



A conceptual model for assessing the impact of electronic procurement

Luitzen de Boer*, Jeroen Harink, Govert Heijboer

Faculty of Technology and Management, University of Twente, P.O. Box 217, 7500 AE Enschede, Netherlands

Abstract

This paper aims to contribute to the development of a conceptual model for studying the direct and indirect impact of various forms of electronic procurement (EP) on a firm's integral purchasing (-related) costs. The model builds on existing classifications of purchasing-related costs and benefits and is illustrated by means of empirical data. Building the model leads us to conclude that assessment of the direct impact but especially the indirect impact of EP is far from straightforward. A form of EP may not only affect different categories of purchasing-related costs but also induce opposing direct effects within one such category. In addition, indirect effects can occur in many ways, as drastic reduction costs in one category may offer possibilities for structural changes in existing purchasing routines, which may in turn affect costs and benefits in other categories as well. © 2002 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Fundamentally, Internet technology provides ways of drastically reducing different categories of transaction and communication costs. In that respect, the potential merit of various electronic procurement (EP) forms, such as electronic catalogue systems, electronic auctions, intelligent agent applications, electronic market places seems largely undisputed (Smeltzer and Ruzicka, 2000; Croom, 2000). However, given the wide range of solutions available, many organisations struggle with assessing the suitability of the different solutions for their specific commodities, suppliers relationships and portfolio of purchasing requirements (Gebauer et al., 1998; Roberts and Mackay, 1998). Although a fast-growing body of literature emerges on various specific EP forms, like electronic ordering systems (Harink, 1999), electronic reverse auctions (Teich et al., 1999), intelligent agents (Liang and Huang, 2000) and so on, a clear theoretical basis for specifying conditions under which different EP forms appear appropriate in different

purchasing and organisational settings seems to be lacking (see e.g. Min and Galle, 1999; Emiliani, 2000). The research described in this paper aims to contribute to the development of such a basis. More specifically, we present the first outline of a conceptual model, which identifies the impact of various EP forms on categories of purchasing-related costs and benefits.

The paper is organised as follows. First, we define six EP forms that exist in practice. Second, we specify possible ways in which introducing a new form of information and communication technology (ICT) in general may impact on organisations. Third, we present the results of a literature study regarding existing conceptual models of purchasing-related costs and benefits. Next, we qualitatively assess the impact of the six different EP forms on different categories of purchasing-related costs and benefits. The assessment takes place in two stages. The first stage assumes that the implementation of a certain EP form does not fundamentally change the existing purchasing processes in the sense of organisational routines, as defined by Feldman (2000), or standard operating procedures, as defined by Cyert and March (1963). The second stage also considers the possibility of radically changing purchasing processes—given the drastic shift in search and communication costs—and the impact of these changes on purchasing-related costs and benefits. The resulting

*Corresponding author. Tel.: +31-53-4894090; fax: +31-53-4892159.

E-mail addresses: l.deboer@sms.utwente.nl (L. de Boer), jeroen.harink@nl.pwcglobal.com (J. Harink), g.j.heijboer@sms.utwente.nl (G. Heijboer).

conceptual model is illustrated by empirical evidence gathered in the course of several research and consulting projects in which the authors were involved. Finally, we draw conclusions and formulate directions for further research.

2. Electronic procurement encompasses several forms

EP can be defined as using Internet technology in the purchasing process (for the specific steps in the purchasing process see e.g. Van Weele (1994)). It is important to note that this definition is narrow in the sense that it excludes old applications like ordering by telephone or by fax. On the other hand, this definition is relatively wide because it not only encompasses the use of Internet applications in the purchasing process, but it also includes the use of intranet and extranet applications. For example, using this definition, ordering office supplies by using a supplier catalogue on a website is a form of EP.

Note that in this paper we consider each form of EP as part of a process—that is to say a collection of activities that has to be executed by one or more employees. The Internet technology that is needed in these processes can be offered to the employees in several ways via:

- *Electronic (public) market places*: market places are specific websites on the Internet (aimed at, for example, an industry or a commodity) that aim to bring buyers and sellers together in order to facilitate the application of various forms of EP and more general e-commerce (which can be defined as doing business using Internet technology).
- *Intranets*: intranets can be seen as a collection of websites with information and applications that support one or more EP forms. An intranet can only be accessed by employees of an organisation. For example, Siemens has an intranet running with a SIS Supplier Information System that is available for employees of Siemens only.
- *Extranets*: extranets can be seen as a collection of websites with information and applications that support one or more EP forms. An extranet can only be accessed by employees of a specified set of organisations. For example, ThePurchasingExtranet (managed by WIZNet) enables employees of subscribed organisations to access it.

Using the definition provided earlier, a large number of forms of EP can be distinguished. Some of these forms have received a lot of attention already and they are by now quite well-defined and relatively well-developed. Other forms of EP are still quite young and immature. Some of them will mature, others may never reach that state. In this paper, we focus on the forms of

EP that seem quite well-defined and relatively well-developed. We distinguish between the following forms:

- e-MRO,
- web-based ERP,
- e-sourcing,
- e-tendering,
- e-reverse auctioning,
- e-informing.

In the following we shall briefly define these six forms.

Both e-MRO and web-based ERP refer to the process of creating and approving purchasing requisitions, placing purchase orders and receiving goods and services by using a software system based on Internet technology. In the case of e-MRO, the goods and services ordered are maintenance, repair and operating (MRO) supplies (i.e., non-product related). The supporting software system (an ordering catalogue system) is used by all employees of an organisation. However, in the case of web-based ERP (enterprise resource planning), the goods and services ordered are product-related. Usually, only the employees of the purchasing department (or the planning department) are using the supporting software system (the web-based ERP-system).

E-sourcing refers to the process of identifying new suppliers for a specific category of purchasing requirements using Internet technology (usually the Internet itself). By identifying new suppliers, a purchaser can increase the competitiveness in the tendering process for this purchasing category. E-sourcing is also a way of decreasing the supply risk associated with this purchasing category. For example, new back-up suppliers can be identified more quickly in case the existing supplier fails to deliver and/or a more profound evaluation of the existing set of potential suppliers may be facilitated.

E-tendering concerns the process of sending requests for information and prices to suppliers and receiving the responses of suppliers using Internet technology. Sometimes, e-tendering also includes the analysis and comparison of responses. E-tendering does not include closing the deal with a supplier. It smoothes a large part of the tactical purchasing process without focusing on the specific content of that process.

In practice, an auction enables a supplier to sell goods and services to a number of known or unknown buying organisations. During a relatively short time frame the buying organisations involved submit bids for the goods and services that are auctioned. The auction operates with an upward price mechanism (an English auction with several bids) or a downward price mechanism (a Dutch auction with one bid only). A reversed (English) auction is the opposite: it enables a purchaser to buy goods and services needed from a number of known or unknown suppliers. E-reverse auctioning is the Internet technology based equivalent of reverse auction. Usually,

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