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ECONOMIC CRISIS AND INFORMATISATION STRATEGIES OF ENTERPRISES. RESULTS OF COMPARATIVE SURVEYS FROM YEARS 2009-2010

Abstract: The materials of the AITM'2009 Conference contained results of the survey – carried out by the author of this paper in 2009 – which aimed at analysing how the recent economic crisis influenced informatisation strategies of enterprises [Dyczkowski 2009]. In 2010 a comparative study was conducted, with an objective to determine whether any substantial differences in reference to the previously obtained results could be observed, and if yes, how intensive such changes were. This paper discusses results of the comparative surveys from the years 2009-2010. The results obtained support a working hypothesis that the economic crisis affected – to smaller or greater extent – short- and long-range informatisation strategies in the majority of companies or institutions. The detailed information to that subject is included in this paper.

Keywords: statistical analysis, informatisation strategies, comparative survey results.

1. Introduction

The global financial crisis, which have affected the Polish economy since the second half of 2008, resulted in deteriorating economic situation in majority of companies and institutions. The evidence was provided by: current business statistics, economic and social analyses, or by monitoring tendency changes in the economy. Implications of the crisis were also observed in information technology domain. Clear signals came from producers and providers of IT products and services, as well as from their customers. They were also acknowledged by nearly all major companies monitoring IT industry, including: DiS, Gartner, Forrester Research, IDG or PMR. The last of the forgoing companies revised, for example, its forecasts for the Polish IT market twice in 2009, from the original 14.7% to 1.2% growth only (see [Olszynka 2009a, b] and [Dyczkowski 2009]). The report published in August 2010 [Olszynka 2010], which already incorporated the timely data on the value and dynamism of the Polish

IT market, revealed that the situation was actually much worse. For the first time in many years, instead of growth, a decrease (see Figure 1) by 10.1% was observed (from 26.9 to 24.2 billion PLN). This forced consulting companies to examine quality and credibility of their projections and to update them (see opinions and assessments included in e.g. [*BCS Polska*... 2009; Jadczak 2010; Laskowska 2010; Prusek 2010; Waszczuk 2009a, b]). The observed situation confirmed the author's belief that it was necessary to continue the study initiated in 2009, which investigated an impact of the economic crisis on informatisation strategies and IT projects in selected companies and institutions. The same conclusion resulted from the presentation of the published outcomes of that study at several conferences where they earned marked attention (see [Dyczkowski 2009, 2010a, b, c]).

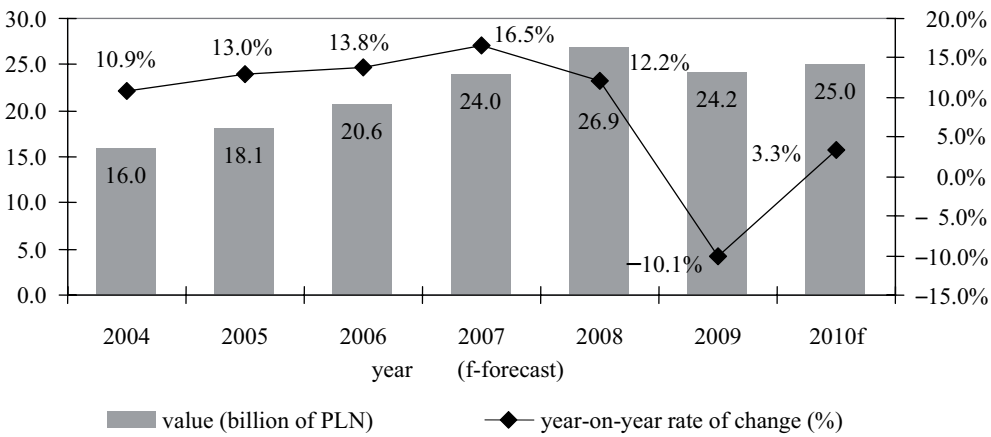

Figure 1. Value and year-on-year rate of change at IT market in Poland according to PMR data and forecasts from August 2010

Source: own presentation based on [Olszynka 2010, p. 2].

This paper will present various data breakdowns and analyses which help to assess an impact of the economic crisis on informatisation strategies and to detect changes observed in the two subsequent years.

2. Assumptions for the comparative study

The selection of the area for the comparative study followed the author's conviction that awareness of ways in which business organisations and institutions respond to the prolonged economic crisis (with the focus on IT-related activities) is important in order to counteract results of the crisis more effectively. Such knowledge should enable the IT industry to get back on track of dynamic growth observed in recent years (see Figure 1) much quicker, which is essential considering long-range strategies for

developing e-society and e-economy in our country. For the author – an academic – the information collected, beside its cognitive and utilisable aspects, has a certain educational value (both in didactic and in advisory or consulting activities).

The study has an interregional reach, and reflects situation of companies and institutions located mostly in Warsaw/Mazovia or in Wrocław/Lower Silesia. Both surveys, which provided data for the comparison, were carried out by students of the postgraduate managerial programme "IT Projects Management" at the Faculty of Management of the Warsaw University, and by part-time master-level students of Information Technology and Econometrics at the Faculty of Management, Computer Science and Finance of the Wrocław University of Economics.

Both studies were carried out in April and May, the first in 2009 and the other in 2010 – as already mentioned in the introduction. Selection of that period resulted, to some extent, from the schedule of the academic year. Yet, the far more important reason was the author's conviction – substantiated by other sources – that at that time forecasts drawn up at the turn of 2008/2009 and 2009/2010 were modified, and already incorporated information on crisis development, figures from financial statements for years 2008 and 2009 as well as data from closing reports for the first quarters of 2009 and 2010. The companies and institutions reflected the most recent data in their strategies, including those of IT area, by either sticking to or modifying prior plans.

The overall number of collected – and duly filled in – questionnaires amounted to 139 in 2009 – 52 of which were delivered by students from Warsaw, and 87 by students from Wrocław. In 2010 it reached 109 – 55 from Warsaw and 64 from Wrocław. All questionnaires formed a repository of 248 sets of data, each comprising: 38 quantitative and qualitative characteristics describing how the economic crisis affected IT strategies and what changes in strategies were adopted, 6 descriptive and typological features of the surveyed objects, and 5 other which allowed to verify collected data (including sources of information). The repository is stored and proceeded in two file formats: primarily as workbooks of Statistica, and secondly as MS Excel files. The repository contains data on a very diverse group of companies and institutions, which differs also in subsequent years. Therefore, a detailed presentation of that group is required.

3. General characteristics of the surveyed objects

Before selected results of the study are discussed, the surveyed objects – companies and institutions – will be presented briefly. Table 1 presents a breakdown of objects examined in 2009 and in 2010 by their areas of operations and sizes. It includes: importance of clusters in the whole samples, dominating values (cells with digits in bold), and substantial differences between the examined two years (cells shaded in grey).

Table 1. Structures of the surveyed objects by sector and size – the comparative analysis

Sector	Object size* (percentage in surveyed objects)										Total	
	micro		small		medium		large		the largest			
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Public administration	0.00	0.00	0.72	1.83	2.88	4.59	2.16	1.83	**4.32**	**6.42**	10.07	14.68
Banking, finance, insurance	0.00	0.00	0.00	0.00	1.44	0.92	2.16	5.50	**4.32**	**7.34**	7.91	13.76
Commerce (commodity trade)	2.88	4.59	**5.04**	**5.50**	3.60	3.67	2.16	0.00	1.44	1.83	15.11	15.60
Industry	0.00	0.00	1.44	**6.42**	4.32	3.67	5.04	4.59	2.88	1.83	13.67	16.51
Other	8.63	5.50	**12.95**	**10.09**	12.23	7.34	11.51	6.42	7.91	9.17	**53.24**	**38.53**
Total	11.51	10.09	20.14	23.85	**24.46**	20.18	23.02	18.35	20.86	**27.52**	100.00	100.00

* Sizes of institutions were determined in a simplified manner, and considered number of employees only. Though, classification criteria comply with both national (GUS) and European statistic systems (Eurostat).

The information presented in Table 1 requires short comment. Considering areas of operation, the category "other" prevails (despite observed decrease of its share by 14.71%, from 53.24% of answers in 2009 to 38.53% in 2010), which was a consequence of professional profiles of students who carried out the surveys. This group included mostly IT companies (58.67% in 2009 and 48.84% in 2010), but also telecommunication ones (10.67% in 2009 and 13.95% in 2010). This means that the ICT industry amounted in total to 69.33% in 2009 and to 60.47% in 2010 of all objects belonging to the category "other sector". It should be noticed that distinct differences (exceeding 2.5% – see cells shaded in grey) between year 2009 and 2010 were observed – beside previously mentioned category "other" – in relation to the following groups: "public administration" (increase by 4.61% in 2010 in relation to 2009), "banking, finance, insurance" (growth by 5.85%) and "industry" (gain by 2.84%).

With regard to size, similar shares of objects belonging to: small-, medium-, large- and the largest-sized enterprises can be observed (18.35 ÷ 27.52%). Some changes in composition of the samples should be noticed, though. They include both increases (the share of small objects went up by 3.71% and that of the largest ones by 6.66% in 2010) and declines (the number of medium-sized entities went down by 4.28% and that of large ones by 4.67% within one year time). A number of microenterprises was relatively smaller (11.51% of the sample in 2009 and 10.09% in 2010). The situation differs slightly from sector to sector, in particular in case of financial institutions where the largest objects prevail (54.55% of that sector in 2009

and 53.33% in 2010). The author is aware that the samples reflect neither sector- nor size-related profiles of the Polish economy (both in 2009 and in 2010).

Table 2. Structures of the surveyed objects by sector and informatisation level – the comparative analysis

Sector	Informatisation level (percentage in the surveyed objects)										Total	
	low (≥ 30%)		some (≥ 45%)		medium (≥ 60%)		high (≥ 75%)		very high (≥ 90%)			
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Public administration	0.72	0.00	1.44	0.92	**4.32**	2.75	1.44	**5.50**	2.16	**5.50**	10.07	14.68
Banking, finance, insurance	0.00	0.00	0.00	0.00	0.72	0.00	**5.04**	3.67	2.16	**11.01**	7.91	13.76
Commerce (commodity trade)	0.00	0.92	2.16	1.83	2.16	2.75	**5.76**	**6.42**	5.04	3.67	15.11	15.60
Industry	0.00	0.92	0.72	0.00	2.16	**5.50**	**8.63**	**5.50**	2.16	4.59	13.67	16.51
Other	1.44	0.00	0.72	0.92	7.19	2.75	12.95	10.09	**30.94**	**24.77**	**53.24**	**38.53**
Total	2.16	1.83	5.04	3.67	16.55	13.76	**33.81**	**31.19**	**42.45**	**49.54**	100.00	100.00

Table 2 links industry profiles with informatisation level in the surveyed objects. The latter was quantified by describing to what extent IT solutions support processes in such areas as: core business, administration and office work or in other activities. It can be observed (see cells with bold digits in the "Total" row) that the surveyed objects (76.26% in 2009 and 80.73% in 2010) were characterised by high or very high values of the said parameter. This stemmed from the industry profile of the samples, and particularity from the biggest share of ICT companies – where business operations are computerised in general. The bigger contribution of that group to the entire sample in 2010 derives from increases in the following sectors: "public administration" (by 7.41%) and "banking, finance, insurance" (by 7.48%), which counterbalanced the significant decrease in the category "other" (by 9.02%). One has to realise also that assessments of informatisation level were prone to subjectivity.

Having considered basic characteristics of the objects for which data were successfully collected, the following parts of the paper will analyse influence of the crisis on their economic situation.

4. Assessing the influence of the crisis on economic situation of the surveyed objects

Table 3 compares industrial profiles of the examined objects with evaluation of an impact which the crisis had on their economic situation. The assessments were based on a 5-grade scale.

Table 3. Structures of the surveyed objects by sector and by impact of the crisis on their economic situation – the comparative analysis

Sector	Impact of the crisis on economic situation of an object										Total	
	it is much worse		it is slightly worse		nothing has changed		it is slightly better		it is much better			
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Public administration	0.00	2.75	**5.04**	**7.34**	**5.04**	3.67	0.00	0.92	0.00	0.00	10.07	14.68
Banking, finance, insurance	2.16	2.75	**3.60**	**6.42**	2.16	3.67	0.00	1.83	0.00	0.00	7.91	13.76
Commerce (commodity trade)	1.44	0.00	**8.63**	**10.09**	4.32	4.59	0.72	0.92	0.00	0.00	15.11	15.60
Industry	0.00	2.75	**8.63**	**9.17**	4.32	3.67	0.72	0.92	0.00	0.00	13.67	16.51
Other	2.88	2.75	**25.90**	**20.18**	16.55	8.26	7.91	5.50	0.00	1.83	**53.24**	**38.53**
Total	6.47	11.01	**51.80**	**53.21**	32.37	23.85	9.35	10.09	0.00	1.83	100.00	100.00

Considering information presented in Table 3, it can be observed (see cells with bold digits) that the most frequent response was that a situation of an object became "slightly worse" (51.8% of all the answers in 2009 and 53.21% in 2010). Nevertheless, the significant share (32.37% in 2009 and 23.85% in 2010) of responses suggested a stable economic position. It is worth pointing out that in this last group a decrease of 8.52% in comparison to the previous year was observed. Considering also a growing share (by 4.53%) of responses: "it is much worse", it can be stated that the economic crisis still affects the surveyed objects. In relation to sectors, the most acute deterioration of the economic situation was noticed in the following three domains: "public administration" (increased share of negative assessments by

Table 4. Structures of the surveyed objects by size and by impact of the crisis on their economic situation – the comparative analysis

Object size	Impact of the crisis on economic situation of an object										Total	
	it is much worse		it is slightly worse		nothing has changed		it is slightly better		it is much better			
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Micro	1.44	0.92	**7.19**	3.67	1.44	**4.59**	1.44	0.92	0.00	0.00	11.51	10.09
Small	0.72	1.83	7.91	**12.84**	**8.63**	8.26	2.88	0.92	0.00	0.00	20.14	23.85
Medium	2.16	0.92	**11.51**	**10.09**	8.63	6.42	2.16	1.83	0.00	0.92	**24.46**	20.18
Large	1.44	3.67	**11.51**	**11.01**	7.19	0.92	2.88	2.75	0.00	0.00	23.02	18.35
The largest	0.72	3.67	**13.67**	**15.60**	6.47	3.67	0.00	3.67	0.00	0.92	20.86	**27.52**
Total	6.47	11.01	**51.80**	**53.21**	32.37	23.85	9.35	10.09	0.00	1.83	100.00	100.00

18.75% to the previous year), "industry" (growth by 9.06%) and "other" (increase by 5.47%). The biggest increase in share of neutral or positive assessments was noted in the "banking, finance, insurance" cluster (by 10.23%).

Table 4, in turn, compares size of the surveyed objects with assessments of an impact of the crisis on their economic situation. Considering information presented in that table, it can be noticed that the most acute deterioration of the economic situation was observed among "small" and "large" objects (increased share of negative assessments by 18.68% and by 23.75%, respectively, in relation to the previous year). On the other hand, the highest increase in share (by 29.55%) of neutral or positive assessments was observed in the "micro" cluster.

Since all basic characteristics of the impact of the crisis on economic situation of the surveyed objects have been considered, the following parts of the paper may focus on analysing the influence of the economic crisis on informatisation strategies – which is the major point of interest of this publication.

5. Assessing influence of the economic crisis on informatisation strategies

Results of the analysis, showing how the economic crisis affected informatisation strategies, will be presented in the following sequence. In the beginning it is going to be examined whether – and, if yes, than to what extent – informatisation strategies were modified; firstly, in particular industries (Table 5), secondly, in objects of certain sizes (Table 6), and thirdly, in objects grouped according to informatisation levels (Table 7). Subsequently, it is going to be analysed in what ways changes in economic situation of companies influenced their informatisation strategies and ongoing IT projects (Table 8). The following tables present: importance of clusters in the whole sample, dominating values (cells with bold digits), and important differences in surveyed years (cells shaded in grey).

Table 5. Influence of the economic crisis on informatisation strategies and projects in the surveyed objects according to sectors – the comparative analysis

Sector	Influence of the economic crisis on IT strategies and projects						Total	
	no change		slight change		radical change			
	2009	2010	2009	2010	2009	2010	2009	2010
Public administration	2.88	4.59	**6.47**	**9.17**	0.72	0.92	10.07	14.68
Banking, finance, insurance	1.44	0.92	**4.32**	**13.76**	2.16	0.00	7.91	14.68
Commerce (commodity trade)	5.04	6.42	**8.63**	**9.17**	1.44	0.00	15.11	15.60
Industry	6.47	3.67	**7.19**	**12.84**	0.00	0.00	13.67	16.51
Other	20.86	11.01	**28.78**	**21.10**	3.60	6.42	53.24	38.53
Total	36.69	26.61	**55.40**	**66.06**	7.91	7.34	100.00	100.00

Table 6. Influence of the economic crisis on informatisation strategies and projects in the surveyed objects according to their sizes – the comparative analysis

Object size	Influence of the economic crisis on IT strategies and projects						Total	
	no change		slight change		radical change			
	2009	2010	2009	2010	2009	2010	2009	2010
Micro	4.32	**4.59**	**6.47**	**4.59**	0.72	0.92	11.51	10.09
Small	8.63	4.59	**10.79**	**18.35**	0.72	0.92	20.14	23.85
Medium	5.76	**11.01**	**16.55**	9.17	2.16	0.00	**24.46**	20.18
Large	**12.23**	1.83	9.35	**13.76**	1.44	2.75	23.02	18.35
The largest	5.76	4.59	**12.23**	**20.18**	2.88	2.75	20.86	**27.52**
Total	36.69	26.61	**55.40**	**66.06**	7.91	7.34	100.00	100.00

Table 7. Influence of the economic crisis on informatisation strategies and projects in the surveyed objects according to their informatisation levels – the comparative analysis

Informatisation level	Influence of the economic crisis on IT strategies and projects						Total	
	no change		slight change		radical change			
	2009	2010	2009	2010	2009	2010	2009	2010
Low (≥ 30%)	2.16	0.00	0.00	**1.83**	0.00	0.00	2.16	1.83
Some (≥ 45%)	**2.16**	**2.75**	**2.16**	0.92	0.72	0.00	5.04	3.67
Medium (≥ 60%)	4.32	3.67	**11.51**	**10.09**	0.72	0.00	16.55	13.76
High (≥ 75%)	12.95	7.34	**17.99**	**22.02**	2.88	1.83	33.81	31.19
Very high (≥ 90%)	15.11	12.84	**23.74**	**31.19**	3.60	5.50	**42.45**	**49.54**
Total	36.69	26.61	**55.40**	**66.06**	7.91	7.34	100.00	100.00

Table 8. Crisis-related changes in economic situation of the surveyed objects and their influence on informatisation strategies and projects – the comparative analysis

Impact of the crisis on economic situation of an object	Influence of the economic crisis on IT strategies and projects						Total	
	no change		slight change		radical change			
	2009	2010	2009	2010	2009	2010	2009	2010
It is much worse	0.72	0.00	1.44	**9.17**	**4.32**	1.83	6.47	11.01
It is slightly worse	10.07	10.09	**38.85**	**40.37**	2.88	2.75	**51.80**	**53.21**
Nothing has changed	**20.83**	**13.76**	10.79	9.17	0.72	0.92	32.37	23.85
It is slightly better	5.04	0.92	4.32	**7.34**	0.00	1.83	9.35	10.09
It is much better	0.00	1.83	0.00	0.00	0.00	0.00	0.00	1.83
Total	36.69	26.61	**55.40**	**66.06**	7.91	7.34	100.00	100.00

The data presented in Tables 5÷8 requires short comment.

First of all, the study showing (see the cells with bold digits in Table 5) that as much as 63.31% (in 2009) and 73.39% (in 2010) of the surveyed objects adjusted their informatisation strategies and IT projects due to the crisis (slightly: 55.40%

in 2009 and 66.06% in 2010; in a radical way: 7.91% in 2009 and 7.34% in 2010) supports results of similar analyses carried out in 2009 and 2010 (see [Dyczkowski 2009, p. 84; Olszynka 2009a, 2010]). Considering data from Table 5 (see shadowed cells in the "Total" row) material changes in answers received in subsequent years can be noticed. On the one hand, the number of objects reporting "slight changes" increased in 2010 (by 10.66%), and on the other, the share of answers indicating "no change" decreased at a similar rate (by 10.09%).

Secondly, the data collected shows that influence of the crisis on informatisation strategies and IT projects was only partially related to sectors where the objects operated. Intensity and direction of observed changes differ between sectors and groups of answers (see shadowed cells in Table 5, depicting the biggest changes from year to year).

Thirdly, a similar conclusion may be drawn in reference to the relation between the crisis and sizes of the objects (see cells with bold digits and shaded cells in Table 6).

The fourth conclusion is that an impact of the crisis on informatisation strategies and IT projects is more visible among objects characterised by higher level of informatisation (see shaded range in Table 7). Nevertheless, the changes were recognised as "slight" both in 2009 and in 2010.

Finally – as expected – a scope of adjustments in informatisation strategies and in IT projects was correlated with a magnitude of change in economic situation of an object. The growing tendency can be detected among objects declaring evolutionary ("slight") changes in their informatisation strategies and IT projects. It refers (see Table 8) both to deteriorating ("much worse" or "slightly worse" indications were more frequent by 9.25%) and to improving economic situation (the answer "slightly better" was more frequent by 3.02%).

The following parts of the paper will identify and depict the most important symptoms of changes in informatisation strategies in reference both to the whole analysed group and to those objects where IT strategies were modified.

6. Symptoms of changes in informatisation strategies and in IT projects

The data collected in both studies enabled also to detect and structure major symptoms of changes in informatisation strategies and in IT projects, which resulted from the crisis. It should be added that these symptoms were identified by the surveyed objects with the help of a predefined list. The list was open, nevertheless, only 6 of all the objects (i.e. 139 in 2009 and 109 w 2010) presented other reasons than defined. By compiling the list, the author considered various studies (the complete list can be found in [Dyczkowski 2009, p. 85]) and selected the following symptoms:

1) a budget of an IT department was reduced,
2) spendings related to IT investments decreased,

3) new projects were abandoned,
4) ongoing projects were stopped,
5) a scope of projects was reduced,
6) IT investments were postponed,
7) IT services outsourcing was intensified,
8) IT personnel was made redundant,
9) IT seminars and trainings were cut,
10) IT was financed with external sources,
11) IT costs were streamlined (using TCO),
12) other, namely…

The surveyed objects were asked to select all relevant symptoms. The following tables present structures of responses in the whole analysed group (Table 9, columns 2 and 3) and for those objects only where changes in informatisation strategies – either slight of radical – took place (Table 9, columns 4 and 5). Dominating values (those exceeding 20% of indications) were marked – like in previous tables – in a bold type, and substantial changes (over 5%) between results from 2009 and 2010 were shaded.

Table 9. Structures of identified symptoms of changes in informatisation strategies for the entire group of objects – the comparative study

Identified symptoms of changes in informatisation strategies	Percentage share of particular symptoms			
	all objects		objects which modified their strategies	
	2009	2010	2009	2010
A budget of an IT department was reduced	25.90	28.44	38.64	38.75
Spendings related to IT investments decreased	30.94	30.28	48.86	41.25
New projects were abandoned	13.67	6.42	**21.59**	8.75
Ongoing projects were stopped	7.19	7.34	11.36	10.00
A scope of projects was reduced	13.67	13.76	**21.59**	18.75
IT investments were postponed	20.86	38.53	32.95	52.50
IT services outsourcing was intensified	2.88	4.59	3.41	6.25
IT personnel was made redundant	15.83	16.51	**23.86**	**22.50**
IT seminars and trainings were cut	33.09	33.03	51.14	45.00
IT was financed with external sources	1.44	3.67	2.27	3.75
IT costs were streamlined (using TCO)	15.83	**22.94**	**25.00**	**31.25**
Other, namely…	4.32	5.50	5.68	6.25

Referring to data depicted in Table 9 (columns 2 and 3) it should be noticed that the surveyed objects declared the following symptoms of informatisation strategy changes the most frequently (they appeared in over 20% of questionnaires): reduced

number of IT seminars and trainings (33.09% of questionnaires in 2009 and 33.03% in 2010), decreasing spendings on IT investments (30.94% in 2009 and 30.28% in 2010), reduced budgets of IT departments (25.90% in 2009 and 28.44% in 2010), postponed IT investments (20.86% in 2009 and as much as 38.63% in 2010) and IT cost streamlining initiatives using TCO (22.94%-level, which exceeds the 20%-threshold, was observed in 2010 only). When the data is analysed, and values from subsequent years compared, several facts become visible. Firstly, the biggest increase in indications (by as much as 17.67%) refers to the situation when "IT investments were postponed" – which was also the most frequently selected answer by the surveyed companies in 2010. Secondly, the biggest decrease (by 7.25%) in indications, in relation to the previous year, refers to the situation when "new projects were abandoned". All these confirm observations of many researchers (see e.g. [*BCS Polska*... 2009; Jadczak 2010; Olszynka 2010, Prusek 2010; Waszczuk 2009b]), who pointed out significant reduction in number and value of new projects in all sectors except for "public administration". Thirdly, an increased share (by 7.11%) of objects declaring that their "IT costs were streamlined (using TCO)" is also worth mentioning. This is a proof that awareness of this issue has grown recently. The author considers this information particularly important, since efficient application of information technologies has been promoted by him for many years. Finally, the low significance of IT services outsourcing (only 2.88% in 2009 and 4.59% in 2010) along with limited external financing (1.44% in 2009 and 3.67% in 2010) are unpleasant surprises. In particular the latter figure is disappointing, considering significant funds for fostering innovations (including ICT) available within EU and nationwide frameworks for financial support.

The results obtained in the group of organisations which declared changes in their informatisation strategies were similar, and differed only – what is obvious – in percentage levels (see Table 9, columns 4 and 5). The situation is slightly different in case of the two symptoms where changes for the aforementioned group in comparison to the previous year were smaller than for the whole samples. Regarding the answer: "spendings related to IT investments decreased" indications in the said group went down by 7.61%, whereas for the whole population it amounted to 0.66% only. Similarly, for the option: "number of IT seminars and trainings dropped" a decrease of 6.14% was noted for the group in question and that of 0.07% in the whole sample. The latter observation is particularly important. It suggests that changes in IT strategies may not be linked to reduced investments in employees' knowledge and skills as much as in the previous year – and that is positive.

Apart from identifying symptoms of informatisation strategy changes, the study covered also quantitative and monetary characteristics which reflected "intensity" of such changes.[1] Among the objects which modified their informatisation strategies the

[1] This part of the questionnaire used a 5-grade scale of quantitative and monetary assessments. The surveyed objects declared "intensity" of particular symptoms as: "substantial decrease", "decrease", "no changes", "increase", "substantial increase".

most significant decreases were observed in (see Table 10): IT investment budgets (61.36% of answers in 2009 and 62.50% in 2010 indicated "decrease" or "substantial decrease"), seminars and trainings (59.09 and 53.75%, respectively), equipment purchases for IT departments (53.41% in 2009 and only 42.50% in 2010) and current spendings on IT (51.14 and 51.25%, respectively). It should be emphasised that in 2010 a number of answers indicating "decrease" or "substantial decrease" went down in case of nearly all the symptoms, and the most significant changes in relation to the previous year included: "purchases of equipment for end-users" (by 18.18%), "outsourcing projects" (by 12.27%), "project implementation" (by 11.70%), "own projects, carried out by IT department" (by 11.48%) and "purchases of equipment for IT department" (by 10.91%).

Table 10. Intensity of symptoms of IT strategy changes (quantitative and monetary assessments) for the objects which modified their strategies – the comparative analysis

Symptoms of informatisation strategy changes in the objects which modified their IT strategies	"Intensity" of IT strategy changes (quantitative and monetary assessments)									
	substantial decrease		decrease		no changes		increase		substantial increase	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
IT investment budgets	7.95	8.75	**53.41**	**53.75**	31.82	21.25	6.82	13.75	0.00	2.50
Current spendings on IT	2.27	6.25	**48.86**	**45.00**	43.18	28.75	5.68	16.25	0.00	3.75
Purchases of equipment for IT department	18.18	8.75	35.23	33.75	**39.77**	**42.50**	4.55	12.50	2.27	2.50
Purchases of equipment for end-users	10.23	6.25	32.95	18.75	**50.00**	**63.75**	4.55	8.75	2.27	2.50
Software purchases	11.36	7.50	27.27	27.50	**54.55**	**48.75**	5.68	12.50	1.14	3.75
Purchases of application software/systems	7.95	3.75	31.82	26.25	**50.00**	**50.00**	7.95	16.25	2.27	3.75
Purchases of external services	5.68	1.25	27.27	28.75	**61.36**	**47.50**	4.55	20.00	1.14	2.50
Own projects (carried out by IT department)	3.41	2.50	19.32	8.75	**56.82**	**61.25**	18.18	20.00	2.27	7.50
Project implementation	5.68	0.00	27.27	21.25	**56.82**	**57.50**	9.09	20.00	1.14	1.25
Outsourcing projects	5.68	0.00	21.59	15.00	**63.64**	**63.75**	9.09	18.75	0.00	2.50
IT seminars and trainings	18.18	20.00	**40.91**	**33.75**	**38.64**	**31.25**	2.27	11.25	0.00	3.75

On the other hand, in 2009 a noticeable growth (by 15%) could be observed only in case of projects carried out by own IT departments (20.45% of answers indicated "increase" or "substantial increase"), whereas in 2010 such growth was observed for 10 out of 11 symptoms. The most frequent indications of "increase" were related to the following options: "own projects, carried out by IT department" (27.50%), "purchases of external services" (22.50%), "project implementation" and "outsourcing projects" (21.25% each), "current spendings on IT" and "purchases of application software/systems" (20.00% each). It is worth mentioning that in 2010

shares of answers indicating "increase" or "substantial increase" went up for nearly all the symptoms in relation to the previous year. The most significant changes included: "purchases of external services" (by 16.82%), "current spendings on IT" (by 14.32%), "IT seminars and trainings" (by 12.73%), "outsourcing projects" (by 12.16%) and "project implementation" (by 11.02%).

The data collected in the study enabled also to identify IT domains affected by modifications in informatisation strategies and to characterise these changes in quantitative and monetary ways (see Table 11). Among the objects which adjusted their informatisation strategies, the most significant decreases were observed in the following areas: purchases-stock management-supply chain, supported by SCM applications (34.09% of answers in 2009 and 30.00% in 2010 indicated "decrease" or "substantial decrease"), in information systems, where Q&R tools and MIS/EIS applications are used (26.14 and 22.50%, respectively), accounting--finance-controlling applications (21.59 and 20.00%, respectively), human resources applications (20.45 and 23.75%, respectively) and analytical systems, of Business Intelligence class (20.45 and 22.50%, respectively). It is worth pointing out that in 2010 shares of answers reporting "decrease" or "substantial decrease" went slightly down for almost all the areas in relation to the previous year. The biggest changes

Table 11. IT domains affected by changes in IT strategies (including quantitative and monetary assessments) for the objects which modified such strategies – the comparative analysis

IT domains affected by changes in informatisation strategies in the objects which modified their IT strategies	"Intensity" of IT strategy changes (quantitative and monetary assessments)									
	substantial decrease		decrease		no changes		increase		substantial increase	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Office applications	2.27	1.25	**17.05**	**16.25**	**70.45**	**71.25**	**10.23**	8.75	0.00	2.50
Purchases-stock management--supply chain (SCM class)	**5.68**	3.75	**28.41**	**26.25**	**53.41**	**61.25**	4.55	6.25	0.00	2.50
Warehousing applications	1.14	2.50	**17.05**	**8.75**	**79.55**	**82.50**	1.14	3.75	1.14	2.50
Sales-distribution applications (ECR class)	2.27	1.25	**15.91**	**13.75**	**73.86**	**61.25**	7.95	**20.00**	0.00	3.75
Marketing information systems (CRM class)	4.55	1.25	**12.50**	**11.25**	**68.18**	**61.25**	**13.64**	**22.50**	1.14	3.75
Human resources applications	4.55	0.00	**15.91**	**23.75**	**70.45**	**66.25**	7.95	8.75	1.14	1.25
Accounting-finance-controlling applications	**5.68**	1.25	**15.91**	**18.75**	**73.86**	**70.00**	3.41	7.50	1.14	2.50
Manufacturing-production systems (MRP/MRPII class)	1.14	3.75	**13.64**	**13.75**	**82.95**	**80.00**	2.27	2.50	0.00	0.00
Information systems (Q&R tools and MIS/EIS class)	1.14	0.00	**25.00**	**22.50**	**57.95**	**63.75**	**14.77**	**10.00**	1.14	3.75
Analytical systems (BI class)	0.00	2.50	**20.45**	**20.00**	**69.32**	**65.00**	**10.23**	**10.00**	0.00	2.50
Other, namely…	1.14	3.75	0.00	1.25	**97.73**	**91.25**	0.00	3.75	1.14	0.00

included: warehousing applications (by 6.93%), marketing information systems, supported by CRM applications (by 4.55%) and purchases-stock management-supply chain, supported by SCM applications (by 4.09%).

Noticeable increases – in terms of quantity and value – were noticed in the following areas: "information systems – Q&R tools and MIS/EIS class" (15.91% of answers in 2009 and 13.75% in 2010 indicated "increase" or "substantial increase"), "marketing information systems – CRM class" (14.77 and 26.25%, respectively) and "sales-distribution applications – ECR class" (only 7.95% in 2009, and as much as 23.75% in 2010). It should be mentioned that in relation to the previous year the number of answers reporting "increase" or "substantial increase" went up in nearly all the areas in 2010. Considerable changes (exceeding 10%) included, however, only two positions: "sales-distribution applications – ECR class" (by 15.80%) and "marketing information systems – CRM class" (by 11.48%).

7. Main conclusions

The selected results from analysing data collected in comparative surveys carried out in April and May 2009 and 2010, with a focus on an impact of the economic crisis on informatisation strategies and IT projects, entitle to formulate the following conclusions.

Firstly, the results supported the working hypothesis that the economic crises affected, to smaller or greater extent, long- and short-term informatisation strategies in most of the examined objects. Observed modifications in IT strategies (in 63.31% of all the surveyed objects in 2009 and 73.39% in 2010) are the most evident indicator of this situation. In majority, though, the adjustments had a limited scope. The surveyed objects which declared modifications in their informatisation strategies chose the answer: "there was a slight change in the informatisation strategy" in the 87.50%-share in 2009 and in 90.00% in 2010. Stronger inclination to modify IT strategies observed in 2010 (increase by 10.09% in relation to the year before) may suggest "disbelief" in a near return of times of prosperity on the one hand, or sustaining rationalisation trends in IT area on the other.

Secondly, the observed frequency and magnitude of changes in IT strategies was – as expected – correlated with informatisation level (see Table 7). It is worth mentioning that this correlation was stronger in 2010 than the year before (for the cluster "high and very high" the increase in indications on "slight and radical change" amounted to 12.35%). The major symptoms of IT strategy and projects modifications were similar in subsequent years (see Table 9). Substantial changes in indications between the two years were observed only for the following answers: "IT investments were postponed" (increase by 17.67%), "IT costs were streamlined using TCO" (increase by 7.11%) and "new projects were abandoned" (decline by 7.25%). From the perspective of the author, who has been involved in promoting pro-efficient IT development for many years, increasing share of answers reporting cost streamlining with TCO is a particularly positive symptom. When the analysis

is limited to those objects which modified their informatisation strategies due to the crisis, another positive trend can be identified. It is related to the decreasing number of objects which reported that a "number of IT seminars and trainings dropped" (decline by 6.14% from year to year). This proves that the examined companies and institutions understand importance of investments in knowledge, skills and competences of their employees, but also that they benefit, to a larger extent, from offers supported by the European Programmes such as "Human Capital".

Thirdly, in 2010 the number of indications on negative changes, including "decreases" and "substantial decreases" went down in comparison to the previous year with regard to most of the symptoms for IT strategy modifications (see Table 10). This was particularly noticeable for: "purchases of equipment for end-users" (number of answers indicating "decrease" or "substantial decrease" went down by 18.18%), "outsourcing projects" (by 12.27%), "project implementation" (by 11.70%), "own projects, carried out by IT department" (by 11.48%) and "purchases of equipment for IT department" (by 10.91%). At the same time the number of "positive" answers, reporting "increases" or "substantial increases" went up for most of the symptoms of IT strategy modifications. This was particularly relevant in case of: "purchases of external services" (number of answers indicating "increase" or "substantial increase" went up by 16.82%), "current spendings on IT" (by 14.32%), "IT seminars and trainings" (by 12.73%), "outsourcing projects" (by 12.16%) and "project implementation" (by 11.02%). The aforementioned data substantiate observations included in other reports and analyses, and depicted by Jadczak in 2010 in the tile of his study: "The Polish IT market – 2009 debacle! 2010 – new hope" [Jadczak 2010].

Finally, considering applications of information technologies affected by changes in informatisation strategies, a softening "negative" tendency and a hardening "positive" one were observed, on a smaller scale, though. The most important modifications – in those objects which decided to verify their IT policy – included: "sales-distribution applications – ECR class" (number of answers indicating "increase" or "substantial increase" went up by 15.80% within one year period) and "marketing information systems – CRM class" (by 11.48%). The foregoing results support assessments included in other reports, which declared that trade – or in more general terms: sales and distribution – is the area of IT application, which is recovering from the crisis the most rapidly [Olszynka 2010].

The author believes that by monitoring the behaviour of companies and institutions and their responses to the economic crisis in IT domain, and observing changes in this respect in the two subsequent years, the following two objectives were achieved. On the one hand, the findings presented in other reports and analyses were confirmed and supplemented, and on the other – due to new pieces of evidence gained – negative consequences of the crisis in IT area may be effectively counterbalanced. All these should, at least indirectly, lead to achieve goals of long-range strategies for developing e-society and e-commerce in Poland, both more effectively and much quicker.

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KRYZYS EKONOMICZNY A STRATEGIE INFORMATYZACJI PRZEDSIĘBIORSTW. WYNIKI ANKIETOWYCH BADAŃ PORÓWNAWCZYCH Z LAT 2009-2010

Streszczenie: Materiały konferencji AITM'2009 zawierają rezultaty przeprowadzonego przez autora tego artykułu w 2009 r. badania ankietowego, którego celem była analiza wpływu obecnego kryzysu gospodarczego na strategie informatyzacji przedsiębiorstw [Dyczkowski 2009]. W 2010 r. przeprowadzono studium porównawcze, które miało wykazać, czy, a jeżeli tak, to jakie, istotne zmiany nastąpiły w stosunku do wcześniejszych obserwacji. W niniejszym artykule omówiono wyniki badań porównawczych z lat 2009-2010. Uzyskane wyniki potwierdziły roboczą hipotezę, że kryzys gospodarczy, w mniejszym lub większym stopniu, wpłynął na długo- i krótkookresowe strategie informatyzacji większości przedsiębiorstw i instytucji. Szczegółowe informacje na ten temat zawiera niniejszy artykuł.