



# WeBid: A web-based framework to support early supplier involvement in new product development

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## Abstract

It has been found from the contemporary research in the fields of concurrent engineering and supply chain management that significant benefits can be achieved if suppliers are involved in the early stages of product development process. However, recent investigation in manufacturing industries has also revealed that this approach is not widely practised in industries and its implementation has been a great challenge to researchers and practitioners. The research reported here proposes to develop an overall methodology for enabling better supplier involvement in new product development process and to demonstrate the framework through a prototype web-based platform on the Internet/intranets using the web technology. This paper presents some results from the initial investigation, development and implementation of the proof-of-the-concept prototype system called WeBid. © 2000 Elsevier Science Ltd. All rights reserved.

*Keywords:* World wide web; Customer-supplier partnership; Early supplier involvement; New product development; Supply chain management

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## 1. Introduction

Over the last decade or so, substantial investments have been made to support the research and practice of concurrent engineering and supply chain management from both the government research councils and industrial bodies all over the world. One of the common findings is that great benefits can be achieved if suppliers are involved in the customer's new product development process as early as possible. The rationale is that suppliers frequently possess vital product and process technology that can lead to improvements in product design and the new product development (NPD) process itself. Early supplier involvement (ESI) has emerged as a good practice in NPD to ensure that the positive aspect of such impacts are maximized while the negative aspect is minimized.

There are opportunities for suppliers to be involved in major stages of the customer's product development process. At the concept design stage, suppliers help

identifying most up-to-date technologies to be incorporated into a new product. Suppliers participate in detailed design by providing solutions to component and part designs and the selection of most suitable materials and catalogue components. Suppliers are able to assist in making "Make or Buy" decisions when production design begins. Infrastructural suppliers provide the most capable tooling, fixturing and equipment. Throughout the NPD process, suppliers may be involved in carrying out Design for Manufacturability analyses to ensure that the product is delivered effectively and efficiently.

It is widely accepted that ESI is beneficial to both the buyers and suppliers [1]. It is vital but extremely difficult to involve suppliers early at the product specification stage [2]. Despite past progress, there are a number of unique issues that have not yet been addressed adequately from either community. Firstly, there is a need for a new model of supply chain to support ESI in NPD. In the past, supply chain analysis and modelling have focused on the entire chain [3] or individual member companies along different levels of the chain [4]. In order to capture the full complexity of the process of supply in a more holistic and strategic view [5] presents the use of the term "supply network" to define the process of supply which involves complex non-linear links

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among inter-connected supply entities. These have been reflected in some well-known supply chain models such as SCOR proposed by AMR Supply Chain Council ([www.supply-chain.org](http://www.supply-chain.org)) [6]; and CPFR by Voluntary Inter-Industry Commerce Standards Organisation ([www.cufr.org](http://www.cufr.org)). However, these models are limited because they do not analyse and model the interfaces between the customers and suppliers. In particular, they do not reflect customer's nor supplier's product development processes.

Secondly, a new method for supplier selection is needed to support ESI in NPD. The importance of supplier selection comes from the fact that it commits resources while simultaneously impacting not only such activities as inventory management, production planning and control, cash flow requirements, and product quality, but also product design and development [7]. The literature in vendor or supplier selection continues to grow rapidly in areas such as vendor or supplier attributes and performance metrics [4,8], and decision models [9,10]. Much of the previous research in the area of supplier selection and supplier evaluation emphasizes conceptual and empirical decision support models, mainly for purchasing managers. They may suffer from one or more shortcomings such as being mathematically too complex, too subjective, requiring too many supporting data, etc. [9]. What practitioners need is a methodology that is simple to use and understand, and yet produce reasonably accurate results. From the literature, supplier attributes or performance metrics for traditional supplier selection do not seem to include design specifications that are usually provided in the early stages of product development.

Thirdly, supply development is normally based on competitive tender/bidding despite the fact that partnership development is advocated to increase purchasing efficiency. Competitive tender/bidding is considered adversarial, undermining collaborative partnerships or relationships. The focus is usually on price as the key element. Yet the tendering process is time consuming and expensive for the vendor. In industrial sectors such as electronics tendering is usually performed for a given set of criteria in a relatively short space of time. It is usually assumed that the customer has a fairly clear description of its requirements and that there are several suppliers who are willing and able to provide the services, with their capabilities clearly described.

Finally, with promises and potentials, information technology (IT) and information systems (IS) are increasingly used in supply chain management. Early applications have been focused on implementing sophisticated mathematical decision models for supplier selection. Optimal selection of partners in agile manufacturing (OSPAM) was probably one of the first attempts to apply extensively IT/IS in general and the Internet in

particular in supplier selection [11]. Vanwelkenhuysen [12] has described a Tender Support Expert System for industrial centrifugal pumps. The system assists sales engineers to quickly generate and explore technically valid pump configurations as a response to customer requirements. Kroemker et al. [13] presented a concept of simultaneous bid preparation and implemented a prototype infrastructure to support interdisciplinary co-operative bid preparation over a distributed heterogeneous system environment. These are only the beginning and more work remains to be done in this direction.

This research has been conceived based on the above observations on the significance of the ESI in NPD approach and the new challenges for rigorous investigation. A web-based framework, called WeBid, is under development to promote and facilitate the ESI in NPD approach in practice. This paper summarises the results of the initial investigation. Section 2 presents an overview of the WeBid methodology and framework. Sections 3–6 focus on the Supply Explorer, the Bid Explorer, the Partnership Explorer, and Share Explorer, respectively. Section 6 briefly summarises the implementation issues.

## 2. The *WeBid* framework

The aim of the research reported here is to develop an overall methodology for enabling better supplier involvement in new product development process and to demonstrate the framework through a prototype web-based platform on the Internet/intranets using the web technology. Four focus areas have been identified. They are (1) to develop a product-oriented supply chain model that is consistent with the new product development process; (2) to develop a mechanism for the customer to invite and potential suppliers to submit bids for manufacturing specific product components; (3) to develop a rigorous but pragmatic supplier selection methodology; and (4) to develop a mechanism for facilitating information sharing between the customer and suppliers.

An initial round of investigation has been completed. A prototype system called WeBid has been developed. Fig. 1 shows an overview of the WeBid system. The right-hand side of the figure shows the main stages of the customer's new product development process. The left-hand side presents main activities of the supplier's bid preparation process. As can be seen from the diagram, WeBid is primarily an interface between these two processes.

The middle of Fig. 1 shows the four main modules of WeBid. These four modules also correspond to the four main activities of the general procedure of ESI proposed by Fine and Whitney [14]. They are summarised briefly

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