Gaining Benefits from Cross-Functional Information Systems – a Socio-Technical Approach to Managing Information Systems

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Abstract. It's very well known that effective and efficient utilization of Information Systems (IS) brings many advantages to companies and organizations and consequently helps them sustain on the market and be profitable. At the same time, however, it's possible to claim that many managers and decision-makers still do not fully realize the data-processing and information-sharing capabilities of computerized system solutions and are not able to specifically define the advantages of using Supply Chain Management Systems to support inbound and outbound logistics. Therefore, the aim of this study is to emphasize that, in order to fully benefit from using IS, the role and the benefits of using the systems must be well understood, and their acquisition and utilization must be properly managed. Besides, the purpose of this contribution is to define the use value and acquisition of strategic IS and suggest what businesses should research more and focus on today - the alignment of IS/IT acquisition and utilization with the business processes and overall strategy, as the use of technology should be business-driven, not vice versa.

Key words: Management Information Systems, SCM Systems, logistics, end user involvement, ICT benefits.

1 Introduction

Over the last couple of years, we have witnessed an explosive growth in the power and speed of computing, as well as rapid developments in the sphere of data communication methods and information systems' functionalities and capabilities. It can be claimed that Information and Communication Technologies (ICT) and Information Systems (IS) have become a common, unavoidable, or even vital part of business, political, cultural, social, and also personal life almost in every part of the world. Besides, it's possible to argue that the above mentioned exponential developments, vast utilization of ICT and the vision of the Information Age suggest that the trend of "going digital" will continue also in the near future and will have further, mostly positive impact on business and society. At the same time, however, it is necessary to emphasize that, in order to fully benefit from using IS, their acquisition and utilization must be understood and properly managed. The second chapter of this study shows, that in spite of the fact that advanced technology and IS are available, affordable and commonly used, still, many managers and other end users do not really understand and are not able to define their use and strategic value. Similarly, many managers and other employees would not able to effectively manage the utilization and acquisition of IS solution to support the overall organizational operations, individual business processes and specific info-processing tasks. Therefore, the remaining part of this contribution summarizes the use, value and benefits of using cross-functional system solutions and emphasizes the importance of the socio-technical approach to managing IS in business.

2 Survey

Within a one and a half year period, together with CityU of Seattle and VSM students, we have contacted 148 businesses in Slovakia (98), Czech Republic (34), Poland (8), Hungary (6), and Austria (2), in order to find out how businesses recognize, use, manage, and acquire the computer-based IS. We've received 83 replies, to be specific, 55 from Slovakia, 18 from the Czech Republic, 6 from Poland, 3 from Hungary, and one response from an Austrian company. As to the size of the companies based on the number of employees, there were 53 businesses with 50 employees and less, 24 enterprises with 50 – 250 employees and only 6 companies with over 250 employees who have participated in this survey. This means that the results reflect mainly utilization and management of IS in small-sized companies. From the business area point of view, we've received replies from 12 companies competing in the food/agriculture, 9 from IT businesses, 21 from service companies, 14 from manufacturers and producers, 18 from retail/sale companies, and 9 from various other industries and business areas. Finally, the questionnaire was filled out by 44 regular IS end users and 39 managers or business owners. The respondents were asked several, both, structured and open-ended questions, this contribution, however, will be based on the results of the nine structured questions:

1. Would you be able to specifically define the strategic role of IS?
2. Are you familiar with cross-functional systems solutions (CFS), such as ERP, SCM, CRM?
3. Would you be able to define how SCM systems enhance effectiveness and efficiency of business processes?
4. Do you use some of these systems in your company?
5. Would you be able to specifically define the use of CFS?
6. Would you be able to specifically define the value of CFS?
7. Would you be able to effectively manage the usage of IS?
8. Would you be able to effectively manage the acquisition of IS?
9. Have you heard about the socio-technical approach of managing IS?

All, except for four respondents answered all nine questions. The following subsection summarizes the study results.

2.1 Survey results

The following table provides a basic overview of responses to the selected structured survey questions. Due to the fact that three business representatives did not answer questions 7, 8, 9 and 1 did not respond to question 9, the total number of answers to these questions is logically lower (Q7, 8 – 80, Q 9 – 79 respondents).

Question #	Yes	No	Maybe	I don't understand the question
1.	19	12	39	13
2.	51	9	8	15
3.	28	29	9	15
4.	47	21	0	15
5.	14	43	12	14
6.	17	24	36	6
7.	28	13	33	6
8.	8	29	32	11
9.	4	47	12	16

Tab. 1. Summary of survey results

The results show, that in spite of the fact that the majority of respondents have already heard or are familiar with examples of CFS and proved that such systems are used in their business, only about 23% of respondents were able to specify the strategic role of IS. Also, it might be interesting to point out that 8 out of the 12 respondents, who would not able to specify how IS could be used to build competitive advantages and help business succeed and sustain in the hyper-competitive environment of the Information Age (Q1), were managers or business owners. Besides, as shown in the table, over 55% of contacted businesses utilize cross-functional systems. Survey results, which are not available in the survey summary table show, that the most commonly used systems are the SCMs, followed by CRMs. What's interesting, however, is that more than one third of respondents would not be able to define how SCM systems enhance effectiveness and efficiency of business processes, including the inbound and outbound logistics (Q3). What's so more, more than one half of those 29 respondents claimed to be managers or business owners. All in all, no matter what cross-functional business solution, based on this survey, not many respondents would be able to definitely define use and business value of such systems (Q 5&6). Finally, the last thing that might be considered a bit alarming is the fact that more than 59% of respondents have not heard about the socio-technical approach to managing IS and 20% did not understand the question (Q9).

Based on the survey results it might be claimed that many managers and decision-makers and other IS end users still do not fully realize the data-processing and information-sharing capabilities of computerized system solutions and are not able to specifically define the strategic advantages of using CFS to support and enhance business processes. At the same time, it can be stated that just a few of them are familiar with the socio-technical approach to managing IS and would be able to effectively and efficiently manage the utilization and acquisition of computerized system solutions that would be in alignment with the overall corporate/business strategy and help business build competitive advantages and consequently succeed and sustain on the market. Therefore, the results of the study suggest that in spite of the availability and affordability of sophisticated and powerful IS and technologies, many businesses, mainly the Slovak small-sized ones, would not be able to fully benefit from using them. That is why the remaining chapters of this contribution summarize and emphasize the value of different types of CFS and provide a brief overview of the socio-technical approach to management IS.

3   Cross-functional Systems

It is possible to categorize Information Systems into three main groups – Functional Systems, Cross-functional Systems (CFS) and Integrated System Solutions. The Functional Systems are IS that focus on a particular business function, thus, it's possible to divide these systems into following categories: accounting, finance, marketing, sales, and productions and operations management, etc. In reality, however, these systems often do not support the information needs of just one particular department or a functional business area, but are integrated into combinations of several Functional Systems [5].

To the category of the most popular IS, tools of Business Intelligence (BI), undoubtedly belong CFS. CFS may be defined as an organized combination of several Functional Systems—eventually, their fundamental functionalities—that are used to support information-processing and decision-making needs of several departments. In other words, these systems cross not only the departmental boundaries and the boundaries of the distinct business functional areas, but may also cross the borders of the whole enterprise. In spite of the fact that these systems are more sophisticated and thus more costly to acquire and implement, they help companies improve the vital business processes all across the enterprise, which, again, consequently leads to improved work effectiveness, time saving, greater efficiency of organizational costs, and significant cost-saving. According to O'Brien, internetworked e-Business enterprises "view cross-functional enterprise systems as a strategic way to use IT to share information resources and improve the efficiency and effectiveness of business processes [5]. Among the most popular and most commonly used CFS certainly belong Enterprise Resource Planning Systems (ERP), Supply Chain Management Systems (SCM), Customer Relationship Management Systems (CRM), and Knowledge Management Systems (KMS) [2]. The more detailed description of these systems and their advantages will be provided in several upcoming sections of this chapter. Finally, among the most popular CFS brands undoubtedly belong Oracle and SAP.

3.1   ERP

Enterprise Resource Planning Systems, also known as Enterprise Systems or ERP, are CFS that eliminate the firm's internal, departmental boundaries as they merge several business processes into an integrated software solution, which enables seamless flow of instantly updated information throughout the company. To be more specific, ERP system is an organized combination of mutually connected software modules and a central pool of data. The common database gathers data from and supplies the updates to a variety of organizational applications, which, according to Laudon & Laudon support almost all the firm's internal activities and business processes including manufacturing, logistics, distribution, accounting, finance, and human resources functions of a company [2].

The ERP system solutions are designed based on predefined business processes that reflect so called best practices – the best possible and the most successful problem-solving approaches or solutions in a given industry. Because of this, ERP may help an organization effectively and consistently reach the business goals and objectives. Thus, the value of these systems lies in the capability to improve and increase organizational efficiency, coordination, and collaboration. Besides, because of the fact that new or updated data or information entered by one application is instantly available to the other applications and business processes, utilization of ERP also leads to improved quality of decision-making. All of the mentioned system advantages consequently lead to significant cost saving. Finally, it can be claimed that the Enterprise systems "create a foundation for a more customer-driven organization by integrating firm data to enable quicker responses to customer requests and information" [2].

3.2   SCM

Supply Chain Management is a managerial concept that integrates the management and coordination of the supply chain processes, which are somehow involved in producing and moving a product. Supply Chain Management System (SCM) is a type of CFS used to support and increase the effectiveness and efficiency of all the activities that are included in the process of creating and selling a product. Just like ERP, this system consists of a combination of integrated software applications and shared database or a part of database. Unlike ERP, however, SCM crosses the boundaries of the whole enterprise and integrates the business processes, activities and information of a firm with its supplier(s) and customer(s).

It can be claimed that there are three main categories of SCM – internal, upstream and downstream SCM, which may, obviously, be merged into an integrated system solution. Their main purpose of utilization is as following:
  • the Internal SCM supports internal supply chain processes and activities to convert the acquired materials and services into completed products as well as to manage inventory and materials;

- the Upstream SCM is used to support inbound logistics as it integrates a business with its supplier(s) and is used to manage and co-ordinate the supply ordering processes and overall relationships with strategic supplier(s);
- the Downstream SCM is used to support the outbound logistics as it supports activities and processes connected with distributing and delivering products to customers or even consumers.

The following image clearly demonstrates the features and utilization of the Up- and Downstream SCM in Nike.
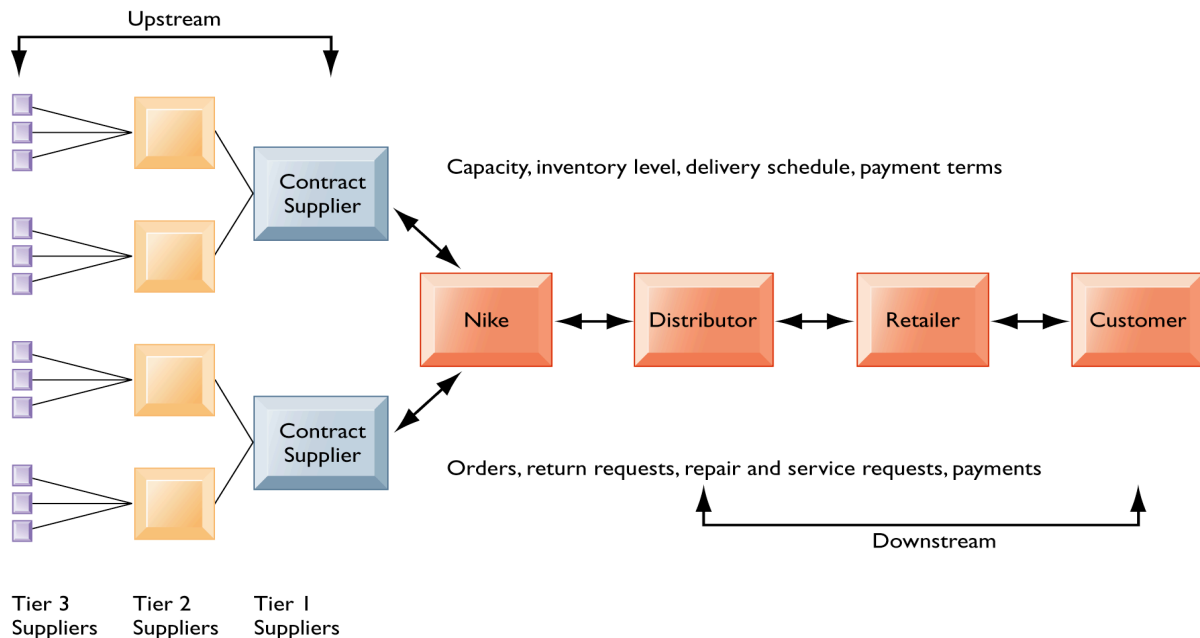

Fig. 1. Upstream and Downstream SCM in Nike [2]

Besides the classification of SCM based on the supply chain part, it is also possible to categorize these systems by their information-processing support functionalities. From this point of view, there exist two main types – Supply chain planning and Supply chain execution systems. The first type helps companies determine production quantities to meet the customers' demand and that is why the software helps businesses suggest sourcing and manufacturing plans, distribution and logistics action statements or so called product demand forecasts [3]. On the other hand, the execution SCM is used to co-ordinate the outbound logistics and therefore actual flow of products from the company to warehouses, distribution centers, retailers, or even customers or consumers.

The last possible classification of SCM is based on type of product demand forecasting. The original type of SCM, classified based on the production decision-making, is known as a build-to stock or push-based system. As the category name suggest, this software is based on a decision-making and modeling algorithm that creates production schedules based on forecasts of demands for products, and once the goods are produced, they are pushed further in the chain, either to warehouses, distribution centers, or retailers. The more recent SCM, which is Web-driven and is preferred by the internetworked e-Business enterprises, is known as a demand-driven, made-to-order or pull-based model. The build-to-order systems the manufacturer only begins assembly after an order has been placed. Usage of this system leads to lower inventory, reduced product cycle time, and also, thanks to its utilization a company may be able to effectively implement the just-in-time strategy, because of accurate delivery of goods in the right amount and as they are needed [6].

In the Information Age, the functionality of the SCM systems is enabled mainly by web technologies, including the Internet, intranets and extranets, which consequently enhance performance and increase efficiency of these systems. Thanks to the internet-based networks, all involved parties can easily and quickly communicate with each other, instantly share updated information regarding supply or product quantities, inbound and outbound logistics, or actual demand, and thus make better decisions regarding any process or activity of the production cycle. Besides, thanks to the standardized web-based environment, the SCM may be effectively used also on a global basis to coordinate global chains that include participating members from many countries. Finally, to summarize the business value of SCM, among the top benefits of using these systems undoubtedly belong well-run supply chain, accurate information instantly available to all involved parties, significant time

saving, reduced supply chain costs, and even increased sales through the correct and exact availability of products where they're needed.

3.3 CRM

Customer Relationship Management Systems may be defined as CFS that are implemented to increase effectiveness of organizational operations by crossing the company's internal as well as external boundaries. As the name of the system solution suggests, CRM is used to manage and coordinate relationships with company's customers, the more sophisticated types also contain modules used to co-ordinate firm's relationships with strategic business partners and employees. Just like ERP or SCM, this system consists of a combination of integrated software applications and shared database or a part of database, which collects and integrates data about customers from all over the organization. Afterwards, the CRM software performs customer data analysis and delivers the results to corresponding applications and to so-called customer contact/touch points that serve as an interface or a method of interaction between the business and its customers, e.g. e-mail, web site, customer service desk, etc. [5].

According to Laudon & Laudon, the commercial "software packages range from niche tools that perform limited functions, such as personalizing Web sites for specific customers, to large-scale enterprise applications" and provide modules or applications for Sales force automation (SFA), Customer service, and Marketing [2]. The SFA feature may help company increase the efficiency of productivity thanks to focusing on sales and service on the most profitable customers. Customers service applications help provide updated information about customers to contact points and thus make the customer support and service more efficient and Marketing modules include tools for analysis of data about marketing and customers and consequently identify the opportunities for product/service modification, improvement or adjustment, as well as for cross-selling (providing complementary products), up-selling (providing valuable products/services) and bundling, which is a "cross-selling in which a combination of products is sold as a bundle at a price lower than the total cost of the individual products" [2].

Because of the fact that customers have an enormous value in the Information Age and are considered a most important business asset, the CRM systems might be considered a must have system solution for businesses that are trying to compete, succeed and sustain in the Digital Era, as they help companies and organizations understand and work with their customers, determine the financial lifetime value of customers or customer groups and identify exclusive needs of customers. Therefore, it can be claimed that business value of these systems involves improved customer satisfaction that consequently leads to increased loyalty and repeating purchase, more effective marketing and decreased direct-marketing costs, decreased costs for customer acquisition and retention, improved efficiency of processes connected with marketing and sales, and thus significant time saving, cost saving, and generating increased sales revenues.

3.4 KMS

Just like customers, also information and mainly knowledge have enormous value in the era of the IA and it can be stated that quality and usage of these assets can spell the difference between the success and failure of a business in the hyper-competitive environment in the age of computer technology. In other words, acquisition, creation and dissemination of information and/or knowledge in an enterprise, eventually, between a company and its business partners have a direct impact on a business' position on the market. Because of the above mentioned facts, it is possible to claim that knowledge management has become one of the major strategic uses of information technology and that is why many companies and organizations are designing, implementing and using Knowledge Management Systems to effectively manage, create and share knowledge and business know-how. According to O'Brien, "the goal of KMS is to help knowledge workers create, organize, and make available important business knowledge, wherever and whenever it's needed in an organization. This includes processes, procedures, patterns, reference works, formulas, best practices, forecasts, and fixes" [5]. In other words, the main goal and also value of KMS lies in its ability to capture or allocate the desired knowledge, weather new or existing, and deliver it to where it is needed, what consequently helps a business become competitive.

3.5 Enterprise Application Integration

Finally, the latest trends in CFS solutions suggest integration of several CFS into one application. This process as well as the combination of several CFS is known as Enterprise Application Integration or EAI. EAI, or so called Enterprise Solutions, which are also known as Enterprise Suites or e-Business Suites, rely on flexible software that enables the interconnection of CRM, ERP, SCM modules. In spite of the fact that the EAI might be costly do develop, implement and maintain, in the long run, its effective utilization, especially in large enterprises, may bring significant benefits and much greater efficiency of information sharing, decision making and business process support than the usage of the standalone CFS.

4 Gaining benefits from IS/IT implementation

As described in previous sections, IS, or, to be exact, effective utilization of IS/IT brings many advantages to companies or organizations and consequently helps them sustain on the market and be profitable. According to Laudon & Laudon, IS may be viewed as so-called socio-technical systems; this means that in spite of the fact that they consist of the technology, they need extensive intellectual, organizational and even social investment to function correctly and bring benefits [2]. And that is why it is possible to state that the pure technical/technological aspect of design, implementation and management of IS in businesses would not be satisfactory; moreover, such approach that primarily focuses on mathematical, conceptual, normative and formal IT aspects of Information Systems might lead to ineffective usage of the system and consequently decrease its value. And that is why Management Information Systems (MIS) approach, which combines the behavioral approach, computer and management science, and "operations research with a practical orientation toward developing system solutions to real-world problems and managing information technology resources", the best choice in the system selection, design, implementation, training and also maintenance processes [2]. This approach is also known as so called socio-technical view of IS.

The statement that the socio-technical approach may be considered the best choice in managing IS resources can be supported by the fact that IS and organizations are distinct entities, which, however, have a significant, direct impact on each other. This approach, therefore, suggests that a company or organization, in order to succeed in the IA, should follow the trends in IT and be open to acquisition and utilization of IT/IS, but, at the same time, the data and information-processing needs of an organization should significantly affect the choice and the design of IS. Thus, it is possible to state that the corporate environment, politics and culture, as well as managerial decision-making, business processes, activities, and individual information-processing needs of specific departments, employee groups or even individuals should be reflected in the overall design and specific features and functions of IS.   As Laudon & Laudon claim, "technology must be changed and designed, sometimes even "de-optimized," to fit organizational and individual needs. Organizations and individuals must also be changed through training, learning, and planned organizational change to allow technology to operate and prosper" [2]. Finally, an extremely important aspect that directly spells the difference between the success and failure of IT/IS utilization is the IS Project Management, including the benefits management, which may be considered a key component of MIS [1].

4.1   The importance of Project Management

According to Dhillon, a significant amount of financial resources is lost just because of the inability of organizations to properly manage IS/IT projects and realize IS/IT benefits [1]. Similarly, Laudon & Laudon, in their more recent publication state that only almost one third of IT/IS related projects are completed on time, budget and as requested by the company or, more specifically, the system end users. On the contrary, approximately 35% of IS project greatly exceed the schedule and many IS projects are even cancelled. A systems development project without proper Project Management will probably end up with costs that significantly exceed the budget, unplanned time slippage, lower technical performance, poor data quality and/or user interface, and, consequently, the failure to get the business requirements and obtain the anticipated benefits [2].

4.2   Benefits management

An IT/IS benefit may be defined as a difference between the existing situation and the expected and planned outcome. To demonstrate this statement, the outcome of IT implementation and effective utilization might be the reduction of the workforce, while the benefit would be a significant cost saving. Benefits themselves are often not realized just because of the fact that organizations often underestimate the importance of investing into change management of processes, organizational structure and culture, and focus only, eventually mainly on technology [1]. Besides, according to Dhillon, also "the proposed benefits from an IT investment project must link in some way into the objectives of business itself" and for "full benefits, both IT management and business management must be involved in the project, with clearly defined roles for the latter in the area of change" [1].

4.3   IS planning and development

In order to fully benefit from implementing IS, it is necessary to properly plan, implement, evaluate and document all the processes and activities connected with the IS design project. The IS/IT planning stage, which is followed by implementation and on-going evaluation, consists of several, mutually dependant and equally important steps:
- Team building, modeling and consensus
- Evaluating what an organization has accomplished and the resources they have acquired
- Analyzing their business, economic, political and societal environments

- Anticipating and evaluating the impact of future developments
- Building a shared vision and deciding on what goals they want to achieve
- Deciding what actions to take to achieve their goals [4].

Besides, that the decision-making processes during the IT planning process is often supported by e.g. scenario approach, SWOT analysis, competitive forces/strategies planning model or value chain concept.

As to the question how to identify, measure, and compare the business/IT innovation as well as the profitability of IT projects in their planning processes, companies can do this by several techniques. These include the standard return on investment (ROI) analysis, Economic Value Added (EVA) analysis, return on opportunity (ROO), pay-now vs. pay-later analysis, risk-and-payback analysis, and reengineering processes. Other ways may be to hold the business unit responsible for ensuring the success of an IT project by building it into their functional unit's budget. Establishing standards to use in evaluating projects, establishing project management checklists, and involving managers in the process is also highly recommended [4].

There are several different approaches to IS design. These include Systems Development Life Cycle (SDLC), prototyping, purchasing a SW package from a vendor, end-user development and/or outsourcing. Probably the most structured and well manageable approach, which is suitable for complex system development projects, or for projects that require great amount of customization, is SDLC. This systems approach to develop information systems solutions may be described as a multistep process, which is composed of five equally important steps. Each phase of this process consists of activities that must be performed before the following stage can begin. The SDLC includes the following stages: 1. systems investigation, result of which is a feasibility study, 2. analysis that defines the functional requirements, 3. design, output of which are system requirements, 4. implementation, which leads to development and implementation of an operational system, and 5. maintenance, result of which might be an improved system solution [5]. Probably, the most important phase, which can spell the difference between the success and failure of the IS project, is the requirements analysis, as this stage specifies information needs of the future end users, in other words, the output of requirements analysis defines what info should be delivered when, how and to whom, and what business processes, events and attributes should be tracked. It can be claimed that direct end user participation in the second systems development step is especially important to reducing the potential for possible end user resistance. Active involvement of end users helps ensure that they "assume ownership" of a system, which is designed to meet their needs. Consequently, the utilization of the new system will be more effective and the company or organization will be able to fully benefit from the technology, build competitive advantages and consequently succeed and sustain in the hypercompetitive environment of the Digital Era.

5 Conclusion

The computer technology and Information Systems have become a common and unavoidable or even vital part of the Information Age as they have the power to bring enormous benefits to individuals, businesses, organizations, and the whole society. As briefly discussed in this contribution, IS, more specifically, Cross-Functional system solutions such as SCM, CRM, ERP or integrated Enterprise Suites enable businesses to electronically exchange data and information anytime and anywhere in the world with other end users, customers, suppliers, and business partners, thus help businesses collaborate more creatively, manage their info-processing tasks, business processes and organizational resources and operations more effectively, and consequently help companies build competitive advantages and successfully compete in today's fast changing global economy. The results of a survey, part of which was briefly summarized in this article, suggest that business owners, managers, and also regular IS end-users should get familiar with features, functionality, and also benefits and strategic usage of IS. Besides, enterprises, especially the small-sized ones, in order to fully benefit from technology, should focus on the alignment of IS/IT acquisition with business processes and overall business strategy, and follow the principles of the socio-technical approach to effectively and efficiently manage and use IS. Therefore, a key factor that might lead to the capability of a company to strategically implement and utilize IS is the effective deployment of the MIS (socio-technical approach) and proper IS Project Management and IS design approach.

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