

## DOES IT HAVE A REAL BUSINESS VALUE?

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

### 1. INTRODUCTION

The business value of information technology investments has received considerable interest from both academics and the 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 the investing organisations. Businesses continue to invest enormous sums of money in IT presumably expecting a substantial payoff.

As suggested by Gartner Group (Gartner Group, 2002) IT is becoming a high-expenditure activity. Gartner's survey results show that organisations 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 organizations differs significantly. According to our survey majority of organizations invest less than 2 percent of sales revenue into IT. The

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results also show that less than 10 percent of Slovene organizations invest more than 5 percent of revenue into IT. Despite significant investments in IT, the results of a variety of studies present contradictory evidence as to whether 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 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 at large 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 have a sharper edge. Indeed, they often indicate an erosion of corporate support for IT, despite the external and internal rhetoric's 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 with business performance ratios of the organisation.*

**Hypothesis H2:** *IT investment is related with productivity.*

**Hypothesis H3:** *IT investment is related with value added.*

As suggested by Hitt and Brynjolfsson (Hitt and Brynjolfsson, 1994), productivity improvement and business performance are not necessarily correlated. Improvements in productivity will not necessarily translate into gains in profit measures that can be reflected through business performance. That was the reason that 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 the 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 a basis for comparison.

The basis for H3 is a fashionable concept, around which everything revolves - integration of the value chain. This refers to value added optimization through three ways, in which IT assists the enterprise: supply chain optimisation on the back end, interaction with customers on the front end and linking up of the front-end and back-end processes. In the literature, impact of IT is most often 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, the survey has been undertaken to highlight the real situation of business informatics in Slovenia. On the basis of the survey, the relationship with the business performance indicators have been achieved.

### **3. METHODOLOGY**

The survey was performed in March 2000 by the IS researchers of the Faculty of Economics in Ljubljana. The survey was based on a questionnaire. Our target population included 350 Slovene large organizations taken from a wide range of industries, randomly chosen from the Register of Organizations, a register of all organizations in Slovenia. In order to ensure that the responses reflect the organizations' perspective, CEOs and IS executives were interviewed to provide information by answering the questions on the following subjects: organization of the IS departments, the state of IS, the concepts and technologies of the data warehousing as well as the strategic IS planning and BPR practices.

The survey has been repeated annually since 1999, in order to compare the results and observe current trends in Slovene organizations over a longer timeframe. The answer on IT investment of the particular company has been pre-set into three levels (0%-2% of the revenue, 2%-5% of the revenue and above 5% of the revenue).

Although small and medium-sized enterprises dominate Slovene economy, the analysis is performed on large organizations enabling us 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 were obtained, representing the database on the situation on business informatics in Slovenia. Table 1 shows the structure of the organizations according to the number of employees and their activities. The activities in the category Miscellaneous are of a different kind such as consulting, transport, IT, catering, tourism, and health service, government, telecommunications. 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 Slovenian large organizations (Slovenia in figures, 2000; Slovene Corporate Law, 1993). Therefore we can generalize the results of the survey to the population of large organizations in Slovenia.

*Table 1. Structure of organizations based on the business type and number of employees*

<b>STRUCTURE BY TYPE OF BUSINESS</b>			
	<b>Sample</b>		<b>Slovenian large organizations</b>
	<b>Number</b>	<b>Percentage</b>	
<i>Manufacturing</i>	36	39,1%	36.5%
<i>Retail and Wholesale</i>	14	15,2%	12.0%
<i>Finance and Insurance</i>	6	6,5%	3.2%
<i>Miscellaneous</i>	36	39,1%	48.3%
<b>TOTAL</b>	<b>92</b>	<b>100%</b>	
<b>STRUCTURE BY TOTAL NUMBER OF EMPLOYEES</b>			
	<b>Sample</b>		<b>Slovenian large organizations</b>
	<b>Number</b>	<b>Percentage</b>	
<i>&lt; 100</i>	19	20,7%	14.9%
<i>101 - 500</i>	38	41,3%	43.5%
<i>501 - 1000</i>	20	21,7%	24.8%
<i>&gt; 1000</i>	15	16,3%	16.8%
<b>TOTAL</b>	<b>92</b>	<b>100%</b>	

#### **4. RESULTS**

According to Gartner Group (Gartner Group, 2002) IT is becoming a high-expenditure activity. Gartner's survey results show that organisations 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 organizations differs significantly. According to our survey approximately 60 percent of organizations invest less than 2 percent of sales revenue into IT. The results also show that by the year 2000 only 5 percent of Slovene organizations invested more than 5 percent of revenue into IT (Table 2). Nevertheless the share of Slovene organizations investing significant share

of revenue into IT, the overall lack of investing into IT is still predominant in Slovene organizations.

Table 2. IT investments in Slovene organizations

Year	0%-2% of the revenue	2%-5% of the revenue	Above 5% of the revenue
1999	64%	32%	4%
2000	67%	27%	5%
2001	52%	34%	13%

The analysis of the real business value of IT is based on  $\chi^2$  test, testing the relationship between IT investment and selected key indicators. The results are shown in Tables 2-5. Sample sizes differ, since not all financial data has been available publicly.

As shown in Table 3, 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 ( $\chi^2=10,516$ ,  $p=0,105$ ) 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 results differ from one country to another.

Table 3. Impact of IT investments on business performance

	ROS	ROA	ROE
$\chi^2$	10,516	4,024	3,246
$p$	0,105	0,673	0,758
Sample Size	82	82	82

Table 4. Impact of IT investments on productivity and value added

	Productivity	Value added
$\chi^2$	9,997	11,266
$p$	0,040	0,026
Sample Size	92	92

For productivity and value added, the study shows a strong relationship ( $\chi^2=9,997$ ,  $p=0,040$  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 the business performance data for the year 2001 were used, comparing them to the survey findings in 2000.

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. 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 study shows a strong relationship ( $\chi^2=10,756$ ,  $p=0,039$  for productivity,  $\chi^2=10,489$ ,  $p=0,043$  for value added) thus we can support H2 as well as H3 even in case of a time lag.

Table 5. Impact of IT investments on business performance (One year lag)

	ROS	ROA	ROE
$\chi^2$	11,236	3,269	4,569
$p$	0,956	0,596	0,621
Sample Size	82	82	82

Table 6. Impact of IT investments on productivity and value added (One year lag)

	Productivity	Value added
$\chi^2$	10,756	10,489
$p$	0,039	0,043
Sample Size	92	92

## 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 0%-2% of the revenue, 2%-5% of the revenue and above 5% of the revenue) our methodology

slightly differed from previously adopted methodologies. Nevertheless, the results of the study reveal important guidelines.

The strength of the current study is that it enables us to compare the results of one economy to others and allows cross-national research comparison. This is particularly important since IT investments are key issue of companies worldwide and 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 study. 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 that includes hardware and software investments, support costs and complementary investments (such as training costs, designing and implementing business processes). Since this definition of IT investment is generally not easily shown in the accounting, detailed data on the totality of IT investments is generally not available. That was the main reason, we decided to split the answer on IT investment of the particular company into three levels (0%-2% of the revenue, 2%-5% of the revenue and above 5% of the revenue).

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

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. Someone might oppose that a one-year lag may not capture all of the impacts because organisations may not realize all of 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 prolonged 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 much broader 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 variety of other factors that are institutionally and societally related also have an important impact.

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 core 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 of the output and value created by IT has made MIS manager's job justifying investment particularly difficult. 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 chronicled 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 much due to deficiencies in the measurement and methodological toolkit 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.

The principle of the role of information is best described by value chain analysis (Porter, 1980; Porter, 1984). The overall performance of the industry in terms of its ability to maximise value added and minimise 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 those goods and services as efficiently as possible to



the satisfaction of the consumers. If poor information means that those resources are wasted or used inefficiently, costs rise without increases in revenue, and business performance falls overall.

An understanding of the industry value chain, and the key information flows in the industry, can enable an organisation to intercept and influence those information flows to its advantage, to the benefit of its trading partners and at the expense of its competitors. Whilst this ability is not a substitute for good products and services or good marketing, it can complement those strategies and ensure the organisation maximizes the profits from them over the long run. Empirically, the strong relationship between IT investment and value added can be empirically depicted from results in Table 4 and 6.

## **6. CONCLUSION**

The results of our study indicate that Slovene organizations are increasingly investing into IT. Nevertheless Slovene organizations investing significant share of revenue into IT, the overall lack of investing into IT is still predominant. While organisations 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 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 in increased productivity and value added. However, the link between IT investments and business performance has not been confirmed.

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#### **IMA LI INFORMACIJSKA TEHNOLOGIJA STVARNU POSLOVNU VRIJEDNOST ?**

##### **Sažetak**

O stvarnoj poslovnoj vrijednosti informacijske tehnologije (IT) već se raspravlja duže vrijeme. Dok joj neki autori pripisuju značajno unapređenje produktivnosti, doprinos stvaranju nove vrijednosti, te, općenito, veliki utjecaj na poslovni uspjeh, drugi iznose rezultate prema kojima IT nema utjecaja na poslovne rezultate. Međutim, iako su produktivnost, novostvorena vrijednost i profitabilnost povezane, utjecaj IT na svaku od navedenih veličina treba posebno razmatrati. Na temelju rezultata ankete o stanju poslovne informatike u 92 velika slovenska poduzeća, testirano je nekoliko hipoteza. Rezultati pokazuju da investicije u IT djeluju na povećanje produktivnosti i dodane vrijednosti, ali se ne može utvrditi veza između ulaganja u IT i poslovnih rezultata.

