AN INTERNET-BASED BIDDING AND PROCUREMENT SYSTEM FOR THE TILE INDUSTRY’S SUPPLY CHAIN

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ABSTRACT
This paper describes intermediate results of the European project e.bip (IST-1999-10710), which aims to innovate the bidding and procurement processes of tile layers by establishing a new broker service in the supply chain of the tile industry. The paper outlines the concept and functionality of the overall e.bip system, i.e., of the “Master Broker System” (a web-based information broker) and the supportive tools for connecting end users’ legacy systems with the marketplace as well as the internet enabled bidding and procurement application for tile layers. It will also describe first results from testing the system in pilot projects in the tile supply chain.

INTRODUCTION
The bid preparation and procurement process of SMEs in the construction industry is still predominantly based on traditional approaches, tools and communication channels and thus offers different potentials for improvement [Segev et al 1998]. The European RTD project e.bip (Efficient Bidding and Procurement in the Tile Industry - Practical Trading Tools and Broker Services for the Exchange of Product Characteristics, IST-1999-10710) addresses this situation and aims to introduce advanced ICT based support for all procurement and order processing activities in the tile construction sector and to show the opportunities of electronic commerce in overcoming today’s structural problems in this sector. Thus, e.bip aims to help companies to improve their current business processes as well as foster the co-operation between manufacturers of tiles, wholesalers and tile layers.

This paper describes related work and industrial state-of-the-art, outlines the e.bip system architecture and the application developed as well as the pilot approach used to evaluate and test the e.bip applications. The conclusion will summarize the project’s key results so far and the next steps to be performed.

RELATED WORK AND INDUSTRIAL STATE-OF-THE-ART
The software market for tools for bidding and procurement offers a large variety of solutions and we can distinguish basically two areas of applications: On one hand, there are numerous tools which support the bidding and project phase of construction projects – either for construction in general or for specific craft sectors. These tools are used by individual companies for their own bidding and project work and are well accepted, but they hardly consider supply chain aspects [Weber et al 2000]. On the other hand, there is an increasing number of internet marketplaces which offer products and services, support cooperative processes and introduce new business models [Feld, Homann 1999], [Vetter, Pitsch 2000]. Although the adoption of these Internet and Web-based technologies is poor at the moment, the general attitude of SMEs towards its use is positive [Gebauer et al 1998] and case studies confirm the potential of e-commerce in procurement [Eyholzer 1999], [Gebauer, Färber 2000]. However, the integration of the two areas is still weak and the re-use of bidding data in subsequent procurement, order processing and project tasks is currently rarely supported.
On the technological level, the product representation on electronic marketplaces is still limited and far away from what craftsmen and customers are used to from physical product presentations in show rooms. While considerable research is carried out for improving navigation in product data [Stanojevska-Slabeva, Schmid 2000], product representation still focuses on brief textual information on major product characteristics and is sometimes enriched with a small product photo. However, the quality of these photos is so low that they can hardly give an impression on the real appearance of the product. This is less critical for standardised, functional products (say e.g. tile mortar, silicon), but becomes more important for fashionable, design oriented products like tiles, where colour and texture are essential attributes [Zabel et al 2000]. In order to solve the basic problem that no two devices (screens, printers, etc.) produce the same visual colour from the same digital values, the concept of colour management has been introduced and standards have been developed by the International Color Consortium [ICC 1998]. It improves the exchange and reproduction of images across a wide range of industries. However, its application is mainly limited to the area of desktop publishing and design, and it has been hardly taken up for practical usage in traditional business processes of small enterprises which face difficulties in making multimedia data available in day-to-day business pressure. The e.bip system aims to overcome these weaknesses by introducing better integration and product representation for internet marketplaces, bidding and procurement tools.

SYSTEM ARCHITECTURE

The e.bip system architecture (cf. figure 1) consists mainly of three different functional components. The Master Broker System is a central stand alone online broker service that can be accessed through the World Wide Web. The Seller and Buyer Client Modules connect the Master Broker System with existing back office solutions. A local application for bidding and procurement (“e.bid”) supports the daily business of building contractors and exemplarily shows how users can benefit from an integrated information exchange with the Master Broker System. For a detailed description of the different roles in this process, please refer to earlier work of the authors [Zabel et al. 2000].

![Figure 1: e.bip System Architecture](image-url)
Master Broker System

The Master Broker is a virtual business-to-business spot marketplace for commodity items and will be run as an ASP (Application Service Provider) service maintained by one or more of the e.bip partners. It may additionally be sold to interested third party operators. The e.bip broker service primarily covers stone and ceramic tiles, but is dynamically extendable to other products and materials.

The main tasks supported by the Master Broker System (cf. figure 2) are currently maintenance and harmonization of product catalogues from multiple sellers, requests for quotation among buyers and sellers (either one-to-one or one-to-many), and direct online negotiation. Processes involving legal aspects, e.g., contract signatures and electronic payment, are not supported directly by the Master Broker System, but can be added later by means of an ebXML [Kotok, Webber 2001] interface.

The product catalogue covers advanced technical information about tiles as well as colour management aspects by providing images of tile products with different levels of detail and accuracy, e.g. small JPEG files or high-quality spectrographic scan images. For distributing new or updated product information, special offers, invitations to tender, bids, etc. among the connected manufacturers, wholesalers/retailers, and building contractors, the potential buyers or sellers can use the notification services of the virtual marketplace.

Users can subscribe to the virtual marketplace and use it by accessing the web front-end through a normal web browser without installing local software. However, in order to interface the broker system with existing back office solutions (ERP, accounting, etc.), a so-called Seller Client and a Buyer Client application are available.

Seller and Buyer Client Applications

The Seller and Buyer Client applications provide a means of integration between the Master Broker System and IT systems already existing at a building contractor, retailer, stone trader or wholesaler. The Seller Client provides functions to transfer product information generated and stored at the seller’s IT system to the Master Broker System. The Buyer Client can be used to integrate product or bidding/procurement data retrieved from the Master Broker System into the existing IT systems, respectively the e.bid application (cf. section below). Additionally, both modules offer functions to retrieve and archive supplier/customer data.

Local Application for Bidding and Procurement “e.bid”

For the more complex bidding/procurement processes of building contractors, a local application (“e.bid”) is available. It supports the creation of decomposed project calculations that consider services and material, and procurement and invoicing functionality. To take full advantage of the Master Broker System, the e.bid application also includes functions to
• synchronize and extend a local product data repository with up-to-date information from the Master Broker System,
• semi-automatically generate price/material inquiries for submission to the Master Broker System by means of the Buyer Client (see above), as well as incorporation of received responses into the respective bid for the final customer,
• re-use bidding data for procurement, order processing, and invoicing processes.

The e.bid application supports the information flow and workflow for all bidding and procurement activities by substituting paper documents, interfacing the Master Broker System and integrating electronic communication means such as e-mail.

PILOT SCENARIO
The e.bid system is tested and evaluated in a scenario (cf. figure 3) with end-users from different branches of the tile supply chain: two pilot groups of tile manufactures in Italy (natural stone tiles) and Spain (ceramic tiles), two wholesalers for construction material in Austria and Portugal, and a tile layer in Austria.

The Italian and Spanish tile manufacturers access and enter their product data through the Web interface of the Master Broker System. A sub-contracted company provides a representative number of high-quality spectral images of ceramic and stone tiles.

The wholesalers of the consortium act as Sellers and Buyers of tile products. They run a Seller and Buyer Client to automatically provide and retrieve tile and notification data to/from the Master Broker System.

The e.bid application is installed at the tile layer of the consortium and at the tile laying division of one of the wholesalers. It demonstrates how the e.bid approach can be used to support the daily business of a building contractor.

Figure 3: e.bid Pilot System Scenario

PILOT PHASES
The pilot is subdivided into four pilot phases in order to co-ordinate the sellers and buyers better during start-up of the pilots and to ensure a smooth and efficient testing phase of the overall e.bid system:
Installation and Training: The Master Broker System is set up and the client applications as well as the e.bid application are installed at the end users’ sites.

Data Capturing Phase: A sound data basis of natural stone and ceramic tile products is created on the Master Broker System. The Italian pilot group and the wholesalers enter and provide tile and company data for the online product catalogue.

Operational Test Phase: The buying organisations of the pilot users start testing the overall functionality of the system and carry out test business transactions with the sellers. The objective of this phase is to ensure the correctness, stability, and appropriateness of the different applications before extended pilot group members enter the pilot.

Pilot Extension and Commercialisation Preparation Phase: The extended pilot group members join the pilot and start using the system by providing their data and carrying out sample business transactions. This phase aims to increase the frequency of the business transactions to be carried out by using the e.bip software tools. The fact that some members of the pilot groups are already known business partners of the consortium members should facilitate and increase the confidence in carrying out online business transactions through the broker system. The consortium will check whether an appropriate number of transactions is carried out through the Master Broker System in course of the regular business between the buyers and sellers, or whether test scenarios need to be initiated to increase the frequentation of the marketplace during this pilot stage.

Intermediate Pilot Results
At the time of writing this paper, the consortium is working in the operational test phase of the pilots. During the data capturing phase, the Master Broker System has been populated with about 1500 tile products, which have been entered manually by the natural stone tile manufacturers as well as automatically from the databases of the project’s wholesaler partners by means of the e.bip Seller Client applications. Currently the pilot users test the adequacy, usability, and stability of the e.bip software tools before extending the pilot groups to external participants.

CONCLUSIONS
This paper has outlined the e.bip solution for an electronic bidding and procurement system that supports the brokerage and trade model of the tile construction sector. The results can be divided into three major areas:

Support for Micro-Businesses. Unlike most B2B internet marketplaces, the approach not only supports large and medium sized businesses, but also micro-businesses, i.e., companies with less than 10 employees can take advantage of the Master Broker System and its supportive tools. Within the tile sector, this is especially relevant for the natural stone tile manufacturers who are often very small enterprises.

Integration and Support for the whole Tile Supply Chain. The pilot installation of the e.bip broker is carried out for the supply chain of the tile industry. e.bip not only implements the internet marketplace, but also additional connectivity tools to transfer data between the marketplace and legacy systems, and a standalone procurement application taking advantage of the marketplace and in particular the data provided.

Practical colour management solutions. e.bip provides a practical approach to colour management issues in the supply chain. The marketplace provides images of tile products data with different levels of detail and accuracy for different media and marketplace customers. Practical solutions for colour management are offered, ranging from un-calibrated systems up to, e.g., studio solutions where high quality colour scanning (spectral scanning) is offered by a third parties as a service for micro-businesses.
It is expected that the e.bip solution will lead to a higher acceptance of electronic brokerage systems by emphasizing on integration with existing systems and workflow support without neglecting the usual “internet way” of doing business on an online marketplace.

At the time of writing this paper the project has finished implementation of the prototype system and is halfway through the pilots. The consortium has also submitted its XML-Schemas for inclusion in the respective repositories of XML.org and the ACCORDAN project (www.accordan.org). Also, the Master Broker System is being refined to comply with the ebXML standard (www.ebxml.org) to facilitate interfacing with a broader range of third-party applications and services. Future findings and results of the project will be made available on the e.bip homepage on the World Wide Web (www.e.bip.net).

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REFERENCES