



Analysing B2B electronic procurement benefits: information systems perspective

B2B electronic procurement

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Abstract

Purpose – This paper aims to present electronic procurement benefits identified in four case companies from the information technology (IT), hi-tech sector.

Design/methodology/approach – Multi-case study design was applied. The benefits reported in the companies were analysed and classified according to taxonomies from the information systems discipline. Finally, a new benefits classification was proposed. The framework was developed based on information systems literature.

Findings – The research confirmed difficulties with benefits evaluation, as, apart from operational benefits, non-financial, intangible benefits at strategic level were also identified. Traditional evaluation methods are unable to capture all benefits categories, especially at strategic level. New taxonomy was created, which allows evaluation of the complex e-procurement impact. In the proposed taxonomy, e-procurement benefits are classified according to their level (operational, tactical, strategic), area of impact, applying scorecard dimensions (customer, process, financial, learning and growth). In addition the benefits characteristic is captured (tangible, intangible, financial and non-financial).

Research limitations/implications – Research is based on four case studies only. Findings are specific to case companies and the environment in which they operate. The framework should be tested further in different contexts.

Practical implications – The new taxonomy allows evaluation of the complex e-procurement impact, demonstrating that benefits achieved do not concern merely the financial impact. The framework can be applied to preparing new systems implementation as well as to evaluating existing systems.

Originality/value – The paper applies information systems frameworks to the electronic procurement field, which allows one to look at e-procurement systems considering its complex impact. The framework can also be used to evaluate different systems, not simply e-procurement.

Keywords Internet, Procurement, Communication technologies, Information systems, Benefits

Paper type Case study



1. Introduction

This paper presents and categorises electronic procurement benefits identified in four case companies from the information technology (IT)/hi-tech and electronic components sector. The research goal was to identify benefits realised in the organisations as results of e-procurement implementations. To collect data, interviews were completed with staff from various organisational levels. As the next step, data

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were analysed and benefits were assigned according to taxonomies identified in the information systems (IS) literature. These allowed consideration of different dimensions, levels and types of benefits, which is different to previous e-procurement studies that concentrated mainly on productivity and financial dimensions, not on the overall impact on performance (Sriram and Stump, 2004). Such an analysis of e-procurement benefits is important, as in many situations companies are not able to recognise real e-procurement value. Companies have problems identifying e-procurement strategic impact, intangible and non-financial implementation results (Gunasekaran and Ngai, 2008). Evaluation could be complex, as benefits such as process cost reduction, cycle time shortening or process improvement are not achieved directly, but via improvement of communication and relationships with vendors (Sriram and Stump, 2004), impact of the IT system, or process changes (Bendoly and Schroenherr, 2005). There are problems with quantifying e-procurement benefits (Rajkumar, 2001), especially at the strategic level, as traditional, financial based, measurement methods such as return on investment (ROI) are not able to capture them (Hawking *et al.*, 2004). Moreover, the lack of commonly used benchmarks to compare results of e-procurement implementations is listed as one of the major problems (Angeles and Nath, 2007; Perona and Saccani, 2004). Even though IS literature is rich in various frameworks and benefits taxonomies, they are not applied in the e-procurement context. Similarly, e-procurement-related literature does not utilise taxonomies proposed in the IS discipline. This paper is constructed as follows, at the beginning, e-procurement applications, their drivers and benefits, as well as IS benefits taxonomies are overviewed. Then, research methodology and findings from four case companies are presented. In the main part benefits identified in companies are analysed using benefits taxonomies from IS literature, finally a new taxonomy developed from the literature is presented.

2. Electronic procurement and its drivers

E-procurement includes sourcing, negotiations with suppliers, and R&D co-ordination taking place on the internet and electronic market (Yen and Ng, 2003). Croom and Johnston (2003) defined e-procurement as the mirroring of procurement activities in the internet, while Presutti (2003) defined it as all technologies which facilitate buying using the internet. Knudsen (2003) included into e-procurement: e-sourcing, e-tendering, e-informing, e-reverse auctions, e-MRO, and web-based enterprise resource planning (ERP). E-procurement is also considered as part of supply chain (SC) management and includes: e-procurement software, business to business (B2B) market exchanges, B2B auctions, and purchasing consortia (Davila *et al.*, 2003). Rai *et al.* (2006) presented four groups of e-procurement innovations based on the major procurement processes: electronic reverse auctions, electronic catalogue management, electronic order fulfilment and electronic payment and settlement innovations. There is a variety of e-procurement classifications, but common to all is the fact that e-procurement is composed of different applications (Knudsen, 2003). Similarly as there is variety of applications classified as e-procurement, there are also different drivers that motivate companies to use this category of applications. Bartezzaghi and Ronchi (2003) analysed companies' motivation to implement internet-based tools to support procurement processes. Their case study showed that some companies targeted increasing market efficiency through reverse auctions, which provide a chance to get lower purchase prices, as well as improving supplier search and negotiation processes. Other organisations wanted to improve SC agility and responsibility by extending

collaboration with business partners and increasing supply process effectiveness and efficiency. The third group wanted to make lean and streamlined internal procurement processes. Bartezzaghi and Ronchi (2003) stated that the goals of e-procurement tool implementation are linked with product categories and their characteristics. Research on Australian companies (Hawking *et al.*, 2004) resulted in a list of the main e-procurement drivers; namely price reduction, negotiation unit cost reduction, improved visibility of customer demand, reduced administration cost, improved market intelligence, reduced operational and inventory costs, enhanced decision making, improved contract compliance, shortened procurement cycle times, improved visibility of SC, increased accuracy of production capacity and enhanced inventory management. Drivers are linked with expectation of benefits, or problem-solving solutions that should be achieved by e-procurement systems.

2.1 Electronic procurement benefits

A variety of e-procurement benefits have been reported as achieved, or expected, in the academic literature. Among different benefits listed in the literature (Tables I and II), the most common are: transaction cost and buying price reduction, process shortening, improvement of information exchange, and control. Despite the drivers that aim at operational and strategic improvements, as well as the initial expectation that e-procurement would realise both operational and strategic benefits, the literature is dominated by the benefits at an operational level (Davila *et al.*, 2003), but does not widely present the benefits at a strategic level. E-procurement benefits were grouped into several taxonomies (see Table I) that include; operational and strategic (Croom, 2000), operational, strategic and opportunity (Attaran, 2001), operational, tactical and strategic; direct and indirect (De Boer *et al.*, 2002), market efficiency, process efficiency and effectiveness (Bartezzaghi and Ronchi, 2003). Subramaniam and Shaw (2002) distinguished between immediate and performance measures, while Bendoly and Schroherr (2005) looked at variability, bottleneck and waste reduction from implemented systems and process changes. Gunasekaran and Ngai (2008) noted impact on short and long-term organisational performance, cost-performance, competitiveness, alliances and networking. At the operational level, benefits include categories related to operational efficiency and effectiveness (Gebauer and Shaw, 2004). Mukhopadhyay and Kekre (2002) distinguished between direct operational impacts based on transaction process improvement, direct strategic impact through sales increases, and long-term indirect strategic impact. Schoenherr and Tummala (2007) did not look at benefits and their categories in their e-procurement review, but listed some of them, such as: reduced transaction costs, more efficient negotiation with, and identification of suppliers, workflow automation, organisational spending control and leverage, improved process monitoring, co-ordination and control, information sharing and integration. There are also papers that do not classify, but merely report achieved benefits (Table II).

3. IS benefits taxonomies

E-procurement benefits classifications are simple compared to benefits taxonomies used in the IS discipline, and do not reflect the complex character of e-procurement impact, nor capture characteristics of such benefits. Several ways to classify benefits exist in the IS; benefits can be classified as:

Table I.
Benefits and their categories

Paper	Benefit category 1	Benefit category 2	Benefit category 3	Benefit category 4
Attaran (2001)	<p><i>Strategic</i> Purchasing consolidation, lower buying price and better service Freeing human resources Faster response to changes Improve chance to win new business</p> <p><i>Increased market efficiency</i> Reduced supplier searching and selection costs</p> <p><i>Variability reduction</i> From ERP product Common database Standardised human-computer interface – shorter processing time ERP process effect Business procedures rationalisation – less uncertainty regarding execution Simplified user training</p>	<p><i>Operational</i> Better financial control Less paper work Improved auditing and security Shorten delivery time Eliminate time-zone limitations Reduce inventory Maximise labour Data re-entry elimination <i>Increased supply process efficiency</i> Leaning procurement process Aggregating demand Internal efficiency improvement Delivery performance improvement Operative and inventory cost reduction <i>Bottleneck reduction</i></p>	<p><i>Opportunity</i> Better company image and relationships On-time and correct delivery to the customer, fewer delays and errors</p> <p><i>Increased process effectiveness</i> Quality Degree of innovation Time-to-market Service level Stock-outs reduction <i>Waste reduction</i> From ERP product Monitoring of different waste types Standardised interface – easier comparability with other departments ERP process effect Business procedures rationalisation – elimination of unnecessary and waste-generating processes and sub-processes Training/education of users – more workers have ability to recognise waste-generating processes</p>	<p><i>Cost reduction</i> Negotiation Supplier searching Material costs</p>
Bartezzaghi and Ronchi (2003, 2004)	<p><i>Increased market efficiency</i> Reduced supplier searching and selection costs</p> <p><i>Variability reduction</i> From ERP product Common database Standardised human-computer interface – shorter processing time ERP process effect Business procedures rationalisation – less uncertainty regarding execution Simplified user training</p>	<p><i>Operational</i> Better financial control Less paper work Improved auditing and security Shorten delivery time Eliminate time-zone limitations Reduce inventory Maximise labour Data re-entry elimination <i>Increased supply process efficiency</i> Leaning procurement process Aggregating demand Internal efficiency improvement Delivery performance improvement Operative and inventory cost reduction <i>Bottleneck reduction</i></p>	<p><i>Opportunity</i> Better company image and relationships On-time and correct delivery to the customer, fewer delays and errors</p> <p><i>Increased process effectiveness</i> Quality Degree of innovation Time-to-market Service level Stock-outs reduction <i>Waste reduction</i> From ERP product Monitoring of different waste types Standardised interface – easier comparability with other departments ERP process effect Business procedures rationalisation – elimination of unnecessary and waste-generating processes and sub-processes Training/education of users – more workers have ability to recognise waste-generating processes</p>	<p><i>Cost reduction</i> Negotiation Supplier searching Material costs</p>
Bendoly and Schroenherr (2005)	<p><i>Variability reduction</i> From ERP product Common database Standardised human-computer interface – shorter processing time ERP process effect Business procedures rationalisation – less uncertainty regarding execution Simplified user training</p>	<p><i>Operational</i> Better financial control Less paper work Improved auditing and security Shorten delivery time Eliminate time-zone limitations Reduce inventory Maximise labour Data re-entry elimination <i>Increased supply process efficiency</i> Leaning procurement process Aggregating demand Internal efficiency improvement Delivery performance improvement Operative and inventory cost reduction <i>Bottleneck reduction</i></p>	<p><i>Opportunity</i> Better company image and relationships On-time and correct delivery to the customer, fewer delays and errors</p> <p><i>Increased process effectiveness</i> Quality Degree of innovation Time-to-market Service level Stock-outs reduction <i>Waste reduction</i> From ERP product Monitoring of different waste types Standardised interface – easier comparability with other departments ERP process effect Business procedures rationalisation – elimination of unnecessary and waste-generating processes and sub-processes Training/education of users – more workers have ability to recognise waste-generating processes</p>	<p><i>Cost reduction</i> Negotiation Supplier searching Material costs</p>
Croom (2000)	<p>Operational Administrative costs reduction Improved audit and increased procurement control, greater visibility Consolidation, supply base reduction Transparency Real-time data access <i>Cost efficiency</i></p>	<p><i>Operational</i> Better financial control Less paper work Improved auditing and security Shorten delivery time Eliminate time-zone limitations Reduce inventory Maximise labour Data re-entry elimination <i>Increased supply process efficiency</i> Leaning procurement process Aggregating demand Internal efficiency improvement Delivery performance improvement Operative and inventory cost reduction <i>Bottleneck reduction</i></p>	<p><i>Opportunity</i> Better company image and relationships On-time and correct delivery to the customer, fewer delays and errors</p> <p><i>Increased process effectiveness</i> Quality Degree of innovation Time-to-market Service level Stock-outs reduction <i>Waste reduction</i> From ERP product Monitoring of different waste types Standardised interface – easier comparability with other departments ERP process effect Business procedures rationalisation – elimination of unnecessary and waste-generating processes and sub-processes Training/education of users – more workers have ability to recognise waste-generating processes</p>	<p><i>Cost reduction</i> Negotiation Supplier searching Material costs</p>
Croom and Johnston (2003, 2006)	<p><i>Cost efficiency</i></p>	<p><i>Operational</i> Better financial control Less paper work Improved auditing and security Shorten delivery time Eliminate time-zone limitations Reduce inventory Maximise labour Data re-entry elimination <i>Increased supply process efficiency</i> Leaning procurement process Aggregating demand Internal efficiency improvement Delivery performance improvement Operative and inventory cost reduction <i>Bottleneck reduction</i></p>	<p><i>Opportunity</i> Better company image and relationships On-time and correct delivery to the customer, fewer delays and errors</p> <p><i>Increased process effectiveness</i> Quality Degree of innovation Time-to-market Service level Stock-outs reduction <i>Waste reduction</i> From ERP product Monitoring of different waste types Standardised interface – easier comparability with other departments ERP process effect Business procedures rationalisation – elimination of unnecessary and waste-generating processes and sub-processes Training/education of users – more workers have ability to recognise waste-generating processes</p>	<p><i>Cost reduction</i> Negotiation Supplier searching Material costs</p>
				<p><i>Internal customer satisfaction</i></p> <p>(continued)</p>

Paper	Benefit category 1	Benefit category 2	Benefit category 3	Benefit category 4
Gebauer and Shaw (2004)	<p>Transaction costs</p> <p>Shorter processing time</p> <p>Purchase price reduction</p> <p>Internal process cost improvements: electronic transmission, single point of data entry, fewer errors</p> <p>Lower handling and warehousing costs</p> <p><i>Increased operational efficiency</i></p>	<p>Improved budgetary control</p> <p>Robust processes performance</p> <p>Transparency and data accessibility</p> <p>Systems reliability assured compliance to process</p> <p>Improved management information</p> <p><i>Increased operational effectiveness, including flexibility and emergency handling</i></p> <p>Better communication</p> <p>Increased control</p> <p>Shorter response time</p>	<p>Increased employee satisfaction</p> <p>Responsiveness</p> <p>Flexibility</p> <p>Care</p> <p>Reliability</p> <p>Integrity</p> <p>Competence</p> <p>Security</p>	
Hawking <i>et al.</i> (2004)	<p>Bottle-neck elimination and faster processing</p> <p>Improved employee productivity</p> <p>Delays reduction</p> <p><i>Cost-related and tactical</i></p> <p>Price reduction</p> <p>Reduction of administrative costs</p> <p>Reduced operational and inventory costs</p> <p>Enhanced inventory management</p> <p>Improved contract compliance</p> <p>Shortened procurement cycle</p> <p>Increased accuracy of production capacity</p>	<p><i>Strategic</i></p> <p>Improved visibility of customer demand</p> <p>Better market intelligence</p> <p>Enhanced decision making</p>	<p><i>Non-classified</i></p> <p>Improved visibility of supply chain</p>	
Sriram and Stump (2004)	<p><i>Purchasing cost</i></p> <p>Value of buffer stocks</p> <p>Frequency of stock-outs</p> <p>Inspection/quality costs</p> <p>Ordering costs</p>	<p><i>Order processing time</i></p> <p>Order-processing time</p> <p>Purchase lead time</p> <p>Length of the planning cycle</p>	<p><i>Purchasing process improvements</i></p> <p>Order-processing accuracy</p> <p>Order-processing reliability</p> <p>Timeliness of deliveries</p> <p>Early detection of non-compliance by vendors</p>	<p><i>Relationship quality</i></p> <p>Mutual trust</p> <p>Overall coordination</p> <p>Frequency of disputes</p> <p>Information sharing</p>
Subramaniam and Shaw (2002)	<p><i>Intermediate measures</i></p> <p>Lower transaction costs</p> <p>Lower inventory</p> <p>Lower buying price</p>	<p><i>Performance measures</i></p> <p>Higher process quality</p> <p>Lower total procurement costs</p> <p>Increased user satisfaction</p> <p>Increased system responsiveness</p>		

Table I.

Ageshin (2001)	Increased product customisation and build-to-order capabilities, increased collaboration, use of the single system
Bartezzaghi and Ronchi (2003)	Reduce transaction costs, improve internal procurement process efficiency, increase collaboration with suppliers, lead time reduction, process improvement, process automation, reduce cost of purchased goods
Davila <i>et al.</i> (2003)	Transaction costs reduction, shorter purchasing order fulfilment time, shorter purchasing cycle time, reduced number of suppliers, lower prices paid for goods, reduced head count to support purchasing transactions, increased flexibility, more up-to date information about order, increased control on spending
Falk (2005)	Increase of labour productivity
Gunasekaran and Ngai (2008)	Better staff utilisation, efficiencies increment, help to achieve supply chain management, improved existing markets, increased customer service level, increased customer satisfaction, increased market share, reduced inventory levels, reduction in maverick buying, reduction in operational tasks, reduction in processing time, reduction in transaction costs, support for environmental issues
Lin and Hsieh (2000)	Process improvement, shorter delivery time, less administration, purchasing consolidation, time zone elimination, faster information flow, less inventory, better buyer/supplier relationships, maximising labour by empowering employees
Muffatto and Payaro (2004a, b)	Better information management, increased flexibility, reduced lead time, increased system reliability, increased process efficiency, elimination of manual procedures, better control, fewer mistakes, warehouses optimisation, procurement consolidation
Tanner <i>et al.</i> (2008)	Reduction of purchasing price, optimising total cost of procurement, internal process optimisation, securing supplies, maintaining quality guidelines, increase in cost transparency, B2B process optimisation, minimising warehousing costs, reduction of the number of suppliers, product development with suppliers
Tatsis <i>et al.</i> (2006)	Price decrease, reduction of administrative expenses, inventory reduction, shorter cycle times, improved communication and information flow, improved planning and control, improved collaboration with suppliers

Table II.
Benefits – not classified
or single category only

- strategic, tactical and operational benefits (Irani, 2002);
- tangible and intangible benefits (Gunasekaran *et al.*, 2001; Irani and Love, 2002); and
- financial and non-financial benefits (Irani and Love, 2002).

Another classification of IS benefits is based on the Balanced Scorecard (Kaplan and Norton, 1992) and includes benefits in four perspectives: financial, growth and learning, customer and business process. This approach was used also by Milis and Mercker (2004). Farbey *et al.* (1995) presented the benefit evaluation ladder that is composed of stages such as: mandatory changes, automation, direct value added systems, MIS and DIS, infrastructure, inter-organisational systems, strategic systems and business transformation. Companies, however, have not always been climbing the

ladder step-by-step. While at the first steps of the ladder benefits and costs are possible to quantify, later this is much harder, as the complexity of the systems is growing (Farbey *et al.*, 1995). In a situation where benefits are achieved at the operational level these are more often tangible and financial. At the strategic level non-financial and intangible benefits dominate (Irani and Love, 2002).

4. Methodology and research design

Data were collected from the purposeful sample of four companies from IT/hi-tech, electronic components sector. All of them are business units of large, world-leading international corporations and are located in Central Europe. While the case organisations are part of corporations, at the same time they are registered as independent companies under local regulations and in all cases were merged or were acquired by the corporation. Within the case companies a variety of e-procurement application is used, this is not exceptional as e-procurement is commonly used in the information communication technology (ICT) electronic components industry regardless of the country (Batenburg, 2007). The research is based on the interpretive paradigm and concentrates on evaluation of electronic procurement applications, defined as all systems used to support procurement processes (Presutti, 2003). While the whole research looked wider at evaluation tools, methods, costs, risks, part of it look at e-procurement benefits and their characteristics, to find how they could be categorised. This part of the research is reported in this paper. To increase generalisability and to have the possibility to compare findings from various organisations with similar characteristics, a multi-case study design was used. At the exploratory stage initially data collection was completed at three sites, the fourth case company was used for confirmatory purposes. Results of data collection at the fourth company did not give any additional information, but confirmed issues already identified at the three other organisations, at this stage data collection was stopped. Data were collected from four companies, while multiple respondents within each organisation have been interviewed from various organisational levels: senior and middle management from purchasing, logistics and IT departments, as well as direct system users (mainly from purchasing, logistics departments). Employees that could provide the most details about a system usage and/or implementation were identified. Multi-informants naturalistic interviews allowed collecting different viewpoints on the e-procurement impact, and benefits perception at different organisational levels. Altogether 27 face-to-face interviews with 20 people were completed at company premises; some of them were followed by phone conversations (interview questions are in the Appendix). Interview length was up to two hours. Most of the interviews were recorded and transcribed. To reduce bias, apart from multi-informant interviews, data triangulation with external and internal documents such as company reports, presentations and guidelines was completed. Shortcoming of the research is that findings are specific for the case companies, which operate in a specific industrial, corporate and national context. The research looked at B2B only; there could be differences in public sector procurement. In addition, identified benefits are within the case organisations, the impact of e-procurement on the whole SC, such as impact from the view of supplier, or customer, was not covered in this study. Similarly, costs and risks, as well as the evaluation method associated with e-procurement implementation are not covered in this paper.

5. Findings

Within case companies, different e-procurement solutions were implemented. The procurement processes were supported by e-procurement applications, e-procurement modules of ERP systems, sell-side electronic marketplaces, e-catalogues and EDI. All companies used private e-procurement systems. In the following sections, the benefits achieved in the case companies are briefly presented. Benefits identified in the case companies, as well as benefits characteristics are listed in Table III.

5.1 Case company 1

According to interviewees after e-procurement system implementation it is possible to measure and monitor orders and all details such as: processing time, time an order was sent, and current status, as a result the processes become fully transparent. At the initial stage of implementation, processes were standardised and improved, and non-value-added activities were removed. After process automation, paper documents were eliminated resulting in faster order approval and document processing. All information related to the order, and its current stage is available in the system, therefore the time to access information was reduced – all required information is stored in a single database. The sales department have access to the same data as the purchasing department. Before the system was implemented, staff from the purchasing department had to answer questions from sales people related to the order status, spending a considerable amount of time on this activity. Now the salespeople are able to check all information needed on their computers and can answer questions immediately. Members of the purchasing department used to spend around half of their time (four to five hours a day) answering questions from sales; now they spend just seconds a day. The system has also increased customer service level; the sales people have access to the procurement system, therefore they can answer customer questions immediately using available information. According to interviewees an increased customer service created a competitive advantage, and fast response to customer questions looks good from the customer's point of view. Now the company is able to answer the customer needs faster. Usage of the system has increased efficiency as the same number of people can process a higher number of orders; despite increase in sales there was no need to employ many additional staff members in the procurement department. The system has increased reporting capabilities, access to information is easier and faster, in addition customised reports can be generated. The system increased controls at the local level; employees have pre-defined roles (profiles) and cannot do anything that is not defined in the system. It also acts as fraud prevention. At the same time it had an impact on control at the corporate level – processes within the corporation tend to be standardised, so it is possible to compare processes and performance between various countries and offices within the region. Increased reporting provides possibilities to monitor operations at the regional and country level. Additionally there were benefits through an automatic invoicing system, as earlier payment improves financial results.

5.2 Case company 2

At the second case company it is estimated that only around 50 per cent of transactions are in an electronic format. When the procurement system is used, the orders are monitored, so when more departments order products and services from the same

Benefits	Case 1	Case 4	Case 2	Case 3	Tangible	Intangible	Measured	Estimated	Observed/ assumed
<i>Strategic</i>									
Increased control (corporate level)	V	V	V	V		Non-financial			V
Increased customer service	V		V			Non-financial			V
Increased competitive advantage	V					Non-financial			V
Eliminate, reduce problems with suppliers		V	V			Non-financial			V
Eliminate "unwanted" suppliers		V	V	V		Non-financial			V
Fraud prevention	V	V		V		Non-financial			V
Improve cooperation and communication with other business units			V			Non-financial			V
<i>Tactical</i>									
Improved financial results (faster payment)	V				Financial			V	
Increased efficiency	V	V		V	Non-financial			V	
Improved monitoring and control	V	V	V			Non-financial			V
Increased reporting capabilities	V					Non-financial			V
Process transparency	V	V		V		financial			V
Reduce buying costs		V	V		Financial			V	
Reduce service costs		V	V		Financial			V	
Reduce cost of procured goods and services	V	V	V		Financial			V	
Provide better information about suppliers		V	V			Non-financial			

(continued)

Table III.
Benefits achieved – strategic, tactical and operational

Table III.

Benefits	Case 1	Case 4	Case 2	Case 3	Tangible	Intangible	Measured	Estimated	Observed/ assumed
Improve supplier searching process		V	V			Non-financial			V
Reduce transaction costs		V			Financial			V	
Increased staff transferability		V	V	V		Non-financial			V
Reduce employment (or keep the same despite higher workload)	V	V	V	V	Non-financial			V	
<i>Operational</i>									
Improved orders processing	V		V	V	Non-financial		V		
Improve orders creation		V			Non-financial		V	V	
Improved procurement process	V	V	V	V	Non-financial		V	V	V
Improved orders approval	V		V		Non-financial		V	V	
Improved access to information	V	V	V	V		Non-financial		V	V
Elimination of non-value-added activities	V					Non-financial			V
Reduce bank transfer costs	V		V	V	Financial			V	
Reduce warehousing and transport costs	V		V	V	Financial				V
Eliminate exceptions in the processes	V	V	V			Non-financial			V
Eliminate problems with paper documents	V	V	V	V		Non-financial			V
Note: V – identified in the case company									

supplier it is possible to find such information and sign an agreement with a supplier, including re-negotiations of prices and conditions. Before the system was implemented, exactly the same or very similar products were ordered from various sources, under different conditions and with different buying prices. After implementation a central database of suppliers is held at a corporate level and regional offices have access to it, which allow searching for a supplier known to the company. Such system functionality offers the possibility to buy items at reduced prices agreed at the corporate level. It is possible to monitor processes and their key elements, such as order placing time and completion, so the control of orders was increased; it is known who was buying what and why. As the process is in an electronic format, it is possible to block all transactions with selected suppliers in case of any problems. Time to make the decision was reduced through the predefined and automated workflow, as well as orders being prioritised or the first in first out (FIFO) rule applied. The electronic workflow eliminated previously common mistakes and problems with paper documents (missing, sent to the wrong place) and with unreliable fax transmission. Electronic documents are easy to find and their status can be confirmed; also, document transfer is much faster, orders are delivered electronically in one to two hours. Before the system implementation, processes were reviewed and simplified. In the paper format an order was processed over a two-day period; in an electronic version this can be done in 15 minutes. Additionally, with the e-procurement implemented for orders, there is a single point of data entry. There are also benefits achieved as the result of the standardisation of ordered products for internal use (standard computer configuration); non-standard products increase service time, costs and the ordering of spare parts. Savings on bank transfer costs were also reported with a lower number of payments (payments are aggregated). Another category of savings was on transportation, operations and warehousing costs; it is possible to send transport directly from supplier to customer. Systems and processes are the same within the region, so there are possibilities to transfer staff easily between countries. Changes in the system are now easier within the region as every country has exactly the same system, allowing understanding of how other branches operate and what the common issues are.

5.3 Case company 3

E-procurement benefits at this company were also noted. One of them was the single point of data entry into the system; data do not need to be entered into several systems, but are entered once only. As a result of the system implementation, data exchange with suppliers was improved. Document transfer was faster, and electronic documents eliminated the mistakes of data entry and transmission. Efficiency was increased; after the system was implemented there was no need to employ new people, even though the department had to process more orders. Without the system, the company had to employ additional staff members. Decision-making processes were also improved; analysis of historical data in the system allowed the creation of approximations of delivery time from suppliers (based on historical statistical analysis of previous delivery times). As important issues system transparency and easy access to information were listed. From a system user point of view, all available information required to place and monitor orders is easily accessible. The system provides the possibility to separate document and physical flows, allowing shipment of ordered

products directly to a customer, while the company receives only an invoice in electronic format. Non-material products, such as software licences, as well as large orders, are sent directly to the customer. In the case of large orders it reduced the company costs related to transport and warehousing.

5.4 Case company 4

At this company, the advantages of using the e-purchasing system were related to process improvement. The system saved time as the orders could be created in minutes and sent in seconds. Reduction of the process time was estimated to be from four days to four hours, but it was not measured. Because all data are in the system, it is easy to know when, where, and by whom orders were created; the whole process is fully transparent. It is easy to review all process steps, decision points, sending dates and detailed order history. Not only the processes, but also the whole SC is clear and visible. The system has increased control as it is known that money was spent from a correct budget. It is important that the system is fully integrated with other modules, such as financing, so data are automatically exchanged and procurement expenditures are automatically compared with the allocated budget. Additionally, the system eliminates potential problems with suppliers as both parties have exactly the same documents generated by the system. This reduces misunderstandings related to the number and types of products ordered. All transactions are realised through the system only, so it is possible to negotiate better prices and rebates from suppliers for both products and services. Additionally, it is possible to reduce buying and service costs through product standardisation. The volume and value of orders is predictable, so other costs, such as service and warranty costs are listed and added into the buying price to determine the total cost. Required data related to the buying prices and conditions are in the system, so it is possible to compare suppliers from various countries to determine the cheaper supplier who can provide products for the whole region. Supplier searching costs are reduced. In the system a set of supplier-related benchmarks is included, which reduces the risk of potential problems. Every supplier (or customer) who is listed on the US department or the European list of companies that might support terrorism is also included in the e-procurement system and all potential transactions with them will be blocked. Document creation, such as request for quotation (RFQ), is easy and automated. Documents can be automatically generated and e-mailed to the selected suppliers. Next, it is possible to complete automated analysis of answers from suppliers. Tables are generated from documents received; this provides the possibility to compare financial and non-financial conditions such as price, region covered or regional experience. In the buying process, the number of documents is reduced as there is one invoice from a supplier instead of many invoices from various suppliers, which again reduces transaction costs. An automation of the process and the system usage provides possibilities to reduce the number of employees who need to work for the purchasing department. Also, as all processes, procedures and software are exactly the same in all offices around the globe, it is easy to transfer people between branches. An automated purchase order processing function also allowed a reduction of labour costs after transferring the processing department overseas. The system reduces, or even eliminates, the risk of fraud, as payment is made only for products and services ordered. Money is transferred only to a supplier account, as defined in the centralised supplier database.

6. E-procurement benefits – analysis

In the following section, benefits identified in the case companies are classified using various benefits taxonomies from the IS literature, such as Balanced Scorecard (Kaplan, 1996; Milis and Mercker, 2004; Stewart and Mohamed, 2003, 2004), strategic, tactical and operational (Irani, 2002), tangible and intangible (Gunasekaran *et al.*, 2001; Irani and Love, 2002), financial and non-financial benefits (Irani and Love, 2002).

6.1 *Strategic, tactical, operational benefits*

Benefits reported by the case companies have been classified by the author according to the IS benefits taxonomy proposed by Irani (2002) – Table III. The same approach to classify benefits is also used in the e-procurement literature: operational, tactical, strategic (De Boer *et al.*, 2002), and operational and strategic (Attaran, 2001; Croom, 2000). As the benefits taxonomy is used both in IS and e-procurement literature, the author applied it for further analysis. Looking at benefits reported by the companies it is possible to see that the majority of them can be classified as operational and tactical. They mostly improve procurement processes and reduce the costs of goods and services procured. E-procurement and process automation had an impact on the procurement processes; simplifying flow, reducing decision points and eliminating exceptions, this resulted in increased efficiency and time as well as cost reductions. Similarly the e-procurement allows the reduction of buying costs through order-pulling, buying centralisation, and negotiations of the buying prices. However, of the reported benefits, only some could be classified as strategic; mainly those benefits that give an opportunity to improve customer service (case companies 1 and 2) and increase control at the corporate level (case companies 1, 3 and 4). An important issue identified at case companies 3 and 4 and to a low extent at case 2, is the elimination of “unwanted” suppliers – companies that support terrorism or trade with these organisations is forbidden by the US and the EU authorities. As all the case companies trade in hi-tech, dual purpose products, increased control is a very important factor. At case companies 1, 3 and 4, fraud prevention was also mentioned; increased control eliminates or highly reduces the risk of possible fraud by employees or third parties. Increased control protects company reputation on the market and related to it financial results or even company survival. Comparing identified benefits of the e-procurement implementation with those from other types of IT projects (Lin and Pervan, 2003), where most common benefits listed were: competitive advantage, process efficiency and satisfying information needs, it is possible to see that in the case companies competitive advantage was mentioned in one case company only. This might suggest that the e-procurement has a limited impact on strategic benefits compared to other systems, while delivers benefits on the operational and tactical level. The main function of e-procurement at the strategic level is increased control and prevention.

6.2 *Tangible and intangible, financial and non-financial benefits and their evaluation*

Identified benefits were assigned into two categories – tangible and intangible (Gunasekaran *et al.*, 2001; Irani and Love, 2002) – Table III. Table III shows how the tangible benefits could be measured, and what their nature is: financial, or non-financial (Irani and Love, 2002). Analysing the types of benefits it is possible to see that at the operational level, tangible benefits dominate, such as a cost reduction or a

process improvement. On the tactical level, tangible and intangible benefits are equally distributed, while at the strategic level, intangible benefits dominate. Such benefits structure and characteristic creates problems in quantifying benefits at the strategic level. Table III also shows that over half of the benefits (seven of 13) can be easily reflected using financial measures. Even though the remaining six benefits cannot be directly calculated, there are still such possibilities: calculating time improvement and resources that were involved previously and are available after system implementation. Employment reduction might also be calculated, through savings on salaries, or transferring people to other positions. The findings from the four case companies show how the benefits were evaluated. Different benefits were measured using various methods. Some benefits were estimated and the interviewees were able to give quantitative examples, the impact was not based on a precise measurement, the interviewees just gave their opinions about benefits achieved. The other groups of benefits were just observed, or even assumed. The interviewees noticed impact and improvement but were not able to assess it precisely. Part of the positive impact was prevention, such as fraud prevention, or reducing possible damage to company reputation due to involvement in trade with an illegal or suspicious organisation, as well as any allegation of corruption. All these benefits are hard or even impossible to quantify, even though they were mentioned in all case companies as important. According to interviewees the e-procurement resulted in benefits, but in many cases there was no quantitative confirmation, or benefits could not be quantified as they are highly intangible. There were some attempts to measure tangible benefits at the operational level, such as process time, cost or number of decision points. At the tactical level the interviewees were able to estimate observed e-procurement impact and provide some numbers, while at the strategic level they believed that benefits were achieved based on their observations and assumptions. In the case companies the benefits not measured are those in theory easiest to quantify – financial benefits. In most cases they were just estimated.

6.3 Balanced Scorecard perspectives

Table IV classifies benefits according to the Balanced Scorecard perspectives (Kaplan, 1996; Kaplan and Norton, 1992; Milis and Mercker, 2004). Some benefits are listed in more than one perspective, as they influence both.

Based on Table IV it is possible to conclude that the main areas of improvement are two interlinked perspectives: business process and financial. Savings are realised through cost reduction (warehousing, transportation, transaction, service and buying costs) as well as faster payment. Additionally, financial improvement is linked with the improvement of internal business processes. To some extent growth and learning is supported, mainly due to increased control and reporting capabilities. The impact on customers is not high, as the only element mentioned by interviewees was increased customer service. However, due to the e-procurement the “internal customer” service is improved, mainly through cooperation with a sales department.

7. Synthesis

Benefits analysis indicates that to evaluate the achieved benefits, more than a single taxonomy of IS benefit is required. The usage of various taxonomies provides the opportunity to observe how benefits are distributed according to the level and area of

Customer	Balance Scorecard perspectives		
	Business process	Learn and growth	Financial
Increased customer service (including internal customers – other departments)	Elimination of non-value-added activities Improved orders approval Improved procurement process Improved orders creation Improved supplier searching process Improved monitoring and control Eliminate exceptions Eliminate, reduce problems with suppliers Eliminate problems with paper documents	Improved access to information Increased reporting capabilities Increased control (corporate level) Increased competitive advantage Improved cooperation and communication with other business units	Reduced bank transfer costs Reduced transaction costs Reduced buying costs Reduced service costs Increased efficiency Eliminate, reduce problems with suppliers Improved financial results (faster payment) Reduced warehousing and transport costs Fraud prevention

Table IV.
Benefits achieved – the
Balanced Scorecard
perspectives

their impact. The author found that to be able to present and reflect multi-dimensional e-procurement impact, multiple taxonomies combined together (Table V) could provide the best overview of planned and realised benefits. More specifically the author recommends combination of classifications such as: tactical, operational and strategic (De Boer *et al.*, 2002; Irani, 2002); tangible and intangible (Gunasekaran *et al.*, 2001; Irani and Love, 2002); and Balanced Scorecard perspectives: financial, customer, internal process, growth and learning (Kaplan, 1996; Kaplan and Norton, 1992; Milis and Mercker, 2004; Stewart and Mohamed, 2003, 2004). Such combination allows identification of areas where benefits are identified or planned (using Balanced Scorecard perspectives), benefits level (operational, tactical, strategic) and characteristics (tangible, intangible, financial, non-financial). It is important to note that a traditional performance measurement is unable to capture and precisely calculate benefits, as they are moving up in the benefits classification from the operational, through the tactical, to the strategic level. It is possible to measure and quantify operational benefits and to some extent tactical benefits. The strategic benefits are very hard, or even impossible, to quantify.

8. Conclusion

The findings from the four case organisations confirmed the IT/IS evaluation problems indicated in the literature and relate to ability (or more precisely inability) to capture and quantify benefits realised as a result of e-procurement implementation. Some of the benefits identified in the case companies at the strategic level, such as fraud prevention and company reputation, are highly intangible but have significant impact on an

Table V.
E-procurement benefits reported in case companies

Level	Balance Scorecard perspectives		
	Customer	Business process	Learn and growth
Strategic	Increased customer service (INT)	Eliminate, reduce problems with suppliers (INT) Eliminate "unwanted" suppliers (INT)	Increased control (corporate level) (INT) Increased competitive advantage (INT) Improved cooperation and communication with other business units (INT)
Tactical		Increased efficiency (INT) Process transparency (INT) Improved supplier searching process (INT)	Improved monitoring and control (INT) Increased reporting capabilities (INT) Provide better information about suppliers (INT) Increased staff transferability (T)
Operational		Improved orders processing (T-NF) Improved orders creation (T-NF) Improved procurement process (T-NF) Improved orders approval (T-NF) Elimination of non-value-added activities (T-NF) Eliminate exceptions in the processes (INT) Eliminate problems with paper documents (INT)	Improved access to information (T-NF) Improved financial results (faster payment) (INT) Reduced buying costs (T-F) Reduced service costs (T-F) Reduced cost of procured goods and services (T-F) Reduced transaction costs (T-F) Reduced employment (or keep the same despite higher workload) (T-NF) Reduced bank transfer costs (T-F) Reduced warehousing and transport costs (T-F)

Notes: INT – Intangible benefits, T-F – Tangible, financial, T-NF – Tangible, non-financial

organisation, its growth and even survival. In fact existence of the e-procurement system and related to it organisational control could be perceived as necessary to operate the company in the long term, considering the fact that companies trade also in high-tech dual-purpose restricted technologies. While electronic procurement has an influence on the organisational performance, in many cases the benefits are intangible and non-financial, therefore traditional, accounting-based evaluation methods, such as ROI, are not able to capture them. This requires changes in the approaches in IT/IS investments evaluation, including e-procurement. There is a need to clearly state expected intangible and strategic benefits expected from the system and to determine how such benefits will be monitored. The proposed benefits taxonomy allows structuring and defining the character as well as the area of e-procurement benefits, creating an opportunity to determine the impact of the system implemented, including intangible benefits at the strategic level. The framework could be used as a practical tool to assess e-procurement benefits, at the planning stage as well as for already implemented systems. The ability to capture a variety of e-procurement benefits is especially important in situations when analysis of the financial impact alone shows that e-procurement does not deliver promised benefits and e-procurement is perceived as an unsuccessful initiative that created only limited improvements. Moreover, in some cases critique of e-procurement applications could be based on the inability to capture their full value by traditional evaluation methods.

The research also indicated low levels of knowledge exchange between the IS discipline and the field of e-procurement. This creates an opportunity for IS researchers to test theories in an e-procurement context, as well as for procurement researchers to apply approaches already developed and established in the IS discipline. There are also opportunities to apply the benefits taxonomy into different IT/IS systems, as well as to analyse e-procurement impact in different industry sectors and countries/regions. In particular, a cross-sector study could determine the differences in e-procurement impact in various contexts. Further work could look beyond e-procurement benefits, incorporating costs and risks associated with the system implementation.

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Appendix. Topics (questions) for an interview

The questions are in fact a list of topics which the author covered. This approach is characteristic for naturalistic interviewing (Wilson, 1996). Some questions are looking at issues that are not covered in this paper. Structure of the questions is based on Stockdale and Standing (2006).

Questions related to internal and external context

- (1) What is the company structure?
- (2) What is your position within the structure and hierarchy?
- (3) What was the company's situation when you decided to implement electronic procurement?
- (4) What are the company's goals and strategies?
- (5) What is the market and products?
- (6) What applications does your organisation use to procure goods and services? Are they specific and different for various product groups?
- (7) When e-procurement tools were implemented?

Details of the question: "How is evaluation to be carried out?"

- (1) How did you prepare e-procurement implementation?
- (2) Did you use any methods or tools?
- (3) If yes, could you list them?
- (4) If not, how did you prepare implementation?
- (5) How did you evaluate the implemented system?

Details of the question: "What is being evaluated?"

- (1) What were the expectations about the system before implementation?
- (2) Were the expectations written formally?
- (3) Did you calculate the cost of the implementation?
- (4) If yes, how?
- (5) Did you consider the risks related to implementation?
- (6) What did you evaluate after the implementation?
- (7) What in your opinion was the influence of the system on the company? Could you tell more about the impacts?
- (8) What would happen if you would not implement the system?

Details of the question: "Who affects the evaluation?"

- (1) Did somebody perform a formal system evaluation?

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- (2) Who agreed that the system fulfils expectations?
 - (3) Whose opinions were considered before the system was implemented and after implementation?

Details of the question: "Why is the evaluation being done?"

- (1) Why did you evaluate the system?
- (2) Why didn't you evaluate the system?

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