

Do IT Investments Have a Real Business Value?

Aleš Groznik, Andrej Kovačič

University of Ljubljana, Faculty of Economics, Kardeljeva ploščad 17, SI-1000 Ljubljana, Slovenia
ales.groznik@uni-lj.si

Mario Spremić

University of Zagreb, Graduate School of Economics and Business, Trg J. F. Kennedyja 6, HR-10000 Zagreb, Croatia
mspremic@efzg.hr

Abstract

The business value of information technology (IT) has been debated for a number of years. While some authors attribute to IT large productivity improvements, substantial value added contribution and impact on business performance, others report that IT has not had any bottom-line impact. Although productivity, value added and business profitability are related, they are ultimately separate questions. Using the results of the survey on business informatics situation of 92 Slovene large organizations and 116 Croatian large organizations several relevant hypotheses have been tested. The results show that IT investments reflect in increased productivity and value added. However, the relation between IT investments and business performance has not been confirmed.

Povzetek

Ali je vlaganje v IT poslovno upravičeno?

Pogosto slišimo, da postaja informatika osnovno gibalno uspešne prenove poslovanja v smeri razvoja izdelkov in storitev, kar organizacijam prinaša večjo dodano vrednost oziroma zagotavlja uspešnost poslovanja. Vpliv investicij v informatiko na poslovanje organizacije je zato pogosto vroča tema različnih analiz z nasprotujočimi si rezultati. Namen prispevka je analizirati vpliv naložb v informatiko na dodano vrednost organizacije in njeno uspešnost, pri čemer mero uspešnosti izražamo z več delnimi merami oziroma kazalci uspešnosti poslovanja. Statistična analiza temelji na izsledkih raziskave stanja poslovne informatike v 92 slovenskih in 116 hrvaških podjetjih in omogoča učinkovito primerjavo z razvitim svetom. Rezultati statistične analize izbranih domnev kažejo, da je višina investicij v informatiko v tesni zvezi z ustvarjeno dodano vrednostjo in produktivnostjo, kar pa ne velja za zvezo med višino investicij v informatiko ter donosnostjo in ekonomičnostjo.

1 Introduction

The business value of information technology (IT) investments has earned considerable interest from both academics and business community in recent years. The key question is whether the tremendous amount of IT capital invested in the last few decades has had any impact on the performance of investing organisations. Businesses continue to invest enormous sums of money in IT presumably expecting a substantial pay-off. As suggested by Gartner Group (Gartner Group, 2002) IT is becoming a high-expenditure activity. Organizations in developed countries spend between 5 and 7 percent of sales revenue on IT while the majority of Slovene and Croatian organizations invest less than 2 percent of sales revenue into IT. Despite significant investments in IT, the results of a variety of studies present contradictory evidence whether the expected benefits have materialized (Brynjolfsson, 1993), (Wilson, 1993), (Hitt and Brynjolfsson, 1994),

(Kraemer and Dedrick, 1994), (Berndt and Morrison, 1995), (Tam, 1998), (Devaraj and Kohli, 2000). Substantial discrepancies are due to the inconsistency of performance measures and ways the IT impact has been measured. Nevertheless all financial ratios should be issued with care since corporate pressures for control often generate behaviors, which subvert both planning are cases where and organizational philosophies and lead to sub optimization. Equally common, the technologists' views of control tend to be in conflict with the philosophy of the management control system in the organization, so that tension and questioning are typical in this area. Finally, as IT becomes perceived as a strategic resource, traditional control questions get a sharper edge. Indeed, they often indicate an erosion of corporate support for IT despite the external and internal rhetorics about IT being a source of competitive advantage.

2 Empirical Analysis

In order to investigate the real business value of IT the following hypotheses have been articulated:

Hypothesis H1: IT investment is related to business performance ratios of the organisation.

Does IT investment affect business performance? That has been a key question for many years. The roots of this question have at least two major streams. On one hand, IT investment is only one of the investments that are undertaken in an organization. By definition, investments are difficult to measure due to the time lag. Apart from the investment there are also other factors that affect business performance. On the other hand, a variety of measures exist to evaluate business performance. For the purpose of our analysis, the following have been used:

Return on Sales (ROS) - a measure of a company's profitability, equal to a fiscal year's pre-tax income divided by total sales.

Return on Assets (ROA) - a measure of a company's profitability, equal to a fiscal year's earnings divided by its total assets, expressed as a percentage.

Return on Equity (ROE) - a measure of how well a company used reinvested earnings to generate additional earnings, equal to a fiscal year's after-tax income (after preferred stock dividends but before common stock dividends) divided by book value, expressed as a percentage. It is used as a general indication of the company's efficiency; in other words, how much profit it is able to generate given the resources provided by its stockholders.

Hypothesis H2: IT investment is related to productivity.

Productivity has been generally defined as a ratio of measure of output to a measure of some or all of the resources used to produce this output. It is the quantitative relationship between what we produce and the resources we use. Defined in this way, one or a number of input measures can be taken and compared with one or a number of output measures. In case of our analysis, the output measure has been total income of the organization whereas the input measure has been average number of employees.

Hypothesis H3: IT investment is related to value added.

Value added evaluates the efficiency by measuring its inputs against its own outputs. The usual basis is the difference between sales income and the cost of

goods and bought-in services, adjusted for the changes in level stocks and work in progress. The added value remaining therefore represents the amount available to cover wages and salaries, interest charges, rents and rates, company tax and depreciation. Any remaining net income is a profit from which dividends are paid, the balance being retained by the business to cover innovation and expansion.

As suggested by Hitt and Brynjolfsson (Hitt and Brynjolfsson, 1994), productivity improvement and business performance are not necessarily correlated. Improvements in productivity not necessarily translate into gains in profit measures that can be reflected through business performance. That is the reason why business performance ratios and productivity are separated. For H1, three commonly used performance ratios are used: Return on Equity (ROE), Return on Asset (ROA) and Return on Sales (ROS). These measures are widely used in literature to evaluate the investment. They have been used in previous IT impact studies (Alpar and Kim, 1990), (Hitt and Brynjolfsson, 1994), (Tam, 1998), (Rosser, 1998) creating the basis for comparison.

The basis for H3 is a fashionable concept around which everything else revolves: The integration of value chain. This refers to value added optimization by three ways in which IT assists the enterprise: supply chain optimisation on the back end, interaction with customers on the front end and the linking up of front-end and back-end processes.

In literature the impact of IT has very often been adopted but rarely empirically tested. In this study, we attempt to fill this gap by empirically examining the impact of IT investments on value added.

In order to statistically investigate the above-mentioned hypotheses, a survey has been carried out to highlight the real situation of business informatics in Slovenia. On the basis of the survey the relationship with business performance indicators has been investigated.

3 The Method

3.1 The research in Slovene organizations

The survey in Slovene companies was performed in March 2002 by the IS researchers of the Faculty of Economics in Ljubljana. The survey was based on a questionnaire. The target population included 350 large Slovene organizations taken from a wide range of

industries, randomly chosen from the Business Register, a register of all organizations in Slovenia. According to Slovene legislation (Zakon o gospodarskih družbah, 1993), an organization classifies as large when it meets at least two of the following criteria: number of employees larger than 250, turnover larger than 800.000.000 SIT (approx. 3.500.000 EUR) and total average assets larger than 400.000.000 SIT (approx. 1.750.000 EUR). Comparing this classification to a similar one in the developed countries, it is obvious that the size of the organization can be very relative. In order to ensure that the responses reflect the organizations' perspective, CEOs and IS executives were interviewed to provide information by answering questions about: organization of the IS departments, the state of IS, the concepts and technologies of data storing as well as strategic IS planning and BPR practices. The structure of surveyed organizations are shown in Table 1.

Although small and medium-sized enterprises dominate in Slovene economy, the analysis has been performed on large organizations, in order to compare the results with similar studies conducted in the past (Bergeron et al., 2001), (Hitt and Brynjolfsson, 1996), (Tam, 1998), (Sethi et al., 1993). A total of 92 useful returns have been obtained, representing the da-

tabase on the situation of business informatics in Slovenia. Table 1 shows the structure of organizations according to the number of employees and their activities. The activities in the category Miscellaneous are consulting, transport, IT, catering, tourism, health service, government, telecommunications etc. The respondents were reasonably well distributed according to the types of business and number of employees, which can be compared to the distribution of all Slovene large organizations (Slovenia in figures, 2000), (Slovene Corporate Law, 1993). Therefore we can generalize the results of the survey to all large organizations in Slovenia.

3.2 The research in Croatian organizations

The key objective of the research in Croatian companies was to examine a number of issues in current IS practices on a sample of 400 Largest' Croatian companies, ranked according to 2001 annual revenues. To address the study objectives, a survey questionnaire was considered to be the most appropriate research method.

The questionnaire was preliminary tested on post-graduate and doctoral students for content validity, comprehensiveness and readability. Once a feedback from preliminary testing had been obtained, the questionnaire was pilot tested on five senior IS executives. The 2002 survey was being performed from March 2002 to April 2002. It was carried out by a market research agency who interviewed IS executives. The interview was important since the respondents could not select the questions and topics by themselves.

The questionnaire was sent to 400 IS executives and CEOs in Croatian companies selected from the Register of the 400 Largest' Croatian companies, which most likely represent the structure of Croatian economy. In the Register, companies were ranked according to 2001 annual revenues. The questionnaire consisted of four parts: structure and current state of IS, organization of IS department SISP practices, business process innovation issues, and e-business practices.

Moreover, it must be mentioned that by Croatian corporate law a company is classified as large when a total number of employees exceeds 250 and its annual revenue is over 4 million EUR. About 68% of surveyed Croatian companies were large companies according to 2002 annual revenue and 69% had more than 250 employees. Almost a half of Croatian compa-

	Slovene survey		Slovene large organizations
	Number	Percentage	
Structure by type of business			
Manufacturing	36	39,1%	36,5%
Retail and Wholesale	14	15,2%	12,0%
Finance and Insurance	6	6,5%	3,2%
Miscellaneous	36	39,1%	48,3%
Total	92	100%	
Structure by total number of employees			
< 100	19	20,7%	14,9%
101 - 250	33	35,9%	39,3%
251 - 1000	25	27,2%	29,0%
> 1000	15	16,3%	16,8%
Total	92	100%	

Table 1: The structure of Slovene organizations based on business type and the number of employees

nies were large according to both criteria: more than 250 employees and revenue over 4 million EUR.

A similar survey was conducted in 2000. The 2000 survey was performed on the same sample (ž400 Largest' Croatian companies according to 1999 annual revenues) and with exactly the same questionnaire, which formed a solid basis for discussion and analysis of trends.

	Croatian survey	
	Number	Percentage
Structure by type of business		
Retail and Wholesale	42	36,2%
Manufacturing	21	18,1%
Finance and Insurance	8	6,9%
Miscellaneous	45	38,9%
Total	116	100%
Structure by total number of employees		
< 50	4	4,3%
51 - 250	5	5,4%
>250	81	88,1%
No answer	26	
Total	116	100%

Table 2: The structure of Croatian organizations based on business type and number of employees

Although they represent less than 1% of total number of registered companies in Croatia, the sampled Croatian companies held 73% of the equity capital in the Croatian economy in 2001, accounted for 65% of total Croatian export balance and employed 37% of total number of workers in Croatia. Therefore, the analysis has been performed preferably on large companies enabling us to compare the results with the Slovene and other similar studies (Bergeron et al., 2001), (Hitt and Brynjolfsson, 1996), (Tam, 1998), (Sethi et al., 1993).

We received 116 responses, which can be considered a strong response rate of 27%. Table 2 shows the structure of the surveyed Croatian companies according economic activity (based on European Classification of Economic Activities – NACE Rev.1) and total number of employees. More than one-half of the responding companies come from only two industry branches, (wholesale and retail trade - 36.2% and manufacturing - 18%) and that can be considered rep-

resentative for the overall structure of Croatian economy, with trade as prevailing economic activity as opposed to manufacturing. The activities in the category Miscellaneous referred to various types of business, such as transport, tourism, IT, telecommunications, finance and insurance, real estate, government.

Furthermore, the surveyed companies were evenly distributed through Croatia, though the majority are located in Zagreb, the capital and economic center of Croatia, and in the surrounding areas of Zagreb, so that a regional bias in the results cannot be excluded. Regional issues were less important in the 2001 annual revenues. Regarding the sample, proposed methodology and professionalism in planning and conducting the research, the results may be considered representative for large companies in Croatia.

4 The Results

According to Gartner Group (Gartner Group, 2002) IT is becoming a high-expenditure activity. Gartner's survey results show that companies in developed countries (North America, Western Europe, Asia/Pacific region) spend between 5 and 7 percent of sales revenue on IT. By 2005, Gartner forecasts that investments in e-business applications and infrastructure will drive average IT spending in North America beyond 10 percent of revenue. The situation in Slovene and Croatian companies differs significantly. According to our surveys approximately 60 percent of them invest less than 2 percent of sales revenue into IT. The results also show that by the year 2000 only 5 percent of Slovene companies and by the 2002 also 6 percent of Croatian companies will have invested more than 5 percent of revenue into IT (Table 3). Even though the number of Slovene and Croatian companies investing significant share of revenue into IT is increasing, the overall lack of investing into IT is still predominant.

The analysis of real business value of IT is based on χ^2 test, testing the relationship between IT investment and selected key indicators. The results are shown in Tables 4-7. Sample sizes differ since not all financial data has been available publicly. As can be noticed from Tables 4-6 there is no data for Croatian study for year 2000.

As shown in Table 4, IT investment does not correlate with business performance. Having in mind 5% significance level, a test between IT investment and ROS shows a weak relationship ($\chi^2=10,516$, $p=0,105$)

	Slovene companies			Croatian companies		
	0%-2% of the revenue	2%-5% of the revenue	above 5% of the revenue	0%-2% of the revenue	2%-5% of the revenue	above 5% of the revenue
1999	64%	32%	4%			
2000	67%	27%	5%	64%	24%	12%
2001	52%	34%	13%			
2002				61%	33%	6%

Table 3: IT investments in Slovene and Croatian companies

but nevertheless the H1 is not supported. This finding is somehow in line with previous studies (Tam, 1998), (Weill, 1992) where no clear indication of relationship between the IT investment and business performance ratios are reported since the results differ from one country to another.

	Slovene study (2000)		
	ROS	ROA	ROE
χ^2	10,516	4,024	3,246
p	0,105	0,673	0,758
Sample Size	82	82	82

Table 4: The Impact of IT investments on business performance in Slovene study

	Slovene study (2000)	
	Productivity	Value added
χ^2	9,997	11,266
p	0,040	0,026
Sample Size	92	92

Table 5: The Impact of IT investments on productivity and value added in Slovene study

For productivity and value added, the study shows a strong relationship in Slovene 2000 study ($\chi^2=9,997$, $p=0,040$ for productivity, $\chi^2=11,266$, $p=0,026$ for value added) thus we can support H2 as well as H3. This finding is also in line with comparable studies (Brynjolfsson, 1993), (Hitt and Brynjolfsson, 1996), (Hoffman, 1997).

Since IT investments have a lag effect, we performed the same analysis as described above for the time lag of one year. For this analysis we used business performance data for Slovene companies for the year 2001 and compared them to the survey findings in 2000.

Also, here we added the results of Croatian 2002 study and compared them to the similar Slovene ones.

The results of performance are very similar to results with no time lag effect. Like the analysis with no lag, there is no relationship of IT investment with ROA and ROE. For ROS results indicate the existence of a lag effect. Also, Croatian study had some difficulties in reaching all required business ratios (only ROS was available for comparison). Nevertheless that in both cases the results of the analysis show a weak relationship, the H1 cannot be supported.

Results for H2 and H3 are identical to those without a lag. For productivity and value added, the Slovene study again shows a strong relationship ($\chi^2=10,756$, $p=0,039$ for productivity, $\chi^2=10,489$, $p=0,043$ for value added) thus, in Slovene case we can support H2 as well as H3 even in a case of a time lag.

Croatian study results showed no relationship between IT investments and productivity and value added. Some prior researches (Spremić et. al., 2002) showed that Croatian companies underestimate necessity of IS strategic planning, that CEOs have reactive attitude toward IT initiatives, and that organizational position of IT function is inadequate, with the final conclusion that Croatian companies are just keeping present IS in working conditions on the same level of technology with no initiative for its improvement and development. Therefore, in such a reactive environment, major influence on overall productivity or value added cannot be expected.

5 Discussion and Limitations

In this paper we investigated the impact of IT investment on business performance, productivity and value added. Since the question of the survey has been structured into a pre-set multiple question (IT investment

	Slovene study (2001)		Croatian study (2002)	
	ROS	ROA	ROE	ROS
χ^2	11,236	3,269	4,569	2,949
p	0,956	0,596	0,621	0,229
Sample Size	82	82	82	90

Table 6: The Impact of IT investments on business performance (One year lag)

	Slovene study (2001)		Croatian study (2001)	
	Productivity	Value added	Productivity	Value added
χ^2	10,756	10,489	4,920	3,062
P	0,039	0,043	0,296	0,547
Sample Size	92	92	90	90

Table 7: The Impact of IT investments on productivity and value added (One year lag)

0%-2% of the revenue, 2%-5% of the revenue and above 5% of the revenue) our method slightly differed from previously adopted methodologies. Nevertheless, the results of the study reveal important guidelines.

The current study enables us to compare the results of one economy to other economies and allows cross-national research comparison. This is particularly important since IT investments are the key issue of companies worldwide and the results based on a single economy need to be tested and confirmed across borders to establish external validity.

There are several limitations of the data used in the studies. Ideally, we wanted to incorporate all components that are considered IT investment into our measure. Interviewers were instructed in detail that for the purpose of the survey IT investment consists of broad definition including hardware and software investments, support costs and complementary investments (such as training costs, designing and implementing business processes). Since such a definition of IT investment is generally not easily shown in accounting, detailed data on the totality of IT investments is generally not available. That was the main reason, that we decided to split the answer on IT investment of a particular company into three levels (0%-2% of the revenue, 2%-5% of the revenue and above 5% of the revenue).

Second, the Slovene survey data were self-reported which could lead to errors in reporting and sample selection bias. However, the large size of the sam-

ple helped mitigate the impact of data errors. Since the respondents were reasonably well distributed according to the types of business and number of employees we can generalize the results of the survey to the population of large organizations in Slovenia. The Croatian study was carried out by a market research agency by means of interviewing IS executives.

For the purpose of taking into account the time lag effect, the analysis of IT investment on business performance as well as productivity and value added was carried out. Someone might oppose that a one-year lag may not capture all of impacts because companies may not realize all the benefits of IT investments for several years. On the other hand, IT investments have extremely short lifetime and short-run competitive advantage. The short-run competitive advantage such as first mover advantage of new IT applications cannot be sustained for a longer period. We believe that one-year time lag best captures the effect of IT investment.

Our findings suggest that the relationship between IT investment and business performance could be a more complex issue. The findings on ROS, ROA, ROE, when combined with empirical studies conducted in the United States (Sethi et al., 1993), (Weill, 1992) and Asia/Pacific region (Tam, 1998) indicate that the impact of IT investment on business performance might not be a direct one and a variety of other factors that are institutionally and socially related also have an important impact.

On the other hand, numerous organization-level studies and analyses show that IT can contribute substantially to the company's productivity growth. This contribution is by all means strong where IT strategy is linked with business strategy, thus IT can initiate major changes in organization structure, business processes and overall activities. In one study, Brynjolfsson and Hitt (1993) concluded 'that while computers make a positive contribution to productivity growth at the firm level, the greatest benefit of computers appears to be realized when computer investment is coupled with other complementary investments; new strategies, new business processes, and new organizations all appear to be important.' Dvorak et al. (1997) argued about the IT management issues and showed that successful companies manage IT functions in much the same way that they manage their other critical functions and processes: by strong leadership at highest level, by treating IT primarily business activity

and by focusing IT efforts on creating added business value.

According to the 2002 survey result, only a moderate number (48,1%, or 51 out of 106) of Croatian companies linked their IT strategy with business strategy. This linkage is well recognized through process of strategic IS planning. Therefore, almost half of the Croatian largest and strongest companies do have a strategic IS plan, which is in line with the Slovene study result (44,6%, or 41 out of 92). In addition, the linkage between IT strategy and business strategy can also be seen through some organizational issues, namely IT manager's position (low hierarchy level) and organizational position of IS (mainly supportive position).

In case of IT investment, the effect of the IT deployment needs to be addressed. An important factor is the type of IT deployment. IT investment covers all types of IT applications. When innovating, the main goal is to invest as much as possible into innovative systems developing strategic and innovative applications. According to Dos Santos (Dos Santos et al., 1993) the financial market values IT investments selectively. As found in their study shareholders value IT investments that are innovative in nature. By investing into innovative systems shareholders expect gaining comparative advantage resulting in positive impacts on business performance.

Productivity is the fundamental economic measure of a technology's contribution. The lack of good quantitative measures or the output and value created by IT have made MIS manager's job justifying investment particularly difficult. Almost two-third of surveyed Croatian companies (65%) don't have any formal measures or generally accepted metrics to evaluate the impact of their IS on productivity, although they are very much aware of their importance (average mark 3,95 on 1-5 scale for the importance of having or implementing such a measure). Academics have had similar problems assessing the contribution of the new technology and this has been generally interpreted as negative signal of its value. The disappointment in IT has been described in articles disclosing broad negative relationship with IT and productivity (Baily and Chajrabarti, 1988), (Baily and Gordon, 1988), (Berndt and Morrison, 1991), (Franke, 1987), (Loveman, 1988), (Panko, 1991). According to Brynjolfsson (Brynjolfsson, 1993) the productivity paradox of information technology has had several reasons

(mismeasurement of outputs and inputs, lags due to learning and adjustment, redistribution and dissipation of profits, mismanagement of IT). After reviewing and assessing the research to date, it appears that the shortfall of IT productivity is due rather to deficiencies in the measurement and methodological tool kit as to mismanagement by developers and users of IT (Brynjolfsson, 1993). The findings of our study are in line with other studies on productivity and IT investments (Brynjolfsson and Hitt, 1996), (Tam, 1998), indicating that IT has increased productivity.

Evaluating investments in information technology poses a number of questions associated with valuing intangible resources, the problem not present when investing in traditional assets. Banker et al. (1993) stressed that, concerning IT investing, focus shifts from measuring hard and quantifiable benefits that will appear on the company's financial reports to measuring indirect, diffuse, qualitative and intangible impacts that are very difficult to measure.

Therefore, to gain a profit from huge IT investments and to make computers effective in use, companies need to make similar investments in software, training, human capital, intellectual capital and organizational changes, which together create intangible assets.

According to the results of the survey, Croatian organizations plan to spend the biggest amount for hardware and the smallest for office software and education of employees. Also, financial situation of the firm greatly influences the level of investments in IT, while industry type, orientation to the foreign markets, type of the ownership and origin of the firm's capital do not have much impact.

The principle of the role of information is best described by value chain analysis. The overall performance of the industry in terms of its ability to maximize value added and minimize its costs is dependent on how well demand-and-supply information is matched at all stages of the industry. To achieve business excellence, the resources of the industry need to be focused on producing goods and offer and perform services as efficiently as possible to the satisfaction of consumers. If poor information means that those resources are wasted or used inefficiently, costs rise without an increase in revenue, and business performance an increase heads down. Understanding the industry value chain, and the key information flows in the industry, a company can intercept and influence

those information flows to its advantage, to the benefit of its trading partners and at the expense of its own competitors. Whilst this ability is not a substitute for good products and services or good marketing, it can complement their strategies and ensure that the company maximizes the profits over the long run. The strong relationship between IT investment and value added can be empirically depicted from results in Table 4 and 6.

6 The Conclusion

The results of our study indicate that Slovene and Croatian companies are increasingly investing into IT. Even though Slovene and Croatian organizations invest significant share of revenue into IT, the overall lack of investing into IT is still predominant. While companies in developed countries (North America, Western Europe, Asia/Pacific region) spend between 5 and 7 percent of sales revenue on IT by the year 2000 only 5 percent of Slovene organizations and 6 percent of Croatian organizations in 2002 invested more than 5 percent of revenue into IT.

But what is the business value of IT? In this paper we investigated the impact of IT investment on business performance, productivity and value added. The results show that IT investments reflect an increased productivity and value added. However, the link between IT investments and business performance has not been confirmed.

7 References

- [1] Alpar P. and Kim M.: A Microeconomic Approach to the Measurement of Information Technology Value. *Journal management Information Systems*, 7, 2 1990, pp. 55-69.
- [2] Baily M., Chajrabarti A.: *Electronics and White-Collar Productivity. Innovation and the Productivity Crisis*, Brookings, Washington, 1988.
- [3] Baily M., Gordon R. J.: *The Productivity Slowdown, Measurement Issues and the Explosion of Computer Power*, Brookings Papers on Economic Activity, The Brookings Institution, Washington, 1988.
- [4] Berndt E. R., Morrison C. J.: *High-tech Capital, Economic and Labor Composition in U.S. Manufacturing Industries: An Exploratory Analysis*. National Bureau of Economic Research, Washington, 1991.
- [5] Berndt E. R., Morrison C. J.: *High-tech Capital, Economic and Labor Composition in U.S. Manufacturing Industries: An Exploratory Analysis*. *Journal of Econometrics*, 65, 1, 1995, pp. 9-43.
- [6] Brynjolfsson E.: *The Productivity Paradox of Information Technology*. Association for Computing Machinery, Communications of the ACM, New York, 1993.
- [7] Brynjolfsson, E. and Hitt, L.M.: *Is information systems spending productive? New evidence and new results*, Proceedings of the International Conference on Information Systems, Orlando, FL, pp. 47-64., 1993.
- [8] Dos Santos B. L., Peffers K., Mauer D.C.: *The Impact of Information Technology Investment Announcements on the Market Value of the Firm*. *Information Systems Research*, 4, 1, 1993, pp. 1-23.
- [9] Devaraj S. and Kohli R.: *Information technology Payoff in the Health-Care Industry: A Longitudinal Study*. *Journal of Management Information Systems*, 6, 4, 2000, pp. 41-67.
- [10] Dvorak, R.E., Holen, E., Mark, D., Meehan, W.F. : *Six principles of high-performance IT*, McKinsey Quarterly, Number 3, 1997, pp. 164 – 177.
- [11] Earl M. J.: *Strategies for Information Technology*, Prentice Hall International, 1989.
- [12] Franke R. H.: *Technological Revolution and Productivity Decline: Computer Introduction in the Financial Industry*. *Tech. Forecast. Soc. Change*, 31, 1987.
- [13] Gartner Group: *IT Spending: Its History and Future*, www.gartnergroup.com, 23.10.2002.
- [14] Groznik, A., Spremić, M.: *Towards a Model of SISP Practices in Transition Countries – Comparative Study of SISP Practices in Slovenia and Croatia*, Proceedings of the 6th International Symposium on Operational Research in Slovenia, Preddvor, Slovenija, 2001, pp. 375-380.
- [15] Hitt L. and Brynjolfsson E.: *The Three faces of IT Value: Theory and Evidence*. Proceedings of the 15th International Conference on Information Systems, 1994.
- [16] Hoffman T.: *Feds Link IT, productivity but hard evidence lacking*. *Computerworld*, 31, 34, 1997.
- [17] Kraemer K. and Dedrick J.: *Payoffs from Investment in Information Technology- Lessons from the Asia-Pacific Region*. *World Development*, 22, 12, 1994, pp. 1921-1931.
- [18] Loveman G. W.: *An Assessment of the Productivity Impact on Information Technologies*. MIT Management in the 1990s working paper 88, 1988.
- [19] Panko R. R.: *Is Office Productivity Stagnant? MIS Quarterly*, June 1991, pp. 190-203.
- [20] Rosser B.: *Making IT Investments Cost Effective*. *Forbes*, 1998, pp. 50-54.

- [21] Sethi V., Hwang K. T., Pegels C.: Information Technology and Organizational Performance. Information & Management, Amsterdam, 25, 1993, pp. 193-205.
- [22] Slovenia in Figures '99, Statistical Office of the Republic of Slovenia, 2000, www.sigov.si/zrs
- [23] Slovene Corporate Law (Zakon o gospodarskih družbah), Official Gazette RS 30/93, Ljubljana, 1993.
- [24] Spremić, M., Strugar, I.: Strategic IS Planning Practise in Croatia: Organizational and Managerial Challenges, International Journal of Accounting Information Systems, Vol. 3, Num. 3, 2002., pp. 183-200.
- [25] Tam K. Y.: The Impact of Information Technology Investments on Firm Performance and Evaluation: Evidence form Newly Industrialized Economies. Information Systems Research, 9, 1, 1998, pp. 85-98.
- [26] Thurow L.: Economic Paradigms and Slow American productivity Growth. Eastern Eco.J. 13, 1987, pp. 333-343.
- [27] Weill P.: The Relationship Between Investment in Information Technology and Firm Performance. Information Systems Research, 3, 4, 1992, pp. 307 – 333.
- [28] Wilson D.: Assessing the Impact of Information Technology on Organizational Performance. Strategic Information technology Management, Idea Group, 1993.
- [29] Zakon o gospodarskih družbah, Official Gazette 30/93, 1993.

▪

Aleš Groznik is assistant professor in the Department of Information Sciences at the Faculty of Economics, University of Ljubljana. He holds a first degree and a M.Sc. in Engineering and a M.Sc. and Ph.D. in Information Sciences from University of Ljubljana. He has extensive industry experience in management and strategic information systems gained working for several multinationals. His research interest is in the areas of information system role within the broader context of corporate objectives, management and strategic information system planning, information technology productivity, information technology management and the role of information systems in ever changing business environments.

▪

Andrej Kovačič is professor at the Faculty of Economics, University of Ljubljana. He was engaged as consultant and project manager on more than 30 Business Process Reengineering (BPR) and Information System (IS) development projects. He is a certified: Expert on Management Consulting and Information Technology, and Information Systems Auditor. He is also Editor of the Slovene review for business informatics Uporabna informatika, and member of Slovene Society of Informatics.

▪

Mario Spremić received a B.Sc. in Mathematical Sciences, M.Sc. in IT Management and Ph.D. in Information Systems from the University of Zagreb. He is assistant professor of IT Management and Business Computing at the Graduate School of Economics and Business, University of Zagreb, at the Department of Information Sciences. His current research interests focus on information system strategy, IT management, business process management and e-business models. He has also worked as a programmer, software engineer and project manager.