapt to the new demands of both their organization and by the submit offer. Overall, the company on a competitive market must be able to modify their objectives and methods of action [Penc 1994].

Its permanent presence allow for the continuous changes made in the company. The ability to operate efficiently and to continuously adapt is often called entrepreneurship.

P. Drucker (1993) has explicitly connected the entrepreneurship with an innovation, which *is the specific instrument of the entrepreneurship – an action that gives new opportunities to create wealth by owned resources*. Business innovativeness is usually defined as an organization's ability to continually develop and adapt – according to their working practices – the results of the scientific research, new concepts, ideas and inventions [Janasz, Leśkiewicz 1995].

[1] *Podręcznik Oslo…*, dz. cyt.

An innovative enterprise is one, in which the process of change is an integral part of its operation. The sustainability of such attitude was highlighted by Ch. Freeman (1982) *not to introduce of innovation – means to die*.

A. H. Jasiński (1992) has concluded that an innovative enterprise is one that meets the following criteria: conducts research and development works (purchases or projects that are developed as a result of the R & D works); dedicates relatively large financial resources to this activity; systematically implements the new solutions in science and technology; it represents a large share of new products (products and technologies) in volume of the production and it constantly introduces the innovations to the market.

This definition limits the concept of an innovative enterprise, placing it rather among entities with research and development activities or in the sector of large enterprises with their own research (e.g. Pharmaceutical companies, companies from the information technology sector). Meanwhile, A. Sosnowska (2011), has classified innovative companies, in addition to large corporations operating in the fields of high technology, and has listed the small and medium-sized enterprises, operating in the niche areas, using the market place, which for various reasons are not occupying by the large corporations.

This division introduces some limitations, as it does not include, among others, small businesses, which operate for example in the area of services. The organizational or technological changes, which are a response to market needs, and even gives rise to the new kinds of services, should be the basis to be graded as the innovative ones.

*The Oslo Manual (2006)* unifies terms, breaking down the concept of innovation to products, processes, organisational changes and marketing innovations. The adoption of unified methods is the basis for making comparative analyses.

According to the definition formulated in this publication, technical (technological) innovation „occurs when a new or improved product is introduced on the market or when a new or improved process is used in production, and the product and process are new at least from the point of view of the enterprise introducing it. Therefore, statistical research on innovations includes all possible degrees of novelty: from products and processes on a global scale (so-called absolute innovations), through products and processes that are new in the scale of the country or market in which the company operates, to products and processes new only to the enterprise, but already implemented in other companies, industries or countries (so-called imitative innovations)".

The *„Oslo Manual"* defines organisational innovation as „the implementation of a new [not used so far in the company – author's note] organisational method in the company's rules of operation, in the organisation of the workplace or in relations with the environment". The aim of introducing organisational innovations is to achieve better financial results, cost reductions, especially administrative costs, and increase employee satisfaction.

Marketing innovation is defined by the authors of the „Oslo Manual" as the „implementation of a new marketing method involving significant changes in design (product design) or in

packaging, distribution, promotion or the pricing strategy". The aim of marketing innovations is to meet the needs of customers, enter new markets and improve positioning of the product.

Evidence for innovative behaviour of businesses should be sought, among others, in the expenditure of companies on new, innovative technologies and outlays on organisational and marketing innovations.

Research on innovation and especially the comparison of obtained results is quite difficult. Unification in this field was introduced by specifying methodological standards. D.B Audretsch (1995) pointed out that the commonly used indicator of spending on R&D determines the amount of all expenses, not just those that are directly related to the introduced innovations. Besides, expenses on research and development are long-term investments, so measuring the direct effects is difficult.

Research on the relationship between innovation and effectiveness has been conducted over the past two decades. Many studies have shown a significant relationship between innovation and productivity (Griliches and Mairesse 1998), but numerous other studies have failed to prove this. On the other hand, Parisi, Schiantarelli and Sembenelli (2006) noticed the impact of R&D on productivity by facilitating the absorption of new technologies.

**A special measure of innovativeness was adopted by S. Gomulka (1998), who recognised as such the GDP growth rate per employee. Although the measure of innovation he defined is a good basis for assessing the innovativeness of the Polish economy, it seems misleading in the case of comparisons of international small and medium-sized enterprises.**

**The study adopted as a measure of the effectiveness of implemented innovations the increase of a company's sales per employee, expressed as a percentage. Outlays on innovation have been described as a percentage of annual sales of the company dedicated to technological, organisational and marketing innovations.**

Data aggregated in such a way will provide information after statistical processing (multiple regression analysis) about the strength of the influence of independent variables (outlays on technological, organisational and marketing innovations) on the dependent variable (the relative increase in sales of the company per employee).

It was assumed that level of outlays on innovations will affect changes in the company's sales per employee (also expressed as a percentage).

Thus, the following have been adopted as independent variables:

- Outlays on technological innovations **– *Et***
- Outlays on organisational innovations **– Eo**
- Outlays on marketing innovations **– Em**

While the dependent variable is:

- The change in the value of sales per employee **– *Se***.

When choosing to conduct further research using multiple linear regression analysis, it was assumed that the relationship between variables is linear.

Thus, the equations of the model described this way takes the following form:

$$Se = a_1Et + a_2Eo + a_3Em + a_0 \quad (1)$$

where:

$a_1$, $a_2$, $a_3$ – parameters,

$a_0$ – absolute term.

As a result of multiple regression analysis, the values of parameters $a_1$, $a_2$, and $a_3$ will be identified and therefore the proposed model will become complete. The obtained values of parameters $a_1$, $a_2$, $a_3$ determine the effectiveness of outlays on technological, organisational and marketing innovations.

## 3. Empirical studies

The first study was conducted in 2005. A mail questionnaire was conducted on the behaviour of innovative small and medium-sized printing companies (W. Cetera 2008). The questionnaire was sent to 420 privately owned printing companies under various legal forms. The study was conducted throughout the country. 95 companies answered the questions, which makes up 22.6% of sent questionnaires. After verification of the returned forms, 87 surveys were included in the study (20.7% of sent questionnaires). During this study, 75 printing companies declared that they would implement innovations in the future.

The above-mentioned companies that were planning to implement innovations were examined in the years 2012-2014. The aim of the study was to determine what innovations have been carried out and the outcomes. During the study, we found that 15 of the 75 companies surveyed in 2005-2015 ended their activity (were liquidated by the decision of the owners or went bankrupt). 11 entities realised their innovation plans, but because they did this with the use of European funds, they have been omitted in the test. Thus, all of the studied companies operated under comparable conditions. Finally, 49 printing companies were qualified for the study.

As a result of conducted interviews, the level of outlays allocated by managers to technological, organisational and marketing innovations in relation to the annual sales of the company was determined (Table 1). It was assumed that their level will affect changes in the company's sales per employee (also expressed as a percentage).

Among the 49 cases analysed, all companies introduced technological innovations in the years 2010-2012, devoting an average of 57.6% of their annual sales (Table 2). In contrast, organisational innovations were introduced by 26 companies, which allocated an average of 3.7% of their annual sales. Marketing innovations were implemented by 38 companies – the average expenditure was 10.5% of annual sales.

The greatest outlays on technological innovation accounted for 80% of the annual sales of a company - the smallest was 10% of annual sales. In contrast, expenditure on organisational and marketing innovations was much smaller. In the case of organisational innovations, it did not exceed 20% of annual sales and 30% in the case of marketing innovations. As a result of the implemented innovations, sales per employee increased from 40% to 280%.

■ **Table 1.** Expenditure on innovations in companies surveyed in the years 2010-2012 (values expressed in % of the sold value)

| No. | Technological innovations | Organisational innovations | Marketing innovations | Sales per employee |
|---|---|---|---|---|
| 1 | 80 | 20 | 15 | 280 |
| 2 | 80 | 15 | 10 | 220 |
| 3 | 80 | 10 | 10 | 210 |
| 4 | 75 | 10 | 15 | 210 |
| 5 | 75 | 10 | 10 | 190 |
| 6 | 75 | 10 | 10 | 180 |
| 7 | 70 | 10 | 5 | 180 |
| 8 | 70 | 5 | 30 | 260 |
| 9 | 70 | 5 | 20 | 210 |
| 10 | 65 | 5 | 10 | 160 |
| 11 | 65 | 5 | 5 | 150 |
| 12 | 65 | 5 | 5 | 135 |
| 13 | 65 | 5 | 5 | 140 |
| 14 | 60 | 5 | 20 | 200 |
| 15 | 60 | 5 | 15 | 170 |
| 16 | 60 | 5 | 5 | 100 |
| 17 | 55 | 5 | 20 | 200 |
| 18 | 55 | 5 | 15 | 170 |
| 19 | 55 | 5 | 10 | 160 |
| 20 | 55 | 5 | 10 | 140 |
| 21 | 55 | 5 | 5 | 130 |
| 22 | 55 | 5 | 5 | 130 |
| 23 | 50 | 5 | 15 | 190 |
| 24 | 50 | 5 | 5 | 130 |
| 25 | 30 | 5 | 10 | 120 |
| 26 | 30 | 5 | 5 | 100 |
| 27 | 70 | 0 | 25 | 220 |
| 28 | 65 | 0 | 20 | 190 |
| 29 | 65 | 0 | 15 | 170 |
| 30 | 60 | 0 | 25 | 210 |
| 31 | 55 | 0 | 20 | 180 |
| 32 | 55 | 0 | 10 | 130 |
| 33 | 45 | 0 | 25 | 190 |
| 34 | 40 | 0 | 15 | 130 |
| 35 | 30 | 0 | 15 | 120 |
| 36 | 20 | 0 | 30 | 180 |
| 37 | 20 | 0 | 20 | 130 |
| 38 | 10 | 0 | 5 | 40 |
| 39 | 80 | 0 | 0 | 110 |
| 40 | 75 | 0 | 0 | 100 |
| 41 | 70 | 0 | 0 | 100 |
| 42 | 70 | 0 | 0 | 90 |
| 43 | 65 | 0 | 0 | 80 |
| 44 | 60 | 0 | 0 | 85 |
| 45 | 55 | 0 | 0 | 90 |
| 46 | 55 | 0 | 0 | 80 |
| 47 | 50 | 0 | 0 | 70 |
| 48 | 50 | 0 | 0 | 60 |
| 49 | 50 | 0 | 0 | 40 |

Source: surveys 2010-2012

■ **Table 2.** Statistics of outlays on innovations

| | Average | Minimum | Maximum |
|---|---|---|---|
| **Technological innovations** | 57.6 | 10.0 | 80.0 |
| **Organisational innovations** | 3.7 | 0.0 | 20.0 |
| **Marketing innovations** | 10.5 | 0.0 | 30.0 |
| **Productivity per employee** | 145.2 | 0.0 | 280.0 |

Source: own calculations

Since it was not possible to measure in specific dates during the course of the study (2012-2014), historical data was used as a point of reference. Therefore, it was assumed that expenditure on marketing, organisational and technological innovations would concern innovations implemented in 2010-2011. However, the information concerning the increase in sales per employee refers to the result achieved in December 2012.
After performing calculations using Statistica, we obtain:
A summary of the dependent variable regression: Productivity per employee (source data Table 1):

R= .98410205 R2= .96845684 Adjusted R^2= .96635396

F(3.45)=460.54 p<0.0000 standard error of the estimate: 10.102

| | BETA | Bd st. | B | Bd st. | t(45) | p level |
|---|---|---|---|---|---|---|
| **Absolute term** | | | 9.014034 | 6.106049 | 1.47625 | 0.146842 |
| **Technological innovations** | 0.358888 | 0.030098 | 1.212432 | 0.101681 | 11.92394 | 0.000000 |
| **Organisational innovations** | 0.374270 | 0.029902 | 4.660816 | 0.372378 | 12.51636 | 0.000000 |
| **Marketing innovations** | 0.783097 | 0.027021 | 4.971468 | 0.171540 | 28.98138 | 0.000000 |

The coefficients of equation **(1)** are:
$a_1$ **= 1.212432**
$a_2$ **= 4.660816**
$a_3$ **= 4.971468**
$a_0$ **= 9.014034**

Thus, the equation of the model described this way, constructed similarly to the first case, takes the following form:

$$Se = 1.212432*Et + 4.660816*Eo + 4.971468*Em + 9.014034$$

The parameters of the presented model confirm the effectiveness of marketing innovations – each 1% of sales allocated to this kind of innovation gives almost fivefold returns (4.971468). In the case of organisational innovations, 1% of company sales allocated to their implementation results in increased sales per employee of 4.66%. Expenditure on technological innovations is the least effective – only 1.21%.

## Conclusions

The current situation of the Polish printing industry confirms that companies have paid excessive attention to technology. Competitive advantage in this area has proved to be insufficient to achieve market success. Companies failed to notice changes in the printing services market and the excess of production capacity remaining at the disposal of businesses.

The obtained results should encourage businesses to pay greater attention to innovative organisational and marketing solutions.

Taking into account the modernity of means of production in the Polish printing sector and at the same time lower productivity than in other branches of the economy per employee, it is marketing and the effective organisation of work that should be the source of competitive advantage.

The obtained results suggest conducting similar studies in other sectors of the economy.

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## ■ Streszczenie

Okres transformacji polskiego sektora poligraficznego rozpoczął się w roku 1989. Budowa nowoczesnego sektora odbywała się w ograniczonych warunkach finansowania, a firmy z trudem pokonywały barierę kapitałową. Dopiero w latach 2005-2009, dzięki funduszom z Unii Europejskiej, przedsiębiorstwa poligraficzne osiągnęły wysoki poziom technologiczny. Przewaga konkurencyjna była budowana w oparciu o koszty (głównie niskie płace) i systematycznie rosnącą jakość. Jednak w roku 2012, pomimo zrealizowanych inwestycji wydajność pracy mierzona wielkością sprzedaży przypadającej na jednego pracownika, była mniejsza niż w całym polskim przemyśle. Menedżerowie polskich przedsiębiorstw poligraficznych nadmierną wagę przywiązywali do technologii zaniedbując innowacje organizacyjne i marketingowe.

Przeprowadzone w latach 2012-2014 badania pokazały wpływ innowacji technologicznych, organizacyjnych i marketingowych na efektywność przedsiębiorstw poligraficznych. Otrzymane wyniki jednoznacznie wskazały, że to innowacje organizacyjne i marketingowe mają największy wpływ na wydajność przedsiębiorstw poligraficznych.

## ■ Summary

The period of transformation of the Polish printing sector began in 1989. The construction of a modern industry took place under restricted conditions of financing and companies barely overcame the barrier of capital. It was not until the years 2005-2009 when thanks to funds from the European Union printing companies achieved a high level of technological development. Competitive advantage was built based on costs (mainly low wages) and steadily increasing quality. However, in 2012, in spite of the realised investments, productivity measured by sales per employee was smaller than in Polish industry as a whole. Managers of Polish printing companies focused too much on technology while neglecting organisational and marketing innovations.

Studies carried out in the years 2012-2014 showed the impact of technological, organisational and marketing innovations on the effectiveness of printing companies. The obtained results clearly indicated that it is organisational and marketing innovations that have the greatest impact on the productivity of printing companies.

**Keywords:** economy, management, printing, transformation, innovation, production
**Słowa kluczowe:** ekonomia, zarządzanie, poligrafia, transformacja, innowacje, produkcja

**JEL Classification:** O12, O31, O52