

E-PROCUREMENT IN DIGITAL ERA

P.SARAVANA PRAVEEN KUMAR*

DR. V. DHAMODHARAN**

SASIKUMAR JAYACHANDRAN***

ABSTRACT

Introduction: From the late 1990s a number of independent e-procurement mechanisms were launched which offered potential benefits such as increased order accuracy, transaction efficiency and greater integration between trading partners. At the outset of this programme of research, e-procurement was therefore an emerging phenomenon with little academic research and presented an opportunity to investigate a largely unexplored area. **Edmondson and McManus (2007)** suggest that for nascent, as opposed to mature areas of research, where few formal constructs or measures exist, an exploratory, qualitative approach is required. This research followed such an approach through the use of case studies, involving observation, participation and interviews with key organisational actors. Each paper makes use of several cases in order to compare and contrast results from different organisations and to draw conclusions from multi-case analysis.

Methodology: The main objective of this research is to determine the e-procurement strategies and problems in digital era. The nature of the research is Descriptive method, and the sample size is 251 respondents from various locations in India and data collection method used in the research is “Questionnaire Method”. Data was analyzed by using SPSS 16.0. Findings, suggestions and conclusions were made by keeping an eye on the objectives.

* Research Scholar, Bharathiar University

** Head of the Department, Department of Business Administration, Govt Arts College, Nanadanam, Chennai.

*** Senior Operations Manager, Hewlett Packard

Results: This situation reflects the finding that procurement managers pursue functional targets rather than supply chain-level objectives. However, other significant effects from e-procurement adoption were noted such as the tendency by buyers to reduce supplier numbers and a move to re-engineer the procurement function in buying firms, through automating transactional processes. The research finds that e-procurement does not have a deterministic impact on purchasing management, and that it acts as an enabler to more effective management of the function though the way it's different mechanisms are deployed.

Implications: The exposition establishes that e-procurement is used in relation to supply conditions which are characterised by both 'markets' and 'hierarchies', but that it is the predefined purchasing strategy of the firm, rather than available technology solutions, which determines when markets and hierarchies are used. Additionally, an original model is introduced, focusing on developing an e-procurement policy which can support strategic purchasing goals. This model extrapolates findings from stages in the research, and marries together elements from various papers and frameworks therein, to produce some guidelines for adoption of this technology.

Keywords: *e-procurement, segmentation and descriptive method*

1. Introduction

Fundamentally, Internet technology provides ways of drastically reducing costs in the purchasing process (De Boer et al, 2001). In that respect, the potential merit of various forms of e-procurement seems largely undisputed (Smeltzer and Ruzicka, 2000; Croom, 2000). However, given the huge number of forms of e-procurement that are available, many organizations struggle with assessing the suitability of the different forms for their specific commodities and suppliers (Gebauer et al, 1998; Roberts and Mackay, 1998). Although a fast-growing body of literature emerges on various specific forms of e-procurement like e-ordering (Harink, 2000) and e-reverse auctions (Teich et al, 1999), a clear theoretical basis for specifying conditions under which different forms of e-procurement appear appropriate in different purchasing and organizational 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 a theoretical framework, which makes clear what forms of e-procurement can be used in what purchasing situation. This framework has been compared with the situation at Dutch Railways. Results of this test will also be discussed in this paper. The paper is organized as follows. First we define six forms of e-procurement that actually exist in practice and position these forms in van Weele's model of the purchasing process. Using this positioning, we will then describe our theoretical framework with four different purchasing situations that appear in daily practice, including the forms of e-procurement that are suitable for these purchasing situations. For this purpose a new model for the purchasing process will be presented too. We conclude with a comparison of this framework with the situation at Dutch Railways, in order to practically test the framework.

2. Electronic procurement encompasses several forms

Electronic procurement (EP) can be defined as using Internet technology in the purchasing process. 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 applications¹. For example, using this

definition ordering office supplies by using a supplier catalog on a website is a form of EP. Based on this definition of EP 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-ordering;
- web-based ERP;
- e-sourcing;
- e-tendering;
- e-reverse auctioning;
- e-informing.

3. Review of literature

As noted by Nelson *et al.* (2001), purchasing accounts for the majority of organisational spending. As such, the advent of web-based electronic procurement has been heralded as a 'revolution' because of its potential to reduce the total cost of acquisition (Croom, 2000; Essig & Arnold, 2001; de Boer *et al.*, 2002, Wyld 2002; Rai *et al.* 2006). It is also expected to impact on the nature of supplier governance, either reinforcing market-based relationships (Malone *et al.* 1989; Barratt & Rosdahl, 2002) or encouraging virtual hierarchies (Brosseau, 1990). Finally, the e-procurement revolution is expected to enhance the status and influence of the purchasing function within organizations (Croom, 2000; Osmonbekov *et al.*, 2002).

Much of the e-procurement literature to date has (naturally) focused on early adopters. The particular areas of interest in these studies relate to system implementation, identifying efficiency effects, speculating the potential changes in supply chain configuration that may occur, and positing that e-procurement will have a major impact on the function by leading to its outsourcing or conversely raising its strategic role. Using a case-based approach, our study explored the issues relating to implementation and impact of e-procurement. The objective was to inform the development of a conceptual structural model of the key decision variables, mediating variables and outcomes from the e-procurement process. In this respect the paper is a

'theory in development', intended to inform not only our ongoing research (Croom, 2000; 2001; 2005; Croom & Johnston, 2003; Croom & Brandon-Jones, 2005), but also the work of others in the field. Electronic procurement refers to the use of integrated (commonly web-based) communication systems for the conduct of part or all of the purchasing process; a process that may incorporate stages from the initial need identification by users, through search, sourcing, negotiation, ordering, receipt and post-purchase review. A review of the literature to date identifies five main themes in e-procurement relating to:

- Changes to total acquisition costs
- Changes to organizational characteristics
- Changes to governance structures
- System specification
- Implementation management

Existing literature has emphasized the important contribution of e-procurement in reducing total purchasing costs. These benefits broadly arise through lower prices from suppliers and reduced costs in the 'requisition to payment' process (Croom, 2000; deBoer *et al.*, 2002; Wyld, 2002; Kameshwaren *et al.* 2007; Mishra *et al.* 2007). Whilst it has been widely contended that e-procurement will have considerable implications for the design of the procurement process, Lancioni *et al.* (2000) note that the precise nature of these changes remains unclear. Yen & Ng (2003) carried out a case study investigation of textile and apparel e-commerce implementation in Hong Kong. Although primarily interested in the system roll-out process, they provide a useful comparison of pre- and post- e-procurement process performance. Their case evidence gives some useful description of the changes to the procurement process and supports the claims from prior literature that such changes deliver significant efficiencies. They highlight the reduction in costs arising as a result of 'digitizing' catalogues, fewer errors in order transmission, reductions in inventory, and minimizing suppliers' marketing costs. In the practitioner and general management literature there is a plethora of anecdotal case evidence to support the view that e-procurement is a far more efficient and reliable method for the requisition-to-payment process than manual or semi-automated processes. However, the speed of adoption and

implementation has widely failed to reach the forecasts made by commentators. (Wheatley, 2003; Quale, 2005).

4. Research methodology

The main objective of this research is to determine the e-procurement strategies and problems in digital era. The nature of the research is Descriptive method, and the sample size is 251 respondents from various locations in India and data collection method used in the research is “Questionnaire Method”. Data was analyzed by using SPSS 16.0. Findings, suggestions and conclusions were made by keeping an eye on the objectives.

5. Research Objectives

The published articles focus on the impact of core applications within e-procurement, including online reverse auctions, electronic marketplaces, online catalogue sites, and buying systems covering the ‘requisition to pay’ cycle. The findings from the papers address a number of core themes in purchasing management. In considering buyer-supplier relationships, it was observed that such dyads are driven by traditional buyer negotiation factors such as segmentation, power and price and that use of e-procurement applications tended to enforce such traditional behaviours. In relation to the potential for integration, the study found that integration between firms was barely affected, as the concept of integration was neither an objective nor a business case driver for e-procurement adoption.

6. Analysis and Results

6.1 Structural Equation Models (SEM's)

Structural Equation Models (SEMs), also called simultaneous equation models, are multivariate (i.e., multi- equation) regression models. Unlike the more traditional multivariate linear model, however, the response variable in one regression equation in an SEM may appear as a predictor in another equation; indeed, variables in an SEM may influence one-another reciprocally, either directly or through other variables as intermediaries. These structural equations are meant to represent causal relationships among the variables in the model. A cynical

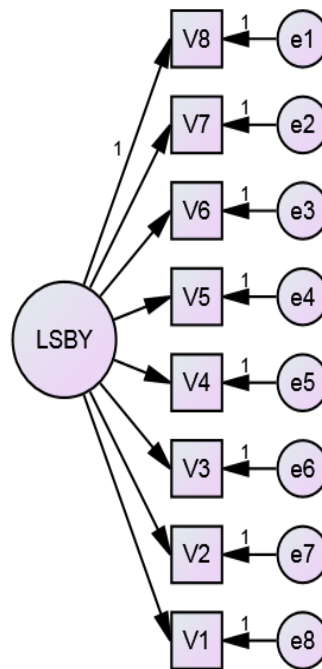
view of SEMs is that their popularity in the social sciences reflects the legitimacy that the models appear to lend to causal interpretation of observational data, when in fact such interpretation is no less problematic than for other kinds of regression models applied to observational data. A more charitable interpretation is that SEMs are close to the kind of informal thinking about causal relationships that is common in social-science theorizing, and that, therefore, these models facilitate translating such theories into data analysis.

To my knowledge, the only facility in S for fitting structural equation models is my SEM library, which at present is available for R but not for S-PLUS. The SEM library includes functions for estimating structural equations in observed-variables models by two-stage least squares and for fitting general structural equation models with multinomial errors and latent variables by full-information maximum likelihood. These methods are covered (along with the associated terminology) in the subsequent sections of the appendix. As I write this appendix, the SEM library is in a preliminary form, and the capabilities that it provides are modest compared with specialized structural equation software. Structural equation modeling is a large subject. Relatively brief introductions may be found in Fox (1984: Ch. 4) and in Duncan (1975); Bollen (1989) is a standard book-length treatment, now slightly dated; and most general econometric texts (e.g., Greene, 1993: Ch. 20; Judge et al., 1985: Part 5) takes up at least observed-variables structural equation models. Notes for Model (Default model)

Table 1 - Name of the Independent Variable

Coding	Name of the Independent Variable
V1	Close partnership with suppliers
V2	Close partnership with customers
V3	JIT supply
V4	Outsourcing
V5	Subcontracting
V6	Supply Chain Benchmarking
V7	Vertical integration
V8	Holding safety stock

Figure 1- Path Analysis and Diagram



6.2 Model Fit Summary

Table 2- CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	16	472.957	20	.000	23.648
Saturated model	36	.000	0		
Independence model	8	2258.243	28	.000	80.652

Table 3- RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.080	.777	.598	.432
Saturated model	.000	1.000		
Independence model	.414	.314	.118	.244

Table 4- Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.791	.707	.798	.716	.797
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 5- Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.714	.565	.569
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Table 6- NCP

Model	NCP	LO 90	HI 90
Default model	452.957	385.841	527.494
Saturated model	.000	.000	.000
Independence model	2230.243	2078.013	2389.808

Table 7- FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	1.168	1.118	.953	1.302
Saturated model	.000	.000	.000	.000
Independence model	5.576	5.507	5.131	5.901

Table 8- RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.236	.218	.255	.000
Independence model	.443	.428	.459	.000

Table 9- AIC

Model	AIC	BCC	BIC	CAIC
Default model	504.957	505.684	569.059	585.059
Saturated model	72.000	73.636	216.229	252.229
Independence model	2274.243	2274.606	2306.293	2314.293

Table 10- ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.247	1.081	1.431	1.249
Saturated model	.178	.178	.178	.182
Independence model	5.615	5.240	6.009	5.616

Table 11- HOELTER

Model	HOELTER	HOELTER
	.05	.01
Default model	27	33
Independence model	8	9

Inference

The desired value CMIN and degree of freedom for default model is 23.648, which is good and reliable; it is a fit model for mentioned independent variables. The actual default model value arrived is 23.648. So the variables are accepted to fit a structural equation modeling. From the RMSEA table, it is inferred that the significant value for default model is 0.000, which is fit model at 5 percent level of significant.

6.3 Model Fit Summary

Step 1:- Variables for e-procurement in digital era are listed; in our research work. .

Step 2:- From the variables identified in step 1, contextual relationship among the variables with respect to different pairs of variables are examined.

Step 3:- The explained and assumed variables are theoretically examined and fitted with a model.

Step 4:- A Structural Equation diagram is developed for variables, which indicates pair wise relationship among variables of the system under consideration.

Step 5:- Model fit is developed from the Structural Equation diagram and the Default model summary is checked for e-procurement in digital era. The independent variables are very much necessity for e-procurement in digital era.

Step 6:- Based on the contextual relationships in the reach ability matrix, a directed graph is drawn and the transitive links are removed.

Step 7:- The resultant diagraph is converted into an Interpretive Structural Model by replacing variable nodes with statements

7. Suggestions and conclusion

This situation reflects the finding that procurement managers pursue functional targets rather than supply chain-level objectives. However, other significant effects from e-procurement adoption were noted such as the tendency by buyers to reduce supplier numbers and a move to re-engineer the procurement function in buying firms, through automating transactional processes. The research finds that e-procurement does not have a deterministic impact on purchasing management, and that it acts as an enabler to more effective management of the function though the way it's different mechanisms are deployed. The exposition establishes that e-procurement is used in relation to supply conditions which are characterised by both 'markets' and 'hierarchies', but that it is the predefined purchasing strategy of the firm, rather than available technology solutions, which determines when markets and hierarchies are used. Additionally, an original model is introduced, focusing on developing an e-procurement policy which can support strategic purchasing goals. This model extrapolates findings from stages in the research, and marries together elements from various papers and frameworks therein, to produce some guidelines for adoption of this technology.

References

- Boer, L. de, Harink, J.H.A., Heijboer, G.J., 2001, A conceptual model for assessing the impact of electronic procurement, proceedings of Ipsera congress, Jönköping, Sweden, 2001
- Croom, S.R., 2000. The impact of web-based procurement on the management of operating resources supply. *The Journal of Supply Chain Management*, Winter 2000.
- Emiliani, M.L., 2000. Business-to-business online auctions: key issues for purchasing process improvement, *Supply Chain Management: An International Journal* 5(4), 176-186.
- Harink, J.H.A., 2000. Excelleren met elektronisch inkopen (Excelling with electronic purchasing). Samsom, Alphen aan den Rijn.
- Kraljic, P., 1983. Purchasing must become supply management. *Harvard Business Review*, September-October, 109-117.
- Min, H. and Galle, W.P., 1999. Electronic commerce usage in business-to-business purchasing. *International Journal of Operations & Production Management* 19(9), 909-921.
- Roberts, B. and Mackay, M., 1998. IT supporting supplier relationships: The role of electronic commerce. *European Journal of Purchasing & Supply Management* 4(3), 175-184.
- Smeltzer, L. and Ruzicka, M., 2000. Electronic Reverse Auctions: Integrating the Tool with the Strategic-Sourcing Process. *Practix*, June 2000.
- Teich, J., Wallenius, H. and Wallenius, J., 1999. Multiple-issue auction and market algorithms for the world wide web. *Decision Support Systems*, 26, 49-66.
- Weele, A. van, 1988, Inkoop in strategisch perspectief. Samsom, Alphen ad Rijn