

# *Enhancing Organizational Performance through IS/IT Management*

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## **Abstract**

The management of IS/IT has an essential role in supporting the operations in an organization. The paper presents different models and paradigms for IS/IT management. With a multiple case study data is gathered from six Finnish organizations. The IS architecture of the cases is described and IS/IT management arrangements of the cases are compared to the presented models and paradigms. The results showed that some cases have reached the level where IS/IT management is truly enhancing performance.

**Keywords:** *IS/IT management, strategy, performance, case study*

## **Introduction**

IS/IT has a vital role to play in developing and maintaining the organization's competitive advantage. IS/IT drives and enables organization systems and operations. (McAuley et al., 1997) IS/IT management is one key actor in supporting the operations of an organization. IS/IT management provides the facilities for the organization to run the business. It maintains the infrastructure for the information systems i.e. network, workstations, servers and database management systems. Therefore is it natural that the goals and strategies of IS/IT management should be aligned with the strategies that guide the business. IS/IT management must identify how information technology and information systems can improve and influence business processes. All the arrangements in IS/IT management must of course support and focus on these identified areas.

There are alternative models that have been presented on organizing IS/IT management. These models differ from each other in their focus for strategic and operational activities. Similarly there are different paradigms that IS/IT management organization might follow. The purpose of this paper is to describe how six different Finnish organizations have arranged their IS/IT management: what IS/IT model they are following and which paradigm is guiding their operations. Final aim of the paper is give answer to the research question: How organizations enhance performance through IS management? The content of this paper comes from a larger research project that concentrated on analyzing diffusion of database innovations.

The paper is organized as follows. Section 2 introduces IS/IT management models, paradigms and relations to strategical issues. Section 3 presents the research methodology. Section 4 describes the organizational choices in IS/IT management starting from the description of IS architectures in the cases. Finally, section 5 presents the conclusions of the research.

## **Strategy guides IS/IT Management**

When discussing IS/IT related issues, it is important to understand how IS/IT is managed and what guides the management. One of IS/IT management's main tasks is to design and to implement an IS/IT strategy, which is in line with the enterprise's business strategy (Gupta et al., 1997, McAuley et al., 1997, Jung and Savioz, 2003). The IS/IT strategy can be divided in two distinct areas. The IS strategy is demand oriented, focusing on information and system requirements in meeting business objectives. The IT strategy, on the other hand, is supply oriented and concerned with specifying the technology as how to deliver these applications. (Burn et al., 2000) The alignment between IS/IT strategy and business strategy is important, as many researches have shown. For example in a Norwegian study the improvement of the links between IS strategy and business strategy was ranked to first place (Christensen et al., 2000) and in another study over

50 percent of the respondents answered that aligning business and IS/IT strategy is very critical to their organization (CSC and FEI, 2003). Also Cheong et al. (2001) write that there is lack of alignment between IT and other organizational and business imperatives.

One substantial concern for organizations is to decide which technologies are relevant to them (Jung and Savioz, 2003). Actually this prioritizing of technology investments was ranked as the most critical issue in organizations in a study in 2003 (CSC and FEI, 2003). The management must also decide in which scope the needed technologies should be internally developed or externally produced. Finally, the organization has to decide which technologies should be used exclusively internally or transferred to other firm. (Jung and Savioz, 2003)

A framework (see Figure 1) proposes that the IS/IT strategy has four dimensions (Cheong and Haglind, 2001):

- Strategic content
- Business content
- Business processes
- Enterprise software architecture.

This framework emphasizes the understanding of the organization and the business in addition to the understanding of the enterprise software architecture. Enterprise software architecture describes how to integrate technical components and applications to meet business needs. This architecture requires many elements and these can be grouped in four domains: process domain, information/knowledge domain, infrastructure domain and organization domain (Iyer and Gottlieb, 2004). These domains overlap partly with the dimensions of the previous framework. This framework also proposes that IS/IT strategy requires a) understanding of the competitive environment, b) analysis of business activities and their support systems and c) understanding of the organizations ability to grow and develop from use of IS (Cheong and Haglind, 2001). Research is also showing the importance of aligning IS and business strategies as a contributor to the success of IS organization (CSC and FEI, 2003).

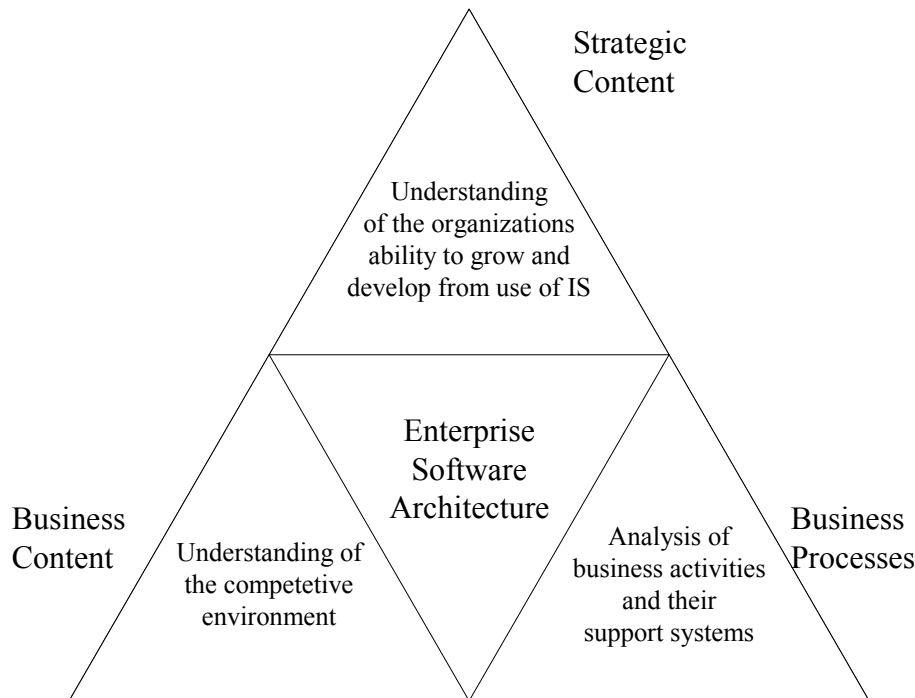


Figure 1. Four dimensions of IS/IT strategy (Cheong and Haglind, 2001)

Achterberg et al. (1993) identify four different paradigms for the IS/IT management (see Figure 2) based on strategic and operational activities. These paradigms are described through four concepts: control process, dominating internal structure, dominating political and power structure and cultural characteristics.

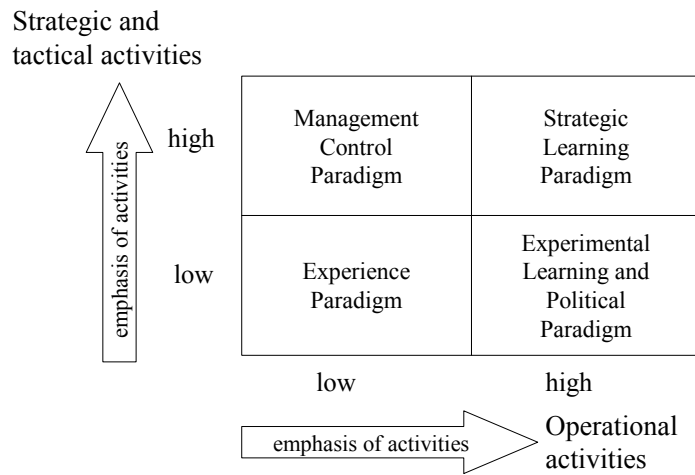


Figure 2. Four paradigms for managing IS/IT (Achterberg et al., 1993)

They continue defining the dimensions of operational activities and of strategic and tactical activities resulting a detailed model that allows positioning an organization to the paradigms presented. In operational activities the dimensions are from low to high: initial, experience, control, managed and flexible. In strategic and tactical activities the dimensions are from low to high: startup, growth, control, planning and strategic planning. (Achterberg et al., 1993) Table 1 provides short descriptions of the different paradigms.

Table 1. Descriptions of the paradigms

Paradigm	Description
Experience	Few emphases are laid on strategic, tactical, and operational activities. Practitioners have to rely on their experience. It is very difficult to implement a proper control system for management.
Management Control	Strategic and tactical activities are relatively sophisticated, but not operational activities. A lot of attention is paid to formulating a strategy for IT, but few attention to developing and maintaining information systems.
Experimental Learning and Political	Operational activities are emphasized over the strategic and tactical activities. Few emphases are laid on the formulation of a strategy of IT, but developing and maintaining information systems is highly sophisticated.
Strategic Learning	There is high level of activities on all dimensions: strategic, tactical and operational. The culture will be characterized by relatively tight control, but this tightness is not due to formal planning, but to the pragmatism that exists.

Another interesting point of organizations' IS/IT function is the way in which it is organized. There are three principles that underlie the ways to organize the IS/IT function. The IS/IT should be organized 1) to foster co-evolution between the business and the IS/IT function, 2) to nurture relationship networks for visioning, innovation, and sourcing and 3) to explicitly manage value-creating processes. Respectively three IS/IT organizational models are introduced. The first model is Partner Model, which aims to stimulate, catalyze and seed thinking about strategic uses of information technology. In the second model, Platform Model, IS/IT is primarily expected to provide infrastructure and tools to enable current and future business innovations. However in contrast with the Partner Model, IS/IT is not expected to be an active collaborator

in initiating business innovations. In the third model, Scalable Model, IS/IT is viewed as a strategic differentiator and an important element of business innovations. (Agarwal and Sambamurthy, 2002)

## Research Methodology

Methodologically this research was a multiple case study research, where each case included multiple units of analysis. This means that within each case multiple information systems and databases were analyzed. This research methodology was selected, because the goal of the research is not to achieve statistical generalization rather analytic generalization (Yin, 1994). Altogether six Finnish organizations were involved in this research (table 1). In cases SSP, TS and OPTI the research focused in the whole IS environment, but in cases SOK, WEST and STAT some specific business area was selected as the target IS environment.

Table 2. The case organizations.

Organisation/abreaviation used in this research	Line of business	Private/ Public	Turnover 2002 (million €)	Employees 2002
SOK corporation/SOK	Co-operative society (main businesses food & groceries and hardware)	Private	6858	22 814
Salon Seudun Puhelin Ltd/ SSP	Telecommunication	Private	28	121
State Provincial Office of Western Finland/WEST	Regional administrative authority	Public		350
Statistics Finland/STAT	National statistics	Public	52	1 074
TS-Group/TS	Printing services and Communications	Private	293	2 052
Optiroc Ltd/OPTI	Building materials	Private	149	388

Each case must be carefully selected so that it either predicts similar results (literal replication) or forecasts contrasting results but for predictable reasons (theoretical replication) (Yin, 1994, Cavaye, 1996). In this research literal replication strategy was used. The cases were selected as equally representative, with no predetermined ideas.

The cases were selected according to certain criteria and the selected six cases satisfied all of these requirements. First and most important of these was a willingness to co-operate. Secondly, the organizations should be at least medium-sized. The EU Commission has defined that a medium-sized organization has 50 to 250 employees and an annual turnover between 10 and 50 million euros (EU Commission, 2003). All except one case are medium-size when looking the annual turnover, but only one is still in this category according to its number of employees. The rationale for aiming at medium-size or larger organizations was the desire to study more complex environments than probably would have been the case otherwise. Third, the organizations should not be direct competitors with each other. This criterion was based on the idea that the organizations could hopefully learn something from each other during the research. It also enabled more open discussions at the beginning and in the final seminars. Furthermore, we could write the reports without worrying about issues of competition. Fourth, the organizations should represent different lines of businesses. This provided a broader perspective in relation to IS management throughout the Finnish economy. Fifth, the organizations should not have IT as the major business. This criterion focused the research more on business than technology issues. Finally, public sector organisations should be among the cases. This criterion also broadened the view of the IS management.

This research follows the interpretivist tradition of the case research, since the aim is to understand the exploitation of information systems and databases through the views of the interviewees. The information systems and databases are not directly examined. In interpretivism there is no objective reality that can be discovered by researchers and replicated by others (Walsham, 1993, Broadbent et al., 1998). An interpretive researcher attempts to gain a deep understanding of the phenomena being investigated and their subjectivity is acknowledged as part of this process (Broadbent et al., 1998). Interpretive researchers attempt to understand the way others construe, conceptualise and understand events, concepts and categories, in part because these are assumed to influence individuals' behaviour (Duchon and Kaplan, 1988).

The research concentrated on analyzing information systems and how they are managed. The research question was "How organizations enhance performance through IS management?". The data was gathered during winter 2002 and autumn 2003. The main method used in data gathering was semi-structured interviews. Interview was selected since with it very targeted and insightful observations can be perceived (Yin, 1994). The strengths of using interviews are that they a) focus directly on the case study topic and b) provide perceived causal inferences. Data was also gathered from existing documents, which provided stable, unobtrusive, exact and broad coverage of the cases. (Yin, 1994) These additional documents (memos, publications, presentations) were received during the interviews.

Altogether 54 interviews were made and the number of interviews per organization ranged from 6 to 15. The length of interviews was approximately 100 minutes and the total time of interviews was over 91 hours. The interviewees were selected with the organization's contact person, who usually was the IT manager of the organization. The interviewees represented various positions, but they were normally persons in administrative positions toward the information systems. The positions of the interviewees were for example CEO, IT manager, IS Manager, Project manager and Main user.

The themes of the interview were delivered beforehand to interviewees and all the interviews were recorded and notes were taken during the interviews. The interviews concentrated on the information systems and databases of the organization and results of two of the themes are described in this paper. After the interview a transcript of the interview was returned to the interviewee for corrections and possible additions.

The goal of the data analysis in this kind of interpretive case research is to produce an understanding of the context of information systems and the interactions between these systems and their concepts (Broadbent et al., 1998). The researcher develops categories and meanings from the data through an iterative process that starts by developing an initial understanding of those being studied (Duchon and Kaplan, 1988). Table 3 describes developed categories for two essential interview themes of this paper.

Table 3. The categories and classifications used in data analysis.

Interview theme	Categories/Classifications
What kinds of information systems are currently exploited?	DBMS Generations <ul style="list-style-type: none"> <li>• 2<sup>nd</sup> generation: Relational database</li> <li>• 3<sup>rd</sup> generation: Object-oriented database</li> <li>• Enriched 3<sup>rd</sup> generation: XML database</li> </ul> Type of information systems <ul style="list-style-type: none"> <li>• On-Line Transaction Processing System</li> <li>• Decision support system, Reporting</li> <li>• Enterprise Resource Planning system</li> <li>• Information channel system</li> </ul> Importance to the business <ul style="list-style-type: none"> <li>• Business Critical IS</li> <li>• Supporting IS</li> </ul>

Table 3. continues.

Interview theme	Categories/Classifications
How is the maintenance and administration of information systems and databases organized?	<p>IS maintenance</p> <ul style="list-style-type: none"> <li>• Outsourced</li> <li>• Mostly outsourced</li> </ul> <p>DB maintenance</p> <ul style="list-style-type: none"> <li>• Outsourced</li> <li>• Mostly outsourced</li> <li>• In-house</li> </ul> <p>Main user –ideology</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• Partly</li> </ul> <p>State of documentation</p> <ul style="list-style-type: none"> <li>• Unsatisfactory, outdated</li> <li>• Documentation started</li> <li>• Almost satisfactory</li> <li>• Satisfactory</li> </ul> <p>Documentation template or standard in use</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>

### **Organizational choices in IS management to enhance performance**

#### *IS architecture in the cases*

This research analyzed IS environments in six organizations as described earlier. During the research 44 different information systems were identified and analyzed. The average implementation year of these information systems was 1997, which also was the median. This means that the average age of the information systems was almost seven years. The newest information systems were implemented during 2003 and the oldest already in 1985. Third of the information systems are implemented later than 1999. Lowest average age of information systems is 4,6 years in OPTI and highest is 10,7 years in STAT.

The information systems studied in this research were classified according to the purposes they represented. Four classes were used: Online Transaction-Processing Systems, Decision Support and Reporting Systems, Enterprise Resource Planning Systems and Information Channel. Most (40 %) of the information systems were transaction-processing systems. There were for example traditional order-entry systems in SOK, OPTI, SSP and TS. 30 % of the information systems were decision support and reporting systems. No real data warehouse systems existed, but customized reporting systems were used in SOK, SSP and OPTI. All Accounting systems were also classified in this category. 25 % of the information systems were enterprise resource planning systems. In addition two information systems were interactive information channels for customers. Most of the studied information systems (75 %) are developed outside the case organizations by some IS/IT-company. Thus, every fourth information system is developed by the organization itself.

Over half (52 %) of the information systems and the databases studied during this research are critical to the business and they are used in business-critical processes. This research identified business critical information systems in all other cases except in WEST. Most (65 %) of the business critical information systems are online transaction processing systems. Analysis of variance shows also that the differences between IS type categories are statistically very significant ( $p=0,0016$ ). In OLTP-category 83 % of the

information systems are business critical, but in DSS, Reporting –category only 23 % and in ERP-category only 45 %.

The ages of the information systems already tell that information systems use basic relational database technology. These old information systems function at least satisfactory level, but they lack some properties becoming more important in the future. Relational database does not support user-defined types and large objects. Nor does it support XML and geographical data management. All these properties and functionalities are identified important new features of future information systems. For example, databases supporting XML are said to ease the integration efforts of information systems (Scannell and Sullivan, 2001). The interviews showed that in couple of years the information systems and databases studied in this research are in a situation where alternative information systems and databases must be considered.

Most (86,5%) of the information systems are using one of the three major database management systems. The corresponding market shares were in August 2003 (IDC, 2003): Oracle 39,4 %, IBM DB2 33,6% and Microsoft SQL Server 11,1%. In this research the distribution of the DBMSs is more balanced: Oracle 29,5%, SQL Server 29,5% and DB2 27,3 %. Mainly more than one DBMS is used in one organization. Only in OPTI a decision is made that all the information systems should utilize Oracle DBMS. In many cases the reason for many DBMSs is in the information systems that have required certain DBMS. Many DBMSs set also additional pressures and challenges to the administration and the maintenance of the databases.

*Used paradigms and models for IS/IT management*

In the different cases different models of IS/IT management were used (see Figure 3). The IT Management of SOK is following the Partner Model and the Strategic Learning Paradigm. They are currently working on their new IS/IT strategy.

Strategic and tactical activities

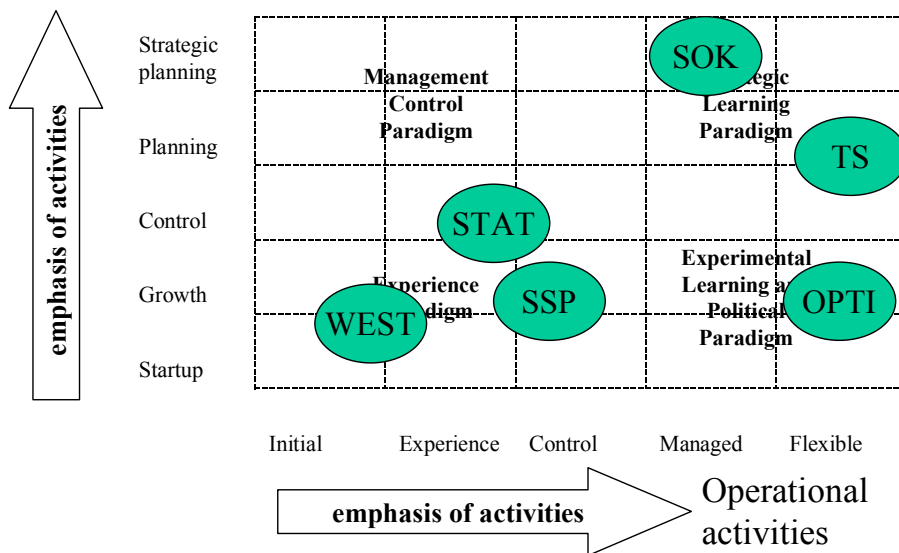


Figure 3. Paradigms of IS/IT management in the cases

The IS/IT Management of SSP is following the Platform Model and the Experience Paradigm. The research identified that there are internal pressures for moving to Partner Model and changing the paradigm more to strategic way. Actually they are currently working on an updated and more complete IS/IT strategy.

Also in STAT and in WEST the IS/IT management is following the Platform Model and the Experience Paradigm. Their IT management is working pragmatically and result-oriented. As the Figure 3 shows WEST is at the beginning of these IS/IT activities, but STAT has progressed more both in operational as strategic activities.

The IS/IT Management of TS is following the Partner Model and the Strategic Learning Paradigm. The development and maintenance of information systems are emphasized and but also the strategic issues are emphasized. They are currently implementing a CRM-system, but they have not written down a CRM-strategy, which they should start doing.

The IS/IT Management of OPTI is following the Scalable Model and the Experimental Learning and Political Paradigm. The IS/IT department use outsourcing to achieve flexibility in resources, but is also emphasizing the maintenance and development of their information systems. On the other hand few emphasis is laid on the IS-strategy, which is also recognized by the interviewees. They are however finally starting the formulation of the IS strategy.

#### *Selected maintenance and administration arrangements of information systems*

None of the case organizations is doing business in IS development and therefore it is no surprise that maintenance of the information system is mostly or totally outsourced (see Table 4). Only exception is STAT because they need special information systems for statistical analysis and they develop those information systems self. In SOK, in SSP and in TS total outsourcing is not achieved while they are all running information systems that are developed by them.

Only WEST and OPTI have outsourced also database administration. The situation is the same in SOK except with the information systems developed by them. In three other organizations own personnel administer the databases. In practice database administrations contains upgrade of DBMSs, backup, optimization, user management, quota management and solving problems. Common to all cases was also the utilization of main user –ideology that was defined as a task where user comments and requirements are coordinated, identified and discussed with the supplier of the information system. In SOK also larger user groups are formed.

The practical processes are also influenced depending on the selected maintenance organization. Total outsourcing was seen as a risk, while all the knowledge of the operational information systems and databases is outside the organization. It was also mentioned that total outsourcing might slow down the development processes while the developers are not bound to the organization itself. A research also says that without in-house expertise, a company cannot understand the viability of addressing new demands or the potential for meeting existing demands on a new technology platform with better economics (Feeny and Willcocks, 1998). Problems were also identified in strong main user –ideology. It might happen that some information system is emphasized over the others and also that the IS wholeness is disturbed.

Table 4. Maintenance issues of the information systems in the case organizations

Case	IS maintenance	DB administration	Main user –ideology
SOK	Mostly outsourced	Mostly outsourced	Yes
SSP	Mostly outsourced	Inhouse	Partly
STAT	Mainly themselves	Inhouse	Yes
WEST	Outsourced	Outsourced	Partly
TS	Mostly outsourced	Inhouse	Yes
OPTI	Outsourced	Outsourced	Yes

Proper documentation plays an important part in the maintenance process. The documentation of the information systems studied in this research proved to be quite good. The documentation is satisfactory or almost satisfactory in 68 % of the information systems and the databases of the cases. In 9 % of the studied information systems and the databases a project has been started to produce or update the documentation into satisfactory level. In 23 % of the information systems and the databases the documentation is unsatisfactory or out-dated. The analysis of variance showed no difference in documentation of business critical and supporting information systems ( $p=0,856$ ). Similarly analysis of variance showed no difference in documentation in different IS-type categories ( $p=0,135$ ).

Although the documentation of 68 % of the information systems was regarded as satisfactory or almost satisfactory there still exist remarkable amount (23 %) of information systems where the documentation is unsatisfactory or outdated. Most of the information systems (75 %) are developed outside the case organizations by some IT-company. On average the interviewees evaluated the state of the documentation of these information systems to 2,56 which is less than almost satisfactory. The rest of the information systems (25 %) are developed by the case organizations and the average level of the state of the documentation was evaluated to 3,45. The analysis with t-test showed, at 5 % significance level, that there are significant differences ( $p=0,019$ ) in the state of the documentation depending on the development place thus indicating that the documentation of the information systems developed within the organization are significantly better than the documentation of other information systems.

## Conclusions

As the results showed the case organizations manage information systems in many different ways. The information systems of the organizations are basically in order, but the research indicates that there are lack of systematic plans and clear definitions of the policies in the field of IS/IT. At the same time only for few information systems the whole life-span is defined. This and other results indicate the organizations do not have proper and up-to-date IS/IT strategies. The lack of up-to-date strategies has also resulted that the technological innovations among databases have not diffused and there are no clear plans to adapt them.

The research showed that the selected model of IS/IT organization has own influences on the maintenance of the information systems. In scalable model the organization is dependent on its' partners. In partner model the organization has in-house expertise, but still maintenance can be outsourced. This way the organization has more resources for the strategical development and design. In platform model maintenance

bounds organization away from the strategical topics. Independently of the model, documentation of the information systems must be in order to be able to develop and maintain IS/IT operations. As described, different models of IS management have effects on the performance of the organization. Organizations that have reached the upper right quarter seem to gain more from the IS management. On the other hand organizations locating in the lower left quarter have not truly solved the role of information systems and therefore the effects of IS management are not significant to the performance of the organization.

The results of this research show that the alignment with IS/IT strategy and business strategy is not yet achieved in the cases. Most organizations are however working on their IS/IT strategies and they have recognized the importance of strategies. Organizations are developing strategies and their activities are emphasizing strategic and tactical activities. Strategies guide organization to do selected actions and this way also IS management is really enhancing performance of the organization.

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