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IT Sector in Poland — Opportunity for Enterprise Development

(Recommended by Prof. A. Katkov)

The study contains the analysis of IT sector. The author describes the situation of this sector in Poland and other European countries by indicating development opportunities and potential barriers. In the research part a linear equation model, which indicates the relation between broadband access and total turnover, was applied.

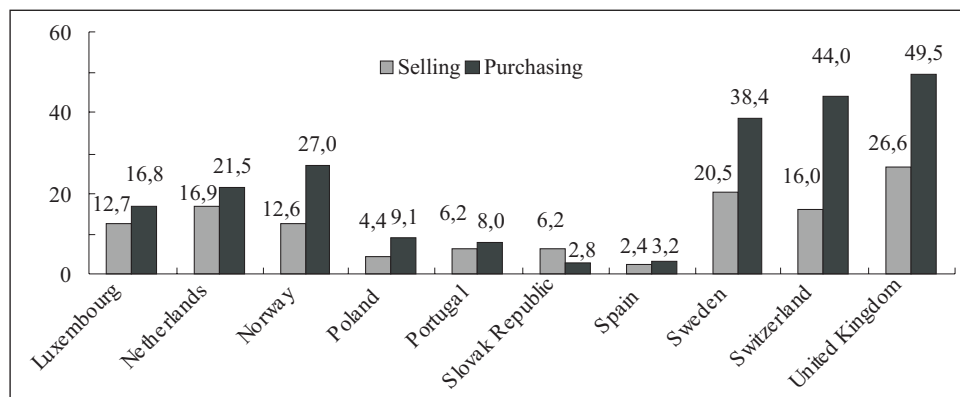
Проведен анализ сектора информационных технологий. Описано состояние этого сектора в Польше и других европейских странах относительно возможностей развития и потенциальных барьеров. Использована линейная модель, устанавливающая соотношение между широким доступом и общим товарооборотом.

Key words: IT sector, high-technology, e-commerce, cross-sectional-time model.

Introduction. The current market conditions in which companies function together with more and more fierce competition provide many tools that enable promotion, sales and operation in the market in general. One of them is the possibility to use computers, computer networks and software in a company's activity.

A company that possesses its own Internet address has many opportunities to present information about its activity. First of all, it is able to put at its own Internet address a set of WWW sites, which exhaustively explain many aspects of the company's operation to all interested parties. After connecting, each Internet user may familiarise oneself with the main WWW site, containing the minimum essential information about an institution supporting it and a thematic contents list of subsequent sites. Such sites contain, above all, the history of the institution's activity, its organisational structure, plans for future activities, a general review of products or services offered by a company and an explanation of how to carry out an interactive exchange of information with the company.

Obviously, the flow of information concerning the company is carried out under strict control of the company authorities. It is important that the presented information creates a suitable and desired company image. However, moderation in this sphere is also essential. In many cases companies excessively use the



Percentage of electronic transactions for companies employing over 10 people (Source: Eurostat. Community Survey on ICT usage in enterprises. May, 2005)

technical capabilities of constantly developing technologies due to which the content to be transmitted becomes unintelligible. Therefore it needs to be pointed out that technology is advancing at such an alarming rate that some Internet users, whose computers were not updated according to new requirements, sometimes have limited access to sites using the most up-to-date technologies. It is worth adding that at present treating the Internet as the source of information is so common that being absent from this global network pushes a company on the sidelines.

The Internet also gives the possibility to sell on-line. Countries with highly developed IT, such as Great Britain or Germany, achieve on-line sales results of 11—14 %, and in the case of Ireland this share has already exceeded 20 % of overall sales (Table 1). These changes are also noticeable in Poland, as the share of online sales has already reached the level of 3 % of overall sales, however, it is only a half of what is achieved by our southern neighbours. It is not so much the value of the very sales but the value of orders placed over the Internet that is constantly increasing in the world market. When analysing sales among companies employing over 10 people, we find that, for example, the share of online sales for Norway constitutes 27 % of overall sales, but for Sweden — 38,4 % and for Switzerland — 44 % (see Figure).

IT sector in Poland and Europe. Proceeds from sales in the sector between 2000 and 2005 among 250 biggest companies in the ICT sector in the world increased in Poland by about 66 %. This corresponds to the average annual increase of 10,6 %. The average annual rate of changes for OECD countries in this period amounted to 3,7 %. In this respect only five European countries are ahead of Poland.

As far as the turnover of hardware is concerned, the Polish import is ten times lower than the export. The import of electronic appliances only amounts to a half of their export.

If we examine export, the share of ICT goods increased from 2,65 % to 4,53 % between 1996 and 2004. The Polish export of ICT goods between 1996 and 2004 was characterised by an increase of 22,8 % yearly, whereas the volume of import increased on average by 12,5 % yearly. Higher rates in this respect were observed in this period only in Hungary — 50 %, Island — 36,6 % and the Czech Republic — 33,8 % [1]. It was also during this period that the turnover of computers in Poland increased in relation to export on average by 16,4 % yearly, and with regard to the volume of import — by 9,4 % yearly. So one may assume that the ratio of international turnover of ICT goods improved in favour of Poland.

The turnover of services related to IT and computer service increased between 1996 and 2004 by a factor of five in export, which reflects the average annual increase of 27,5 %, whereas the average annual increase in import amount-

Table 1. Total e-commerce transaction value (including via the Internet), 2002 to 2004, as a percentage of total enterprise turnover

Country	2002	2003	2004
Ireland	—	17,6	21,0
United Kingdom	14,5	12,8	14,9
Denmark	6,6	—	12,9
Germany	4,7	—	11,8
Finland	11,5	—	—
Norway	10,4	6,7	8,0
Belgium	—	7,4	6,7
Austria	—	6,7	7,3
Czech Republic	—	6,3	6,4
Portugal	1,6	3,3	5,4
Slovak Republic	—	—	3,8
Italy	2,6	2,0	3,5
Luxembourg	3,4	—	—
Spain	2,6	2,4	3,3
Poland	—	—	3,0
Greece	0,8	1,0	1,8

S o u r c e: Eurostat. Community Survey on ICT usage in enterprises. May 2005

ted to 15,2 %. As for the export of IT services in Europe, only Slovakia, Sweden and Ireland — which is considered as the absolute recent leader in the development of information technologies — were characterised by a higher acceleration rate.

The share of turnover of ICT in the overall turnover of goods in the Polish export during the best year (2002) amounted to 5,3 %. The analysis of this phenomenon carried out with reference to other countries proved a similarity to results achieved by Italy, Spain and Switzerland with a two-year delay. Values obtained in a forecast for the nearest periods for Poland determined using time and space analogies prove a decrease of this share to about 4,2 % in 2006. So one may assume that this phenomenon fluctuates around a growing trend line. This probably constitutes a kind of a cycle related to the introduction of various groups of technologies related to IT and their diffusion.

The Czech Republic may «boast about» the biggest foreign capital participation in the production of hardware (6,6 % of computers produced in this country are co-produced by foreign companies, in Poland this rate comes to 37 % and is one of the lowest in Europe)[1]. This indicates that the production sector in our country is quite developed. Other rates related to foreign capital participation in financing of the ICT industry for Poland are similar to other European countries. Poland still is not well presented in the sphere of using broadband DSL networks. The rate of the number of people using this kind of services in Poland comes to only 1,6 per 100 inhabitants — only Turkey and Greece are worse. In other European countries this rate usually exceeds 10, and in Island it amounts to about 26 [1].

Another advantage of using the Internet in management is the possibility to precisely define the target group and reach it with a much individualised advertising message. Promotion by means of the Web currently belongs to the least annoying forms of conveying an advertising message. The cost of electronic advertising is relatively low when taking into account its possibilities and effectiveness. The cost of putting a similar amount of information on the Internet is several times lower than the cost of printing it in a daily newspaper and over a dozen or so times lower than printing a leaflet, a folder or an advertising catalogue. Information about a company is available 24 hours a day, the whole year long and around the world. Moreover, if necessary, information is changed instantly after a Webmaster's intervention. In contrast to traditional brochures, using the Internet makes it possible to systematically update price lists and other information concerning products and company's promotion campaigns, as well as the very company. Preparing an advertisement on the Internet takes much less time than in the case of any traditional medium, and is much cheaper. The Internet also makes it possible to put information on a website that could not be published in a paper form for spatial or technical reasons. So we may certainly

speak about a kind of ease of manipulation of the message, which may be of utmost importance for today's managers.

Advertising on the Internet is interactive. This means that — in contrast with other media — the Internet enables direct access and just immediate contact between a customer and a company running a promotion campaign. This also serves as a valuable source of information for managers about customer needs and expectations related to a company and its products.

E-commerce has become more and more significant in the corporate management. Trade volume realized through the Internet has increased considerably in recent years. Until recently it seemed to be exceptionally attractive especially for countries with a large territory, which is associated with considerable impediments in reaching selling points — countries like Canada or Australia. Currently, demand for services which can be provided through World Wide Web increases because of more rapid style of life associated with permanent lack of time. It is not only review of manufacturers' offers in the Internet, which gain growing attention, but also Internet shopping. Within European Union, enterprises which take advantage of this kind of services in 2006 represented 3 % of enterprises with more than 10 workers in case of Latvia or Italy, and 30 % in case of Sweden. In Netherlands, Great Britain and Norway, this indicator reached the level of 25 %. In the last four years, the increase of above-mentioned enterprises in Norway was equal to 34 % annually. In Sweden and Lithuania every tenth deal was carried on through the Internet for 11 % companies. For 5 % of large and mid-sized enterprises in Great Britain, moreover, 4 % of large and mid-sized companies in Slovenia and Lithuania concluded more than a half of their transactions with the help of the web services [2].

Much higher level of e-commerce development can be observed in the case of large enterprises which employ more than 250 people. It is associated with significant facilities in trade and savings which come out of operations of more and more efficient computer management systems, which are used mainly for on-line sales service.

The share of enterprises which place orders through the Internet rises to more than 44 % in case of Denmark, Sweden, Great Britain, Norway and Iceland. More than a half of sales take place in the global network in 5 % of Danish and 6 % of Icelandic companies. In more than 10 % of enterprises in eight countries every tenth deal is carried out with the help of the Internet, and for Denmark and Sweden this indicator achieves the level of 17 %.

In many analytical studies concerning enterprises which exploit the Internet network in every day business, financial enterprises are usually ignored. On the one hand, it comes out from the fact, that those enterprises are almost entirely computerised, on the other hand, analysts have problems with an access to possible data associated with such sensitive issues as finance. Investments in Infor-

mation Technologies absorb on average approximately 3 % of GDP in European Union. These expenses are relatively stable in recent years which allows one to experience a sustainable development in the area of computerisation of particular countries and of their access to World Wide Web.

The analysis of large enterprises — with exception of financial companies — confirm that in almost every European country more than 90 % of tested enterprises used LAN type internet network in the last year. In case of Finland, Cyprus and Luxembourg this indicator was 100 %, whereas in Bulgaria 81 %, in France — which may be surprising — 88 %. It results rather from popular exploitation of Intranet network in this country — 85 % of enterprises. Analysis of all possible networks used in different countries reveals that more than 90 % of enterprises benefit from using at least one type of network. Only in Bulgaria — 8 % and Slovenia — 6 % of large companies do not use any type of network. Apart from above-mentioned indicators associated with the number of enterprises which contribute to global electronic trade, it is sales volume which is not less important. Sales volume realised through the Internet represents in European Union 4 % of total sales and it has doubled in the last two years. The highest sales value was observed in Ireland — in recent years approximately 10 %. It can be compared with the lowest indicator value in Bulgaria — 0,1 %.

Many of the above rates show the level of economic development of the analysed countries. The possibilities that emerge for companies are related to the development of the global network combined with informatisation are becoming more and more extensive. Unfortunately, to a great extent — especially in the case of less affluent countries — the success of companies depends on the involvement of the state. Regrettably, Poland presents itself less favourably than other countries. The share of expenditure on research and development related to information technologies in 2002 in Poland came to only 0,01 % in GDP, whereas, for example, in the Czech Republic it already amounted to 0,05 % in GDP. In the case of countries leading in the development of information technologies this share exceeds even one percent (Finland, Korea) [1].

The highest level of employment of people working on ICT in the R&D sector in Europe may be observed in countries that have the highest level of expenditure on ICT in expenditure on R&D, i.e. in Finland and Ireland [1]. In these countries more than a half of people employed in the R&D sector work on ICT.

The increase in expenditure on ICT in Poland between 2000 and 2005, just as in the other countries in the region, was very dynamic, it increased by 12 % a year. This is the catch-up effect — in the case of more developed economies this increase amounts to less than 5 %. Nonetheless, we are again falling behind other countries — the Czech Republic recorded an increase of 16 % a year in the discussed period, and Slovakia — even of 17 % a year [1]. It seems that at pres-

ent the driving force behind the development of the information technology in Poland is the economy, i.e. companies. Just they invest considerable resources in the continuous development based on modern electronic technologies in order to be able to compete with other global market participants. Still, such practices are not new in the world — in principle, they are normal practices in the free-market economy. Perhaps the very results and activities of Polish companies in the sphere of informatisation and computerisation of work are the best indications of the adjustment of economy to global market conditions.

Volume of turnover and use broadband networks. Taking into account the above remarks, there was an attempt to prove a hypothesis concerning the clear influence of the possibility to accept orders and to use broadband networks on the value (volume) of turnover. However, the information available has many flaws. The data have been gathered since 2002. In most cases, the duration of time series possessed by us is only three periods. The information we have contains numerous gaps. Basically, the only information that is suitable for modelling in this case is related to the structure indices concerning the indicated categories. Moreover, it seems justified to use the time and space test, due to its possibilities.

When the information available on the formation of the phenomenon examined in a particular population is too scarce, one may expand it by the information on the same phenomenon for another population of a similar nature. Such a test would be cross-sectional in this case (the same variables for various objects, e.g. countries) within the same time unit or cross-sectional-time when the data are additionally related to several periods.

A typical method of using the space-time models is the single-equation, single-factor econometric model estimated in virtue of panel data, in the following form [3]:

$$y_{it} = \alpha + X_{it}^T \beta + u_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T,$$

where i — means an object (e. g. a country); t — time (e.g. years); X_{it}^T — is a vector of observations on explanatory variables with K coordinates; α — is an absolute and invariable term in time and space, u_{it} — is a random component divided into two groups, $u_{it} = \mu_t + v_{it}$; μ_t — reflects the non-observable and regression effect, not included in the equation and resulting from affiliation with the i -th group; v_{it} — the remaining part of the random component.

The balanced data obtained a permit, in addition to the said decomposition of the random component of the absolute term, to differentiate the structural parameter values for the individual variables in the test [4]. It is assumed that the parameter value is composed of the value typical for all the objects and the value characteristic for the individual object [5]: $Y_i = X_i \beta_i + \xi_i$. Therefore, if $\beta_i = \beta + v_i$ then

$$Y_i = X_i \beta_i + (\xi_i + X_i v_i) = X_i \beta + w_i.$$

In the final version the test consists of data concerning 14 countries and the period between 2004 and 2006. The states: Belgium, Czech Republic, Germany, Estonia, Ireland, Greece, Spain, Italy, Lithuania, Austria, Poland, Portugal, United Kingdom, Norway.

The information gathered comes from the official data of EUROSTAT.

In the initial version of the model other variables were also included, however, their significant impact on the volume of turnover was at least dubious. As a result, an estimation using the regression method was carried out, which eliminated isolated and irrelevant absolute terms indicating characteristic features of individual countries. Consequently, the following model was obtained:

$$Tur_{it} = -1,810 + 0,293 Ord_{it} + 0,062 Brd_{it} + \beta_i Z_i + \varepsilon_t,$$

(0,907) (0,046) (0,015)

where *Tur* — Percentage of enterprises' total turnover from e-commerce over the last calendar year; *Ord* — Percentage of enterprises having received orders on-line over the last calendar year (at least 1%); *Brd* — Percentage of enterprises with the broadband access.

Here individual dummy variables indicate differences among selected countries in comparison with values typical for all of them. This model also makes it possible to show similarities — concerning, above all, the shape of existing relationships, as well as differences — in the case of the appearance of statistically significant own absolute terms. So we may conclude that one percent rise in the number of offers placed over the Internet should increase the share of turnover (with a similar level of access to broadband networks) by 0,293 %. The same rise in the number of subscribers using broadband connections should — with a permanent share of orders placed — cause an increase in the share of on-line sales in overall sales by 0,062 %. A very high model match — $R^2 = 0,95$, proves that it is suitable for drawing conclusions based on it.

As can be seen in Table 2, all values are characterised by a high significance level. Even the general absolute term (as -1,810 may be treated as such), in relation to which the criteria are usually less strict, is characterised by a high significance level of 0,055. It could be stated that the indicated results to a large extent reflect the level of development of individual countries in the sphere of sales informatisation of sales. In the studied example the highest index appears in the case of Ireland: +12,848 — which may prove a much higher level of technological advancement in comparison with other countries and consequently a larger share of online sales in comparison to other countries having similar values of explanatory variables. The next places are taken by Germany, Great Britain, Norway and, what is worth emphasising, Poland. So one could propose a thesis that the prospects for the development of the market based on information

Table 2. The values of structural parameter assessments including the levels of rejection of the hypotheses on significance

Country	Parameter β_i estimate	Standard error	T-statistics	Rejection level
Belgium, Greece, Spain, Italy, Lithuania	-1,810	0,907	-1,996	0,055
Czech Republic	2,095	0,816	2,568	0,015
Germany	5,169	0,960	5,387	0,000
Estonia	-3,552	0,802	-4,428	0,000
Ireland	12,848	0,969	13,264	0,000
Austria	2,108	0,830	2,540	0,016
Poland	2,431	0,842	2,887	0,007
Portugal	1,816	0,787	2,308	0,028
United Kingdom	5,372	1,252	4,291	0,000
Norway	3,328	1,012	3,289	0,003

S o u r c e: own calculations

technologies in Poland are higher than in the case of our neighbours from the south — the Czech Republic, or from the east — Lithuania and Estonia. It is worth pointing out that this index is negative for Estonia. This proves the fact that in order to achieve results similar to other countries concerning the share of online sales in overall sales in this country, the development of access to broadband networks and service possibilities — especially in the sphere of accepting orders — via the Internet should be much more intense.

Obviously, the interpretation of the model based on macroeconomic indexes — and in principle on structure indexes, could seem flawed, however, it makes it possible to determine basic relationships and possible differences among the countries analysed.

Conclusion. To sum up, we may state that the situation of Polish companies, as far as the use of new information technologies in sales is concerned, is not very good, however, there are really positive signs of improvement. The society seems to be open to changes related to sales services, which is proved by the results of the model. It is the very fact that we possess information on the development of this sector in Poland that indicates that people who decided to gather such data were truly interested in this subject. Moreover, the existing relationships in Poland and in other countries show how important it is that broadband connections become commonly used in companies' activity. Taking into consideration polish achievements to date in this respect, it is worth paying much more attention to the popularisation of the discussed possibilities.

Наведено аналіз сектора інформаційних технологій. Описано стан цього сектора у Польщі та інших європейських країнах відносно можливостей розвитку і потенційних бар'єрів. Використано лінійну модель, що встановлює співвідношення між широким доступом та загальним товарообігом.

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Поступила 02.04.07