

Changes in the Use of ERP Systems Supporting Enterprise Logistics in Poland – Sectoral Analysis

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Abstract: Markets globalization, consumer behaviour and fast development of products forced changes into running a business. Cooperation within supply chains, strengthening bonds with customers and optimal resource planning are fundamental to the functioning of businesses. The realization of these activities is possible through information technologies, especially those supporting businesses in terms of logistics. The level of complexity of logistic processes is connected with a particular sector. The goal of this work is to determine the scale of Enterprise Resource Planning (ERP) systems use in enterprises across individual sectors. The shift-share analysis is used. The analysis embraces the years 2012-2015. The number of companies using ERP systems acted as variables and the data were shown by sectors. The results of the shift share analysis point to the growing trends in the number of businesses using ERP systems. Relatively speaking, the biggest potential in terms of the analyzed variable was observed in the industrial processing and trade and repair sectors, although these sectors are at the same time less competitive than the others. We can conclude, therefore, that these sectors are not the domineering ones in terms of complexity and the intensity of the realization of processes supported by ERP systems.

Keywords: logistics, shift-share analysis, ERP systems

1 Introduction

The development of information technologies (IT) brought major changes into operating a business. The phrase information technologies denotes mechanisms whose goal is to improve the functioning of complex supply chains and the coordination of processes realized within them (Nativi and Lee, 2012, p. 366, Kott, 2013, p. 51). They are necessary in the management of supply chains (Li et al., 2009, p. 125) maintaining relations with clients (Strzelecka, 2012, pp. 286-286), and maximization of business benefits (Szajt, 2006). Information technologies have different influence on the activity of businesses as they can lead

to: Development of creativity, Corporation strategy support, Organization transformation, Creation of an organization or increase of its value, Shaping the planning process and other business processes, Knowledge integration, Organizational integration (Besson and Rowe, 2012, pp. 109-113).

Information technologies supporting the integration of logistics processes include Enterprise Resource Planning (ERP) systems which act as sources of up-to-date information in an enterprise management. And that is how the systems support the logistics of an enterprise. Investments into IT are often connected with the implementation of ERP systems (Thompson et al., 2014, p. 109). The systems are used in order to increase the effectiveness of an enterprise (Keramati et al., 2013, p. S29) which is possible through the roles the ERP systems play in an enterprise.

Enterprise resource planning system is an information system supporting and integrating the functioning of many business areas within an enterprise (Parthasarathy and Sharma, 2014, p. 1009, Ruivo et al., 2014, p. 167, Lepistö, 2014, p. 194, Madapusi and D'Souza, 2012, p. 24). The implementation of the system results in a better distribution of resources and the increase of effectiveness of enterprise management (Tasevska et al., 2014, p. 529). In contrast to classic enterprise management systems, ERP systems were designed to support business processes between multiple cooperating enterprises in the first place. The intensity of the cooperation and the need for ERP systems use often depends on a particular sector in which a company operates. Belonging to a given sector determines the type of processes realized in an enterprise.

The goal of the article is to determine the scale of enterprise resource planning systems use in enterprises across individual sectors. The article puts forward the following these: the nature of changes in the use of ERP systems is varied depending on belonging to a particular sector.

2 Research Methodology

To examine the diversity across sectors we used the shift-share analysis. This method allows to analyze the level of economic development on a given area juxtaposed with a reference area in the context of the level of development of individual sectors and changes in that development (Suchecky, 2010). The method assumes a decompositional approach which allows to assess the influence of the individual components on the final assessment of the position of a given sector with reference to the whole area, and allows to diagnose the sources of change in sectors.

In order to carry out a shift-share analysis the following elements were specified:

1. Analyzed area potential (AAP) – national share – which determines the changes of the analyzed variable in sectors with the assumption that they develop in a tempo similar to the reference area.
2. Enterprises structure (ES) – industrial mix – which characterizes the portion of changes which comes from the general tendency with the analyzed feature, and where a positive value means a better structure in the examined area than in the reference area.
3. Analyzed area competitiveness (AAC) – regional shift – which describes changes in terms of the analyzed feature caused by a competitive position of enterprises in sectors and, thereby, indicates the difference between the increase index in the analyzed area compared to the reference area.

The following formulas were used (1)-(3) (Santarek and Szerenos, 2006):

$$AAP_{ib}^t = \sum E_{ib}^{t-1} \cdot \left(\frac{E_r^t}{E_r^{t-1}} - 1 \right) \quad (1), \quad ES_{ib}^t = \sum E_{ib}^{t-1} \cdot \left(\frac{E_{ir}^t}{E_{ir}^{t-1}} - \frac{E_r^t}{E_r^{t-1}} \right) \quad (2),$$

$$AAC_{ib}^t = \sum E_{ib}^{t-1} \cdot \left(\frac{E_{ib}^t}{E_{ib}^{t-1}} - \frac{E_{ir}^t}{E_{ir}^{t-1}} \right) \quad (3).$$

E_r – number of enterprises using computers in their activity in the reference area r (Poland), E_{ir} – number of enterprises in terms of the analyzed variable in the reference area r in the group i according to the cross-sectional division, E_{ib} – number of enterprises in terms of the analyzed variable in the reference area b (individual sectors) in the group i according to the cross-sectional division, $t-1$ – the first year in the analyzed period, t – the last year in the analyzed period.

The division is consistent with the classic shift-share model (Knudsen, 2000, Zaccomer, 2006). The sum of the components AAP, ES and AAC is the so called total shift (TS) which represents the actual change of a given variable in the year t compared to the year $t-1$.

The analysis embraced the years 2012-2015. The data come from the Polish Central Statistical Office (GUS, 2015). The analysis involves the number of companies using ERP software packages for transmitting information between different departments (e.g., accounting, marketing, production). The enterprises were divided according to different sections: S1 – industrial processing, S2 – production and the supply of electricity, gas, steam and hot water, S3 – water supply, sewerage and waste management, remediation, S4 – construction, S5 – trade and repair, S6 – transport and storage, S7 – accommodation and catering, S8 – information and communication, S9 – financial and insurance activities, S10 – real estate, S11 – professional, scientific and technical activities, S12 – administration and support service activities, S13 – repair and maintenance of computers and communication equipment, S14 – ICT sector.

3 Research findings

As far as the number of enterprises using ERP systems for the decision making process support is concerned, in Poland we observe significant change dynamics. In the whole 2010-2015 period there was an annual average increase of the number of enterprises using ERP systems. The changes visible in the number of all companies using ERP software packages for transmitting information between different department (on annual average by 17.57%) were connected with changes in small enterprises (on annual average by 22.51%).

The scale of use of ERP systems in Poland is connected with the size of a business and a particular sector. ERP systems are most often used by big enterprises and least often by small ones. Profitability of using the systems in large businesses is connected with the greater scale of business activity, broad cooperation and the complexity of processes realized with the help of information technologies. In Poland, however, the use of ERP systems is generally limited as only 21% of enterprises. Leading sectors in terms of using ERP software packages for transmitting information between different departments (e.g., accounting, marketing, production) are industrial processing and trade and repair. 63.55% of all enterprises using ERP systems belong to these sectors.

Shift-share analysis allowed to cast some light on to what extent, if at all, the results of individual sectors in terms of using ERP and CRM systems are different, and if they also differ from general processes taking place in Polish businesses which use computers. The analysis covers the period of 2012-2015. The results are presented in table 1.

Sector	The level of components			Real change
	AAP	ES	AAC	TS
S1	388.26	2849.87	-152.17	3085.97
S2	13.70	100.59	-24.28	90.01
S3	19.00	139.47	158.26	316.73
S4	74.49	546.77	-279.18	342.08
S5	372.79	2736.32	-1028.20	2080.91
S6	45.91	336.95	150.39	533.24
S7	19.09	140.09	26.14	185.31
S8	35.06	257.34	729.33	1021.73
S9	16.23	119.10	-60.90	74.43
S10	18.50	135.77	285.54	439.80
S11	44.90	329.54	175.06	549.50
S12	27.83	204.27	112.77	344.87
S13	1.51	11.11	4.88	17.50
S14	45.15	331.39	430.37	806.92
Total	1122.41	8238.59	528.01	9889.01

Table 1

Components of shift-share analysis for the number of companies using ERP software packages for transmitting information between different departments (e.g., accounting, marketing, production) in Poland in the period 2012-2015

Source: own elaboration.

The results show an upward trend in the number of companies using ERP software packages for transmitting information between different departments (tab. 1.). In 2015 nationwide, the number was higher by 9889.01 than in 2012. Individual analysis components pertain to different change aspects. The first one reveals changes resulting from the general economic condition of the country and confirms the expected change (increase or decrease) in the number of enterprises using ERP systems with the assumption that the growth in this respect in individual sectors is comparable with the development of Polish enterprises using computers in general. AAP value exhibits a growing pace of the national increase in the number of companies using computers, but the growth is more than eight times smaller than the growth in the use of ERP systems. Positive AAP value in all sectors means that ERP systems use has a growing tendency.

Assuming a similar pace of change in the use of ERP systems in sectors and computers in the country in general, each sector should see an increase in the number of enterprises using ERP systems which was true with all analyzed sectors (positive TS value). Industrial processing and trade and repair sectors were relatively the most potent sectors in terms of the analyzed area. The number of enterprises could be potentially increased by 388.26 and 372.79 respectively (i.e. by 34.6% and 33.2%). No other sector came close to this kind of potential. Ranked

third, the construction sector, displayed a value five times smaller. The least desirable outcome was observed with the repair and maintenance of computers and communication equipment sector where the potential increase of the number of businesses using ERP systems was only 1.51.

The structural component (ES) of the total shift shows the changes in the number of enterprises using ERP systems in comparison to the reference area, i.e. the whole country. These changes come from the differences between the dynamics of the increase in the number of businesses using ERP systems in sectors and the dynamics of the increase in the number of Polish enterprises using computers in general. This shift-share analysis element had the biggest influence on the positive total shift. The component reached its highest value in the sectors: industrial processing and trade and repair, and its lowest value in the sectors: repair and maintenance of computers and communication equipment.

The third component (AAC) shows either a decrease or increase of the analyzed variable caused by a competitive position of enterprises in sectors, and for that reason it is treated as an indicator of the sector economy strength or weakness. Looking at the positive AAC value we can conclude that there is a stronger sector competitiveness among enterprises using ERP systems when compared to companies using computers in Poland. The same result repeated in nine sectors. Unfortunately the lowest AAC value occurred in the sectors with the biggest actual change (highest TS value) which means that the competitive position in these sectors in terms of the analyzed variable is weaker than in the case of the country. This is due to the fact that there are sectors where the use of ERP systems is more desirable because of some business processes, e.g. in the sectors: information and communication, transport and storage. These sectors realize typical logistic processes, and the subject literature often calls them the logistics sector.

Conclusions

Implementing information technologies makes enterprises more responsive to the changing environment. And if applied to the supply chain, IT improve companies' resistance to malfunctioning of any of their partners and allow to control the level of resources at individual partners optimally.

The need for the implementation of ERP systems, which support the realization of logistic processes, results directly from the activity of an enterprise. The main activity of a business, which influences the complexity of logistic processes, is the key determiner of which sector it belongs to. In the 2010-2015 period there was a dynamic increase in the number of enterprises using ERP systems. The biggest annual average increase was observed in the case of small companies which are

the fastest developing entities in this respect. However, this significant increase in the use of ERP systems in small companies can be partly due to the annual average increase in the number of such enterprises in Poland in the years 2010-2015 and a simultaneous average annual drop in the number of medium and large enterprises. Yet still, in Poland it is medium and large sized enterprises that implement ERP systems most often because using advanced information technologies for logistic processes is profitable. The scale of these processes in medium and large sized enterprises is much bigger than in small ones.

The shift-share analysis results indicate growing trends in the number of companies using ERP software packages for transmitting information between different departments. Relatively, the biggest potential in terms of the analyzed data was observed in the industrial processing and trade and repair which is connected with the fact that these sectors contain the largest number of enterprises using ERP systems. At the same time, though, these sectors are characterized by a weak competitive position in comparison to the other sectors and the country. It means that they do not dominate in terms of the complexity and the intensity of the realization of processes supported by ERP systems. In Polish enterprises logistics is still thought of as connected with transport and warehousing. Yet markets globalization and competitiveness increase render customer service, automation and simplifying customer communication important which will result in customer's satisfaction and loyalty.

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