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# DETERMINANTS OF THE LEVEL OF INTERNET-BASED PROCUREMENT: AN EMPIRICAL STUDY OF THE PROCUREMENT OF PRODUCTION GOODS IN MANUFACTURING FIRMS

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## Abstract

*This paper investigates the influence of different product-related, firm-related and external factors on the level of Internet-based procurement (IBP). Drawing upon transaction cost economics, innovations theory and social exchange theory, we provide specific hypotheses about the level of IBP. We empirically test our hypotheses in the context of IBP of production goods in manufacturing firms. Preliminary analyses indicate that digitization of the procurement process, technological uncertainty, volume uncertainty, use of Internet intermediaries, trust in Internet suppliers and ease of relationship creation on the Internet impact the level of IBP positively. This study contributes to the information systems literature by integrating the impacts of different factors on IBP in a theoretical framework, developing an instrument to measure IBP, and conducting a large-scale empirical study of the procurement of production goods in manufacturing firms. This study also has implications for practice.*

**Keywords:** Coordination costs, digitization, intermediaries, Internet-based procurement, uncertainty

## Introduction

The procurement function provides a significant opportunity to manufacturing firms to achieve cost efficiencies, and improve profit margins. Manufacturing firms spend up to three fourth of their revenues on material costs and costs involved in the procurement process (Zenz and Thompson, 1994). A small percentage saving in procurement expenses can impact the profit margins of manufacturing firms considerably. Recently, firms have begun to use the Internet and World Wide Web (WWW) to achieve efficiencies in their procurement process, and some firms have been successful in lowering lead-time, administrative expenses and time to transmit change orders.

There have been several developments to facilitate Business-to-business (B2B) procurement on the Internet. Numerous Internet-based markets, also known as B2B markets and B2B hubs, have started operating in different vertical markets. These markets bring buyers and sellers together on a common platform and often, but not always, enable trade between them. Firms have attempted to bring their suppliers online and move their entire supply-chain to the Internet. Analysts have predicted that as a result of these efforts, B2B procurement on the Internet would grow exponentially. They have also predicted that realizing the potential benefits from IBP, firms would adopt the Internet in their procurement process readily. However, the response of firms to IBP has been mixed, and the level of Internet use in their procurement process varied.

In this paper, we identify and enumerate the factors that impact the level of IBP, and explain why the level of IBP is different in firms. We define the level of IBP as the extent of Internet use in the procurement process of firms. Our focus in this study is on Internet-based procurement of production goods, input goods that manufacturing firms use to manufacture their products.

## Model and Hypotheses

Our theoretical model is represented in figure 1. The model illustrates different product-related, firm-related and external factors that impact the level of IBP. We use transaction cost economics (e.g., Malone et. al. 1987, Clemons et. al. 1987), innovations theory (e.g., Grover 1993, Premkumar and Ramamurthy 1995, Rai and Bajwa 1997), and social exchange theory (e.g., Hart and Saunders 1987, 1988) to develop our arguments. Below, we provide a brief description of how each of the factors identified impacts the level of IBP.

### Number of Goods Procured

Firms procuring a large number of goods may need to interact with a large number of suppliers and transact with them. The Internet helps firms procuring a large number of goods lower their coordination costs by lowering the costs of information search and gathering, and enabling rich information exchange between their suppliers and them. Hence, *the level of IBP will be positively related to the number of goods procured by a firm.*

### Description Complexity

We define description complexity of a component as the amount and variety of information a buyer has to specify for a supplier to be able to manufacture that component. Procurement of complex goods necessitates a large amount of information sharing between buyers and suppliers. By facilitating increased levels of communication and rich information exchange, the Internet lowers the description complexity of the goods procured (Malone, et. al., 1987). This results in lower coordination costs for buyers. Hence, buyers who procure complex goods will increase the level of IBP. Thus, *the level of IBP will be positively related to the description complexity of goods procured by a firm.*

### Size of the Firm

Prior literature has found both positive and insignificant effect of firm size on IT adoption and implementation (e.g., Zmud 1984, Goode and Steven 1999, Grover and Goslar 1993, Teo and Tan 1998). In the context of IBP, size does not provide any inherent advantages or disadvantages. Availability of open and existing infrastructure, and participation in B2B markets allow firms of all sizes to use the Internet for procurement. Hence, *the level of IBP will not be related to the size of a firm.*

### Digitization of the Procurement Process

The impact of digitization has been studied extensively in the context of IT adoption and implementation (e.g., Grover 1993, Premkumar and Ramamurthy 1995). Digitization lowers manual intervention, multiple data entry, errors and delays, thereby lowering the costs involved. Digitization of the procurement process also allows a firm to coordinate easily with suppliers on the Internet. Thus, *the level of IBP will be positively related to the digitization of the procurement process in a firm.*

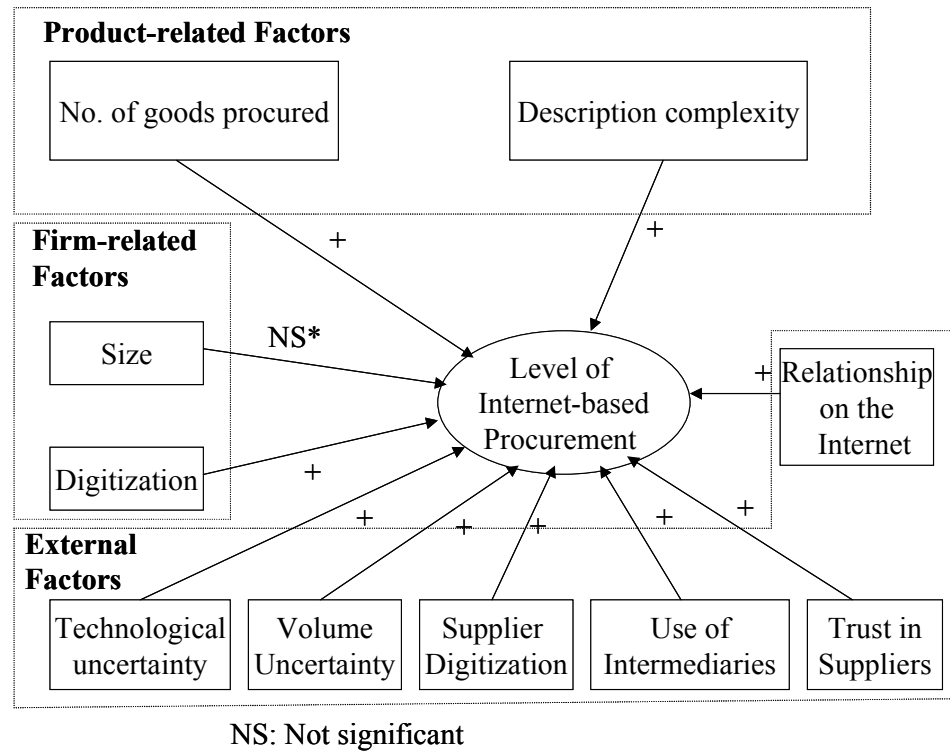


Figure 1. The Theoretical Model

### ***Technological and Volume Uncertainty***

Williamson (1975) argues that high uncertainty can lead to high transaction costs and impact the extent of coordination between buyers and sellers. Research in information systems has shown that firms increase the extent of IT use under high uncertainty conditions (Grover and Goslar 1993) to increase the information processing power, and counter the effects of uncertainty. We focus on demand uncertainty in this study, which is caused by technological uncertainty and volume uncertainty (Walker and Weber 1984). Firms experiencing high technological and volume uncertainties find it necessary to search for goods and competent suppliers, and negotiate with suppliers frequently. By enabling efficient search, and providing markets where buyers and sellers can negotiate and trade, the Internet lowers the search and negotiation costs considerably. Hence, firms that face high technological and volume uncertainties are likely to increase their level of IBP. Thus, *the level of IBP will be positively related to the technological uncertainty and volume uncertainty faced by a firm.*

### ***Digitization of Suppliers' Sales Process***

Supplier digitization plays an important role in the extent of IT a firm can use in inter-firm interactions (Riggins and Mukhopadhyay 1994). Highly digitized suppliers can process documents electronically, respond to enquiries fast, and implement changes easily. It allows buyers to make use of their digitization and reduce manual intervention, errors and delays. Hence, *the level of IBP will be positively related to the digitization of sales process of the suppliers of a firm.*

### ***Use of Internet Intermediaries***

Intermediaries lower the information asymmetry between buyers and sellers by verifying the information, and making it available to all participants. The institutional framework provided by the intermediaries ensures that all the parties observe the rules, and parties with high bargaining power do not suppress parties with low bargaining power. By providing such extensive services, intermediaries lower the operations risk (Clemons, et. al., 1993), thereby lowering the transaction costs. Hence, *the level of IBP will be positively related to the use of Internet intermediaries by a firm.*

### ***Trust in Internet-based Suppliers***

Trust becomes paramount when partners anticipate risk and feel vulnerable. Lack of previous experience or relationship with Internet-based suppliers may increase the risk perception in buyers' minds. However, if buyers can trust the competence of suppliers to manufacture goods and trust their intentions, then buyers can lower their risk perception of suppliers and the transaction costs substantially (Chiles and McMackin 1996). Thus, *the level of IBP will be positively related to buyers' level of trust in Internet-based suppliers.*

### ***Relationship on the Internet***

Bensaou (1997) has argued that a good relationship with suppliers lowers uncertainty and chances of opportunistic behavior. The ease of relationship creation, i.e., the ability to share information with partners, coordinate and plan with them on the Internet will promote greater coordination between partners, and lower the chances of opportunistic behavior. Therefore, *the level of IBP will be positively related to the ease of relationship creation on the Internet.*

## **Methods**

After rigorously pre-testing our instrument, we mailed it to 2,000 randomly selected procurement professionals in manufacturing firms (SIC codes 35, 36, 37 and 38). Firms in these industries manufacture machinery (except electrical), electrical and electronic machinery, transportation equipment, and measuring, analyzing and controlling instruments respectively. Five weeks after the first mailing, we sent a reminder and the instrument to randomly selected 1,000 non-respondents. We received 424 usable responses (response rate = 21.2 %). After data preparation, we tested our instrument for reliability and validity, and found that our instrument had sound psychometric properties.

## Preliminary Results

Results from our preliminary analysis show that digitization of the procurement process, technological uncertainty, volume uncertainty, use of Internet intermediaries, trust in Internet suppliers and ease of relationship creation on the Internet impact the level of IBP positively. The number of goods procured, the complexity of description of goods procured, the size of the firm and the digitization of suppliers' sales process do not impact the level of IBP.

## Contributions

First, this study integrates the impacts of different factors that influence the level of IBP in a theoretical framework. Second, we develop an instrument to measure the level of IBP and other constructs such as digitization of procurement process, complexity of description, trust in Internet suppliers, relationship on the Internet and digitization of suppliers' sales process. Finally, this study is the first large-scale empirical study of Internet-based procurement of production goods in manufacturing firms. Identifying and benchmarking the determinants of Internet-based procurement of production goods in manufacturing firms will provide a basis for managerial action and investment in Internet-based supply-chain management.

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