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A framework for developing a unified B2B e-trading construction marketplace

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Abstract

With its great explosion and the advancement of related technology and services, such as the World Wide Web (WWW), the Internet has provided a rich environment for developing Internet-based electronic commerce (e-commerce) applications in construction. Among the different types of e-commerce, business-to-business (B2B) is the most widely used. The B2B e-trading marketplaces (also called B2B-exchanges), which have sparked a revolution in the way of trading products between buyers and suppliers, are an essential component of B2B applications. However, many e-trading marketplaces have been developed and hosted by different construction products and services providers, and each forms a closed system with their own customers and clients. In this paper, the concept of e-union is presented, which integrates the services provided by different e-trading construction sites to provide an open e-trading service. The design of a mobile agent-enabled framework for building such an open e-trading marketplace environment is described, along with a prototypical implementation.

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1. Introduction

Over the last few years, the Internet has evolved from being a scientific network only, to a platform that is enabling a new generation of business. More and more companies and organizations are doing different types of business and offer value-added services on the Internet [1]. While the first stage was fueled by the vision and innovation of business-to-consumer (B2C) Internet companies, the current phase is defined by the leadership and market success of companies en-

gaged in business-to-business (B2B) electronic commerce (e-commerce) [2].

The B2B e-trading marketplaces, which allow large communities of buyers and suppliers to meet and trade with each other, are an essential component of B2B e-commerce applications. They resemble stock exchanges in many ways, including the way they are set up and organized and the trading methods they employ—but they are trading physical commodities such as doors, tiles and steel. They enable a many-to-many relationship between multiple buyers and sellers in the construction industry, who come together and find each other in the cyberspace. They allow participants to access various mechanisms to buy and sell almost anything, from services to direct

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materials. Buyers and suppliers leverage economies of scale in their trading relationships and access a more “liquid” marketplace. Sellers find buyers for their goods, buyers find suppliers with goods to sell. Many-to-many liquidity allows the use of dynamic pricing models, thus further improving the economic efficiency of the market.

Construction companies are now conducting their business using Web-based e-commerce system. Many believe that e-commerce can provide a win-win situation for both suppliers and buyers, as e-commerce can provide an expanded marketplace within which buyers and suppliers can communicate directly with each other. E-commerce might bring the answer awaited for clients or construction firms, that is, to create the solution for the procurement of materials using non-traditional methods, avoiding delays, high prices, lack of specified products, etc. [3]. Online construction trading markets are not limited by the physical limitations of store spaces and can carry a much larger variety of products and different styles and sizes. At the same time, buyers can search through a wide range of products with low transaction costs at any time convenient to them. More importantly, the direct communication between buyers and suppliers will cut off the multiple layers of middlemen between suppliers and buyers. These middlemen take commissions and fees from both buyers and suppliers. The use of e-commerce will therefore directly benefit the buyers so they can efficiently purchase cheaper products with a variety of choices [4].

The last several years have witnessed the emergence of online B2B e-trading marketplaces. Well-known examples include Catex, Chemdex, e-STEEL, Metal-Site, and VHCome [5]. Currently, however, it is often the case that, within a particular industry such as the construction industry, many e-trading marketplaces have been developed, owned and/or hosted by different companies. Each of the e-trading marketplaces forms a closed system with their own customers and clients. The totality of these e-trading marketplaces appears to be islands in the sea, as they are isolated and with no interoperation between each other. In this paper, a framework is presented for developing an interoperable e-trading marketplace for the construction industry by linking all the existing e-trading marketplaces, as any single e-trading marketplace may not be able to meet all the requirements of the buyers. The ability of market-

places to interoperate extends the idea of liquidity and network effect by joining more buyers with more suppliers but does not sacrifice the ability of each marketplace to be highly specific to the supply-chain node or target buyer group it serves. The concept of “e-union” is described, which integrates the services provided by different e-trading marketplaces in the construction industry to provide an open and unified e-trading marketplace, or e-union, which is enabled by the use of a mobile agent.

2. The e-union concept

The unique feature of a B2B e-trading marketplace is that it brings multiple buyers and sellers together (in a “virtual” sense) in one central market space and enables them to buy and sell from each other at a dynamic price which is determined in accordance with the rules of the exchange. On the Internet, every web site, which enables buyers and sellers to come together and find each other, is really a “virtual” e-trading marketplace.

An e-trading marketplace was developed as part of *VHBuild*, a Web-based mediation service for construction project management in Hong Kong [6]. Fig. 1 shows selected screen dumps of the system’s web interface. The service is provided to mediate among the different parties involved in a construction project for various project management activities, including project initiation, tendering, materials purchasing, project monitoring, project information querying, decision making, etc. These activities are systematically organized and coordinated around a construction project, with a close modeling of the data flow and workflow in the building and construction industry. The system also provides an e-trading marketplace for advertising, marketing and buying/selling of construction materials and equipment.

The Web-based e-trading marketplace contains two major functions: providing trading information and facilitating trading transactions. Users will log onto the system as either buyers or sellers of construction materials. The sellers can upload their product information and find out summary information about their customers and their transactions. The buyers can search certain types of products, giving their requirements such as brand, model, quality, price, etc., or they can browse the products on display. When the products

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