E-Procurement: In Search of the Value of Tools

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Abstract

The objective of the paper is to contribute to the discussion on valuation of E-Procurement (EP) implementation decisions. Therefore the major influences and drivers for value in implementing (EP) tools are discussed. Our research question is 'How can the value of EP tools be measured ?'. In this paper the following answers are found:

- Choices in EP implementation have to be made on different levels (product, supply chain and strategy) and on two factors (the type of EP tool and the characteristic of the firm).
- The determinants of value of EP tools are the visibility of value, the value in the supply chain, the external environment and the value mechanism used.
- The EVA-EP mechanism contributes to the understanding of how value of EP can be achieved and measured. The link between the process efficiencies and EVA has been established. The EVA-EP mechanism shows that the five mature types of EP do not influence revenue, capital charge and tax rate.

EP tools can influence revenue and contribute to a higher efficiency and cost reductions. By demonstrating these revenue increase, cost reductions and higher efficiency, top level management will understand the value of the tools and why EP tools (and which ones) have to be introduced.

Keywords: E-procurement (EP), EP technology, value mechanism, value drivers, EVA (economic value added)

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1. Introduction

The slow adoption of E-procurement (EP) technology contrasts the optimistic forecasts that have been made for its rapid spread and the potential value benefits of EP as described in the literature. Interestingly, the slower-than-predicted growth of e-procurement has been something of a global phenomenon (Davila, Gupta and Palmer 2003; E-Business W@tch 2004; Hawking et al. 2004; Puschman and Alt 2005). The process from EP formulation to EP implementation has been far from smooth, with most companies taking a "wait and see" attitude. In this respect, for some reason, not all the potential value of EP is created, probably because not all relevant decision makers have the same insight in the value of EP.
The essential principle of value based management is that higher profits create value only when the business earns a return on investment (ROI) that exceeds the cost of capital that helped generating that profit (CIMA, 2004). The diverse value metrics in existence, such as Shareholder Value Analysis (SVA), Economic Profit (EP) and Economic Value Added (EVA), Cash Flow Return on Investment (CFROI), and Total Business Returns (TBR), all operate on the principle of maximizing shareholder wealth. In our paper we have chosen EVA for further discussion. The reason for choosing EVA is that in addition to being a value metric, it provides a suitable framework within which both managers and operating people can identify themselves with and pro-actively participate in the value optimization process. Moreover EVA is widely used in management practice. We shall return to EVA later with an example of how it can be applied to the valuation of E-sourcing.

The arrival of the Internet and the new business opportunities provided by IT, have resulted in a reconfiguration of value chain to value network. Value network is an interconnecting web of value-creating and value adding processes that are held together by a unifying design and shared values (De Rose 1994, p. 15 + 21). Verna Allee (2003, p. 192) has defined the value network as "any web of relationships that generates both tangible and intangible value through complex dynamic exchanges between two or more individuals, groups, or organizations." The value creation in e-business does no longer follow a linear, sequential, product-centred trajectory of the value chain. The creation and capture of value in e-business is, above all, governed by the interfirm activities, in which the firm can take the alternate role of supplier, consumer, or complementor. The complementor role may even entail cooperating with the former competitors (Brandenburger and Nalebuff 1996). EP tools play an important role in the 'unifying design' of value networks.

The objective of our paper is to contribute to the discussion on valuation of E-Procurement (EP) implementation decisions. We do so by comparing findings from selected literature on EP justification and valuation. In particular, we shall be looking at how EP can contribute to the value creation process of organizations. In this initial work on this issue, we wish to give a review (from literature) of EP tools, the major EP value drivers and a method of valuation, knowing the differences between EP tools.

The paper starts with a short overview of our research question and methodology. This is followed by a discussion of the choices that have to be made in EP tool implementation (in relation to create value). Next, also derived from literature, an overview on determinants for value of EP tools is given. In paragraph 5 particular attention is given to a mechanism that can assess the value of EP, taking EVA (Economic Value Added) as a base model. Next the usage of the EVA-EP methodology is demonstrated in an example of the valuation of e-sourcing. We conclude with conclusions and recommendations for further research.

2. Research question and methodology

The initial central research question was 'How can an EP tools be valued ?'. Soon we found out that there are many papers written on the subject and jet, almost none of them really answered the question. All authors sum up results from research in terms of differences between EP tools (or categories) and drivers that influence the value. This findings resulted in a sharper research question: 'How can the value of EP tools be measured ?'. We now aim at delivering a mechanism with which managers can assess the value in a given organizational context and for a given EP tool.
The sub questions derived from the central question are:

- what choices in EP implementation have to be made ?
- what determinants of value of EP tools are there ?
- how can a mechanism assess the value of EP tools (taking EVA as starting point) ?

We answer these questions in this paper.

Our research methodology in this initial phase is based on literature research solely. We selected literature in two categories. The first category draws on qualitative research techniques, the second on quantitative techniques.
In the first category the procurement process is deconstructed and analyzed. Key activities, key benefits and performance indicators (value drivers) are identified. Their relationships are usually presented in the form of an evaluation matrix. The techniques used are structured interviews (Barua et al. 2001; Narasimhan, Talluri and Ross 2003; Ranganathan, Dhaliwal and Teo 2004; Subramaniam and Shaw 2004), decision tress (Brun, Corti and Cozzini 2004), ICT success and adoption frameworks from the literature (Aisbett, Lasch and Pires 2005; Leonard and Cronanan 2002), and analytic hierarchy process (Narasimhan, Talluri and Ross 2003).
In the second, quantitative, category the value of the evaluation matrix components are measured. The components' value is expressed in percentages, scores or ratings (Aisbett, Lash and Pires 2005; Barua et al. 2001; Brun, Corti and Cozzini 2004; Narasimhan, Talluri and Ross 2003). In case studies, the components' value is calculated with the help of analytical techniques such as structural equation modelling and partial least square approach (Ranganathan, Dhaliwal and Teo 2004), multivariate analysis of variance and Z tests (Leonard and Cronanan 2002). In cases of new model formulation, hypotheses and propositions are tested (Kauffman and Mohtadi 2004; Kumar 2004; Subramaniam and Shaw 2004).
Working with this two categories we soon found the differences between EP tools. The result of that part of our research is presented in the next paragraph (answering the first research question).

3. The choices in EP implementation

Implementing EP means making choices, each of which affects the value of EP in the given situation of the organization. The implementation of EP technology can have an internal focus on consolidating and speeding up the firm's buying processes, or a more external focus as a source of competitive advantage or with a focus on discovering new markets and trading partners. The decision to adopt EP technology can affect the firm on different levels, namely: product, supply chain and strategy. Completing the choice scenario there are two more factors: the type of EP tool under consideration and the characteristic of the firm taking the decision. We shall now briefly discuss the choices on the three levels and the two factors, based on the discussion in literature.

3.1 Choices on product level

The surveys on EP technology adoption (Davila, Gupta and Palmer 2003; E-business W@tch 2004; Hawking et al. 2004; Puschman and Alt 2005) show that firms usually choose the area of MRO (Maintenance, Repair and Operations) for their first steps in the implementation of web-based EP tools. The given reasons are that purchasing process of MRO products has not been automated (there are virtually no technology switching costs) and the purchasing information is relatively straightforward. Data such as prices and volumes of goods purchased, the suppliers' contracts and their respective percentages in the firm's purchasing budget, are all available and/or traceable. Although the prices of MRO products are (relatively) low, the volumes purchased are high. Furthermore, the paper-based purchasing process is a labor and time intensive operation, error-prone, and lacking in control and ease of use. The transition from the paper-based purchasing to an e-procurement operation can result in considerable savings. Puschman and Alt (2005) in their survey of 12 multinational companies in Germany and Switzerland found that the process cost reductions in a MRO e-procurement project are on average between 50-80%.

The reasons for delaying the adoption of EP technology are more strongly evident in the area of ORM (Operating Resource Management, core products) in which the adoption decisions are much more complex. The purchasing information is heterogeneous and production-specific, involving not only diverse suppliers (tiers), but also different departments within the firm. One of the greatest problems is data synchronization, for the product coding is often firm-specific. Data synchronization is a process that aligns trading partners' (e.g., supplier and customer) information systems and databases with the certified standardized master data from an originating data source to a final recipient of this information (Chang, Markatsoris and Richards 2004; Muffatto and Payaro 2004). Other delaying factors are technology switching costs and the EP systems compatibility. Large firms usually already have ERP (Enterprise Resource Planning) and EDI (Electronic Data Interchange) systems in place. Introducing EP means in this case changing existing systems and change management. Research has shown that large firms prefer to use existing systems in parallel with web-based EP tools (Kauffman and Mohtadi 2004; Puschman and Alt 2005).

3.2 Choices in the Supply chain

Kauffman and Mohtadi (2004) express their surprise at the fact that EDI systems continue to exist alongside the web-based EP technology, despite their higher infrastructure costs to support procurement. Part of the explanation they see in the characteristics of three kinds of B2B procurement systems platforms in use:

1. proprietary platform procurement systems (EDI),
2. open platform procurement systems (e-market Web technologies), and
3. hybrid platforms which involve the elements of both.

Kauffman and Mohtadi point out that proprietary platform procurement systems tend to be customized to the infrastructure requirements of individual firms and their preferred suppliers, and offered via secure private network. By contrast, open platform procurement systems, "tend to exhibit greater neutrality with respect to the infrastructure capabilities of buyers and suppliers". The authors maintain that finding integrated solutions is one of the major challenges of the wider implementation of EP technology.

For small and medium-sized firms, the arrival of web-based EP technologies has opened up new opportunities for supply chain management at an affordable cost. Unlike the large firms, they do not have to worry about technology switching costs and system compatibility. Rather, their problem lies in the need to reengineer their business processes, since the impact of EP goes well beyond the operational level of the firm. (Brun, Corti and Cozzini 2004). Although the web-based EP tools have the advantage of Internet connectivity and interaction, they have the disadvantage of being designed from the point of view of a market mechanism, and, therefore, independent of the individual firm's needs. Consequently, the firm is required to reorganize its supply chain process around the capabilities of EP technology. Alternatively, the firm may decide to use the e-procurement services of an Application Service Provider (ASP), or a Procurement Solution Provider (PSP). Whichever the case, the implementation of EP technology does always lead to reexamination of the firm's core competencies and capabilities, and may result in outsourcing decisions.

3.3 Strategic choices

Aligning procurement and the firm's strategy is often hampered by the management's perception of procurement and miscommunication at the so called 'C-level' (strategic). The Chief Procurement Officer (CPO) is not always successful in convincing the Chief Executive Officer (CEO) that EP technology can do more than just enable procurement transactions online. The experience from purchasing practice shows that it is the two preceding phases prior the procurement transaction, i.e., choosing the right EP solution for each commodity and selecting suppliers, that are responsible for 95% of the purchasing process (McCall 2001).

Knudsen (2003) examines how procurement can be aligned with the firm's strategy by looking for a common denominator which he finds in economic rents (i.e., the competitive advantage of the firm). He then compares three strategy frameworks with which to achieve a competitive advantage: the Porter's competitive forces strategy, the resource-based perspective (RBP) strategy, and the entrepreneurial (Schumpeterian) strategy. For each strategy, the potential contribution of procurement to rent generation is described. In the Porter's strategy framework the procurement function is lowering the purchasing costs and keeping suppliers' dominance in check. In RBP strategy the focus of procurement is value maximization through resource complementarity which is achieved by pooling and utilizing valuable resources with suppliers. Finally, in the entrepreneurial strategy the task of procurement is to scan the supplier space for innovations that can be used in the firm's own customer offerings. To this we would like to add the "novelty" of new ways of conducting and aligning commercial transactions, which are so typical for e-business enterpreneuring. Amit and Zott (2001) have described the innovations in business transaction methods as one of the value drivers of e-business. Knudsen (2003) concludes his study with a brief survey of the suitability of EP tools (using the classification of De Boer et al 2002) for each of the three strategies.

A different approach to aligning the firm's strategy with purchasing is taken by Cousins (2005). The binding factor in this study is not economic rents but ensuring relationships from the competitive strategy adopted by the firm. The study of 142 large manufacturing firms in the UK has revealed that if a firm follows a low-cost strategy, then it is likely to view supply chain in terms of operational and marketing collaboration. The firm forms tactical relationships and the business outcome is business development/market share. On the other hand, if the firm follows a differentiation strategy, it takes a longer view of the business, is more focused on its own resources and capabilities, and is interested in developing these further through collaboration with its trading partners. The firm forms strategic relationships, and the business outcome is relationship development. Cousins (2005), therefore, posits

the argument that supply management has so far focused on the wrong question. Instead of "why isn't purchasing strategic?", the question should be "what are the firm's strategic goals and priorities?".

3.4 Choices on the type of EP tools

EP tools have been classified and defined by many authors. For the purpose of this paper, we simply give an overview of the classifications of some authors. The (chronological) list below is by no means exhaustive but gives an idea of the plethora of terms and perspectives used in describing EP tools.

- Kaplan and Sawhney (2000) have approached the classification of EP tools from the viewpoint of B2B marketplace activities: what businesses buy (i.e., operating inputs or manufacturing inputs) and how they buy it (i.e., through spot sourcing or systemic sourcing). The resulting two-by-two matrix shows four categories of EP tools: 1/ MRO Hubs (horizontal markets enable systemic sourcing of operating inputs); 2/ Yield Managers (horizontal markets enable spot sourcing of operating inputs), 3/ Exchanges (vertical markets enable spot sourcing of manufacturing inputs, and 4/ Catalog Hubs (vertical markets enable systemic sourcing of manufacturing inputs).
- Gebauer and Zagler (2000) categorize EP tools according to two dimensions: 1/ type of transaction, i.e., sourcing vs. buying; and 2/ main focus of the procurement, i.e., product technology complexity, product cost, process costs. The result is a two dimensional framework in which EP tools are presented on a diagonal line as a continuum from efficiency (traditional EDI, desktop purchasing, horizontal exchanges) to effectiveness (collaboration, decision support, and context information).
- Gebauer and Segev (2001) describe procurement activities in a four field matrix: direct vs indirect procurement and strategic vs. transactional procurement.
- An Aberdeen report (Minahan & Degan 2001 cited in Hawking et al. 2004) devides e-procurement technologies into three categories: 1/ Indirect Procurement – MRO (non-production goods); 2/ Direct Procurement – ORM (raw materials, parts and assemblies), 3/ Sourcing (identification, evaluation, negotiation of products and supplies for both indirect and direct supply chain).
- A.T. Kearney, Inc., (2002), an US consulting firm, recognizes three familes of EP tools: 1/ E-sourcing (sourcing enablement), 2/ E-category management (category and supplier relationship management), and 3/ E-ordering (transaction processing). Two other families of tools enable cross-functional collaboration with suppliers: E-design collaboration (collaborative research and development), and E-logistics collaboration (collaborative supply chain).
- Dai and Kauffman (2002) view EP technologies in terms of their B2B e-market functions which are 1/ Aggregation (e-catalogs); 2/ Matching (exchanges, e-auctions, e-reverse auctions); 3/ Facilitation (MRO hubs).
- McLaren, Head and Yuan (2002) examine EP technology in terms of supply chain integration and collaboration. Their classification framework categorizes EP tools following three criteria: 1/ type of relationship (many-to-many, one-to-many, one-to-one), 2/ degree of interorganizational integration (tight vs. loose), and 3/ uniqueness of processes (standardized vs. customized).
- De Boer, Harink and Heijboer (2002) list six categories of EP tools: 1/ E-MRO, 2/ Web-based ERP, 3/ E-sourcing (identifying new suppliers), 4/ E-tendering (sending requests for information and prices to suppliers), 5/ E-reverse auctioning, and 6/ E-informing (gathering and distributing purchasing information both from and to internal or external parties).
- Davila, Gupta and Palmer (2003) refer to EP tools as EP technology models of which they distinguish four types: 1/ E-procurement Software (enables desktop purchasing), 2/ Internet Market Exchanges (websites that bring multiple buyers and sellers together in one central virtual market space), 3/ Internet B2B Auctions (the Dutch auction and the reverse-English- auction), and 4/ Internet Purchasing Consortia (Internet service that gathers the purchasing power of many buyers to negotiate more aggressive discounts, for either direct or indirect goods.

3.5 The firm's characteristic

Not all firms are in a position to benefit fully from a move to e-procurement. Aisbett, Lasch and Pires (2005) identify nine characteristics of a firm that need to be considered when deciding on EP technology implementation. The characteristics are grouped in three sets, namely: the type of the firm's purchases, the firm's procurement staff, and the firm's relationships.

Davila, Gupta, and Palmer (2003) distinguish between the aggressive and conservative adopters of EP technology. The aggressive adopters (27% in the study) are investing in EP technology in expectation of a competitive advantage. Of these, 41% use more than one EP technology. The conservative adopters (33% in the study) are experimenting with EP technology in MRO supply processes. Davila, Gupta, and Palmer (2003) characterize the slow adoption of EP technology in terms of the early stages of new technology adoption S-curve, where alternative technologies are competing to become a dominant design. They make the observation that there is a probable

evolution towards a segmented market. Over 61% of the organizations that had purchased e-procurement software are corporations; of those, 71% are Fortune 500 size. Corporations also dominated B2B e-auction activity. In contrast, non-profit organizations are primary users of market exchanges (62%) and purchasing consortia (61%).
Finally, it should be borne in mind that in the e-business environment the very structure of the firm is undergoing a considerable change, with new organizational architectures emerging rapidly. For example, a large scale Danish research project (Johansen and Riis 2005) covering 1,800 companies has established that one-third of the firms is well on the way to becoming an interactive firm. Johansen and Riis (2005) formulate three archetypes of the interactive firm:

1. the focused firm, which specializes in a particular sphere of knowledge;
2. the networking firm, which puts other companies together; and
3. the integrating firm, which assembles other companies' components into products.

The authors point out that there is no one single model of an interactive firm. Rather, all three archetypal firms participate in a range of different partnership configurations.
A similar conclusion has been reached by Mehra and Inman (2004) who have asked a focus group of experts on the future of purchasing. They predict that in the coming decade, the purchasing professionals will move away from the traditional cost-based focus to managing external relationships with suppliers, and to aligning and synchronizing of processes both outside and inside the firm. The expectation is that purchasing management will get fully integrated in the business planning.

4. Determinants of EP Value

A value mechanism is a strategic/operating reporting framework which enables to understand how value is generated across all levels of the firm. It can be used for decision making and strategy development improvement. At the core of the value mechanism are value drivers. Value drivers are the operating factors with the greatest influence on operating and financial results. Value drivers occur in all parts of the firm and help make the firm's strategy real at a level of specificity that is both meaningful and actionable (Knight 1998).

In literature there is agreement that there is no single generally applicable value mechanism. The identification of value drivers is always firm-specific and should, therefore, be carried out with utmost precision. A checklist of value drivers such as the one developed by Barua et al. (2001) can act as a guideline. A thorough analysis of procurement processes, the firm's characteristics and relations are seen as an absolute precondition for EP technology implementation (Aisbett, Lasch and Pires 2005; Brun, Corti and Cozzini 2004). A process level understanding of the impact of EP technology is essential in determining its value (Subramaniam and Shaw 2004). As reasons for the frequent failure of EP technology projects, the authors name factors such as: a disregard for the strategic relevance of EP technology, and the lack of alignment between operational decisions and the firm's strategic objectives (Aisbett, Lasch and Pires 2005; Barua at al. 2001; Brun, Corti and Cozzini 2004; Kumar 2004). In this paragraph we discuss the results of four different research subjects.

4.1 The visibility of 'value'

The reason for the study by Subramaniam and Shaw (2004) was the lack of visibility of a value mechanism. The study was undertaken at the request of corporate management of a large U.S. manufacturer of heavy equipment with some 30 units around the country. An EP system had been installed and the company's suppliers were invited to participate. However, the corporate management was concerned that at the business unit level, there was no clear methodology to determine and communicate the benefits of the new EP systems. An analysis of the firm's procurement processes has revealed that 55% of the total volume of procurement involves the transactions in the structured procurement and 45% in the unstructured procurement. The product and process characteristics of both types of procurement have been compared. The resulting evaluation framework shows the value components identified (price benefits, transaction cost benefits and technology lock-in costs), the sources of these components and the factors that determine their levels. The unit of analysis is "product category", a collection of procurement transactions of products with similar procurement characteristics, such as demand, search, coordination and control. The value of e-procurement is defined as:

Value = price benefits + transaction benefits – technology lock-in costs

It was found that the value of e-procurement is greater when used for unstructured procurement processes. The savings come from the transaction costs. The value from e-procurement is lower when used for structured procurement process. There the savings come from the inventory holdings.

Next, the authors developed an economic model to assess how the value of EP is affected by two additional factors: the complexity of procurement process and the demand volume. It was found that that at low levels of complexity, the value from EP is significantly higher for unstructured procurement than for structured procurement. When the process complexity is high, the value from EP does not vary significantly between structured and unstructured procurement.

Although the findings show that EP is beneficial for unstructured procurement, the study has also established that the EP value is not evenly generated, and is subject to fluctuations in demand. The value from EP implementation should be more visualised in order to make the procurement function and the management of an organisation aware of the potential.

4. 2 Value in the supply chain

The uneven generation of value from EP along the supply chain has been highlighted by the study of Leonard and Cronanan (2002) which determines the difference in value between electronic and traditional (manual) driven supply chains (SC).
Similar products from two different companies are analyzed in pairs of two, one product using an electronic SC and the other a non-electronic SC. The authors selected two links of the supply chain for their study: the supply-manufacturer link and the distributor-retail outlet link. Data were collected for six products in pairs from the retail sample and 8 products in pairs from the manufacturing sample. All products were similar in complexity. As performance indicators were identified: inventory level, inventory carrying costs, stock outs, order cycle, fill rate, price and availability. Findings indicate that in the manufacturer sample, the electronic SC realised savings with regard to all performance indicators. However, in the retail sample the price to retail outlet customer was not significantly lower with electronic SC than with non-electronic SC. The electronic SC is shown to be more effective in terms of costs for both samples, but not in terms of price. The study shows that savings in the retail sample result from shorter order cycles. The authors argue that ultimately, it is the higher availability of the electronically supplied product that makes the consumer willing to pay a higher price for it. Thus value is created by using EP in the value chain.

4.3 External environment

According to Kauffman and Mohtadi (2004), market uncertainties, such as demand and supply variance, can affect the value from e-procurement system and should, therefore, be included in the decisions on which type of e-procurement technology to adopt. To that end they developed a risk-augmented transaction cost model which calculates the value of proprietary procurement systems (e.g., EDI) and web-based procurement systems in terms of a trade-off between supply variance and procurement costs.

Another example of an external factor is the e-readiness of suppliers. Aisbett, Lasch and Pires (2005) note that “even the lowest level adoption [of EP technology] may impact on the supply chain relationships and any benefits depend on the involvement of current and potential suppliers in the marketplace served by the technology”.

This view on the interdependency of the firm and its suppliers is supported by the findings of the study by Ranganathan, Dhaliwal and Teo (2004). Their research model defines the performance impact of web-based SCM technologies as a function of the assimilation of Web-technology systems into the internal supply chain functions and their external diffusion into inter organizational supply chain networks. The model is based on findings from an extensive study of North-American organizations (176 companies, coming from 13 industry groups, all adopters of SCM application). The study shows that web technologies and systems create significant value in the SCM function.
A further finding of the study is that the two constructs, assimilation and diffusion, are critically linked. Firms that adopt web-based technologies do not do so because of their internal need for internal connectivity, but because of the need to establish external SCM connectivity and supplier interdependence. On the other hand, firms that have implemented web technologies in their internal supply chain operations are more likely to succeed in diffusing these technologies into the interorganizational supply chain. The authors argue that the empirically proven existence of this critical link has consequences for the implementation process of EP technology. They further suggest that organizations may want to adopt a two-pronged “internal assimilation/external diffusion” adoption

strategy. Recently, case studies described by Rigby and Ledigham (2004) have shown that this approach works.

4.4 Value mechanisms

The value drivers in a value mechanism can be both tangible and intangible. The study by Narasimhan, Talluri and Ross (2003) of the Center for Strategic Supply Research (CAPS) has set out specifically to address the issue of intangible value drivers and their role in determining the value of an e-procurement system. The authors decided on this approach after they had interviewed the procurement executives from eight US companies that have recently implemented EP applications. The procurement executives regarded the intangibles that relate to strategic issues, such as supplier and customer relations, just as important as the tangible benefits of cost savings and short payback time.
The proposed methodology consists of two phases. The first phase aims at an initial screening of EP technology vendors. The second phase is a detailed judgmental evaluation of benefits and costs of e-procurement applications using the analytic hierarchy process (AHP), including the intangible drivers. The result is a value metric which is a ratio of benefits per dollar investment for each EP application, compared pair-wise on each benefit and cost category on the lowest level of hierarchies. The value metric is defined as:

Overall return measure = composite benefits score/composite cost score

The metric also indicates what EP tools give the best business case in the given situation.
Another example of how intangible benefits contribute to the value assessment of EP technology is the study by Kumar (2004). The study presents EP value as a dynamic (time-varying) concept. The proposed model calculates the value of investments in EP implementation, based on the theory of financial asset valuation. It takes into account the Net Present Value generated by EP tools and also its usage in an organizational context. The value of EP tools is defined as a function of the number of transactions, as well as the value of each transaction. Kumar recommends to continuously review the EP investments with the aim of increasing the value through increased flexibility. This value model helps to communicate the value of EP to the financial executives and senior management, demonstrating that EP adds value to the organisation. In the next paragraph we will discuss the value mechanism 'Economic Value Added' in respect of implementing EP tools.

5. EVA and EP

Economic Value Added (EVA, trademark of Stern Stewart & Co) has been implemented in a large number of companies worldwide to motivate managers to create shareholder value. Every decision they make should add value to the company and thus enlarge the EVA. EVA is expressed as follows:

EVA = Net Operating Profit after Tax (NOPAT) – Capital charge (Capital x Cost of Capital)

If the EVA is positive, the decision creates shareholder value; a negative EVA indicates that shareholder value is destroyed, meaning that the decision should be taken in an other way.
There are four general ways to increase EVA performance:

- Increase profitability, by increasing sales or by minimizing costs (variable in the short run)
- Improve operating efficiency and use of assets
- Rationalize and/or exiting unrewarding business, i.e., reduce asset base
- Reduce cost of capital

The use of EVA in order to assess the value of EP has been advocated by several authors (De Graauw 2003, Presutti Jr. 2003, Roztocki 2003, Timme and Williams-Timme 2000, Santema and Scholten, 2004, 2005). While most authors concentrate on the potential contribution of EP to the component "costs" in NOPAT, Presutti Jr.(2003) suggests that EP could impact all components of EVA, including the firm's asset base (inventories) and revenues (bringing new products to market quicker by shortening the material delivery time cycles). Timme and Williams-Timme (2000) demonstrate this on the example of SCM.
Santema and Scholten (2005) propose a five step approach towards assessing EP value through the EVA methodology, called the EVA-EP. Below the five steps are (briefly) described.

Step one: Choose a type of EP
In the literature only a few authors (de Boer et al., 2002 and Knudsen, 2003) distinguish between EP types, as Harink (2004) does, namely:

- e-sourcing (tools that facilitate supplier search)
- e-tendering (tools that facilitate the requisitioning process)
- e-reverse auctioning (tools for the auctioning process)
- e-ordering (tools that facilitate the ordering process, including catalogues and free formats)
- purchasing intelligence (includes systems with spend analysis tools)

Step two: Classification of variables of benefits
The benefits that (can) lead to direct financial advantage are taken into account. We have labelled the benefits as 'variables' (of value). We use the general variables of EVA (see above).

Step three: Relation to the cost items in *the EVA mechanism*
The variables that are mentioned are related to the EVA mechanism.
For the costs side, the structure that is suggested by de Boer, Harink and Heijboer (2002) is used. They divided the costs into:

- non-purchasing related costs (NPRC),
- strategic purchasing costs (SPC),
- tactical purchasing costs (TPC)
- operational purchasing cost (OPC)
- the price paid for the product (PP).

Step four: Formulating the EVA equation for EP
Next to the costs, EVA recognizes other elements, such as revenue and capital employed.
The components of EVA-EP that could be influenced by EP are shown in the blocks on the right hand side of Figure 1, these are called parameters. The EVA-EP reflects the actual change in EVA, after having introduced an EP system containing one or more EP types, or reflects the expected change in EVA as part of the decision process on whether to implement an EP tool.

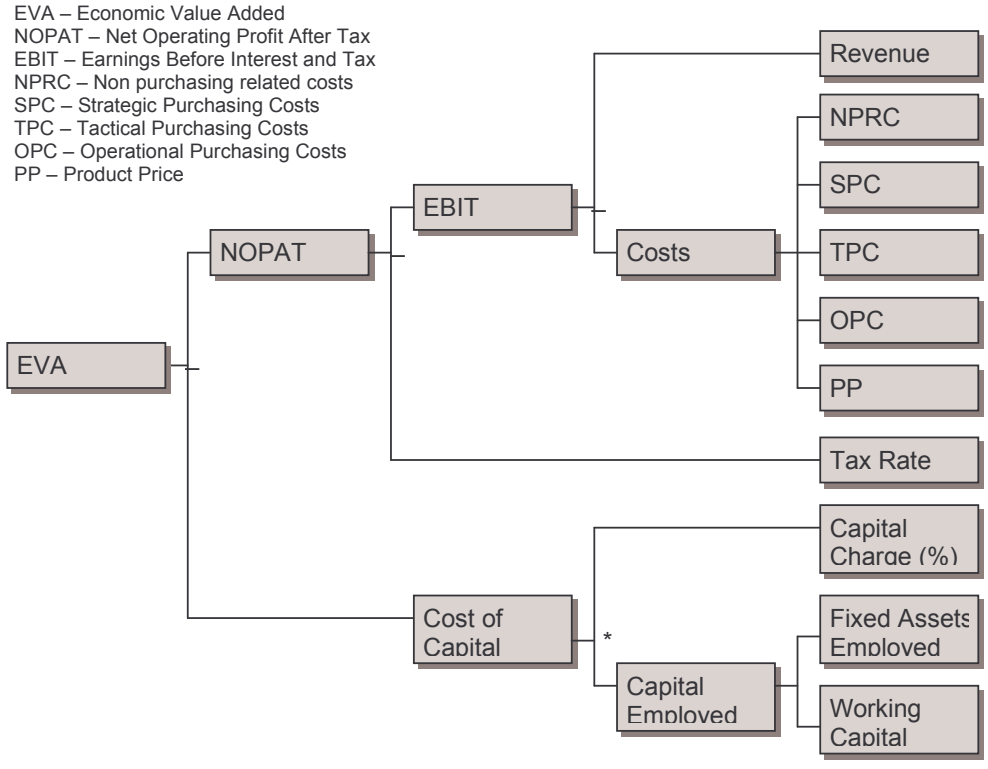

Figure 1: EVA translated in EP value mechanism (Santema and Scholten 2005)

Step five: extracting the value of EP implementation via the EVA mechanism
Every type of EP requires an investment (in e.g., hardware and/or software and training), or it has to be bought as a service, both of which influence the NPRC. The investments also influence EVA on the level of fixed assets employed when the EP system is booked as an asset on the balance sheet. The investment in an EP system will always influence the parameter working capital, because the investment will cause a cash-flow out, which will be earned back in the following periods.
Following the mechanism shown in Figure 1, the value can easily be calculated.

6. The valuation of E-Sourcing

In order to show the way the above described EVA-EP mechanism works, we summarize the value mechanism for E- Sourcing, deriving at two parameters that determine the value. This means that E-Sourcing as a tool for management to improve the procurement function, only adds value if one or both of these parameters are improved. If not, no value is added and another tool should be choosen.
The variables (and belonging drivers) for the value of E-Sourcing are:

- Increased Efficiency
  By the use of e-sourcing, the time needed to find a product, service or supplier is reduced (Faster finding service / product or supplier). This will lead to an increased efficiency for the buyer. The increased efficiency will lead to decreasing tactical purchasing costs (de Boer et al., 2002). Narasimhan, Talluri and Ross (2003) recognize this also, claiming that EP generates operational efficiencies, by enabling managers to electronically search and locate suppliers.
  The belonging driver for increased efficiency is faster finding (of services/products or suppliers).
- Reduced purchasing price
  By using e-sourcing the supply base and the availability of products and services will increase, which will result in a lower price paid for the products or services. Presutti (2003) mentions a similar mechanism, giving the example of GE: GE's EP solution helped the firm to reach a wider supply base and identify heretofore unidentified and qualified resources of supply (Identification of new suppliers). By realizing this, they reached material cost reductions in the range of 5% to 20%. The belonging drivers are the identification of new resources of supply and the derived increase of the supplier base.

No (or very little) investment has to be done in e-sourcing. A web-browser is sufficient. Via the web-browser relevant information about suppliers can be found in sourcing catalogues, or directly on the web. The e-sourcing EVA mechanism is depicted in Figure 2.

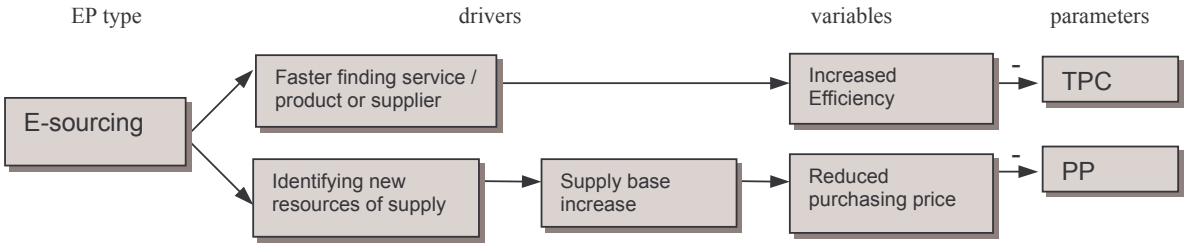

Figure 2 - E-sourcing EVA mechanism

The EVA mechanism of e-sourcing shows that the value is derived from decreased tactical purchasing costs and a reduced purchasing price. Without (significant) investments to be made, there will be value created by introducing E-Sourcing to this company.

7. Conclusion of this paper, limitations and further research

The initial management's preoccupation with the cost savings aspects of EP technology implementation has made place for the issue and concern over the integration of EP technology in both the firm's internal and external processes. Valuation of EP tools can help management to make better decisions on implementation.
In this paper the three research questions have been answered, based on literature research.

- Choices in EP implementation have to be made on different levels (product, supply chain and strategy) and on two factors (the type of EP tool and the characteristic of the firm).

- The determinants of value of EP tools are the visibility of value, the value in the supply chain, the external environment and the value mechanism used.
- The EVA-EP mechanism contributes to the understanding of how value of EP can be achieved and measured. The link between the process efficiencies and EVA has been established. The EVA-EP mechanism shows that the five mature types of EP do not influence revenue, capital charge and tax rate.

EP tools can influence revenue and contribute to a higher efficiency and cost reductions. By demonstrating these revenue increase, cost reductions and higher efficiency, top level management will understand why EP systems (and which ones) have to be introduced.

The research has two main limitations.
Our initial, literature based, research shows commonalities between the authors studied and shows overlapping drivers for value. These have to be tested in practice to enlarge the pragmatic and usable side of valuing EP. The same holds for the developed EVA-EP, which is merely a product of thought and should be tested in practice as well.
Only direct effects of the introduction of EP types were discussed. More diffuse and less straightforward drivers and variables of EP have been only partially addressed. Here, too, a field study should shed some light on the matter.

More case and field studies are needed to illuminate the value of EP implementation. Therefore, a model and methodology of measuring the value of EP should be described in greater detail.
Also, the shift in thinking in management of organisations should be taken into account.
This shift in thinking has consequences for the valuation of EP technology and provides opportunities for further research:

- It has been established that EVA metrics are suitable for the valuation of EP technology within a particular firm. The combined effect of EVA capabilities and the EP technology potential on the shareholder value creation need to be further investigated.
- The valuation of process optimization resulting from the deployment of EP technology is, on the other hand, a question of long term investments, both in the monetary and the relationship terms. It may take some time before the results of the firm's EP process optimization measures appear as financial benefits on the balance sheet. Methods on how to measure such benefits realization and the linkage to the firm's worth is another area of research.

A concluding remark is that the full implementation of EP technology in the supplier and distribution networks can result in virtual integration where the traditional material flow takes the form of an information flow between functions of the supply chain. However, the operational savings and the value creation need not be the same for all network participants, which in turn, can affect the firm's willingness to voluntarily participate. A framework for the valuation of virtually integrated EP systems could be another topic of research.

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