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Reverse electronic auction web tool for B2B

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ABSTRACT

The processes of reverse auctions have proved useful and beneficial to both businesses and governments. The development of software applications in the field of B2B represents a challenging task for emerging economies. This paper presents various concepts, design stages, development and implementation of a particular reverse auction solution. A website construction, namely www.almejor.com, is the result of private initiatives in conjunction with university workforce. The joint efforts resulted in an innovative application in the context of E-procurement. The tool ensures the existence of an effective channel to improve processes between suppliers and customers. This is a web-environment solution that facilitates management of purchases through reverse auction.

1. Introduction

Economic globalization has led markets to find new tools so as to set up new businesses and so has promoted the introduction of new communication technologies that favor a transition process from traditional economy to electronic-based economies. In this context, the incorporation of ICT implies adopting an organizational redesign approach intended to change the traditional administrative techniques and replace them with other strategies that integrate knowledge and information systems.

The new tools and applications that result in enhanced connectivity, together with particular web relationships, are also changing the expectations of people, both as commercial consumers and as citizens. The influence of technological changes goes beyond the specific applications that merely improve governmental efficiency, also improving transparency and response capabilities. Information technology has a great potential to change power hierarchies and responsibilities as well as controlling governmental processes, private-sector organizations and citizens [1]. Critical factors to implement innovative processes based on e-commerce models include ICT acquisition by companies and the ability of human resources to work with such tools [2].

The impact of e-commerce as a driver of strategic decisions within the B2B (Business to Business) domain is well documented. There is consensus about the influence of the Internet as a platform for the development of alternative/supplementary distribution channels [3]. In recent reports [4], namely América Economía Intelligente, a second part of studies about e-commerce in Latin America was published. These studies focused on the structural factors that determine the region's potential in terms of e-commerce. The potentiality of the whole region experienced an increase of 33% when compared to previous years, placing particular emphasis on economical growth, which requires improvements in aspects like technological adaptation, infrastructure, market volume, access to banking services and the strengthening of the local demand.

With the emergence of the Internet, and considering the impact of information and communication technologies on any market, many enterprises and public institutions have opened new opportunities for saving costs and increase efficiency supported by electronic-trading sites. In many organizations, procurement costs constitute a major part of the total costs. Buyers look for lower prices of goods and services, faster purchasing cycles, shorter order processing and fulfillment cycles as well as lower administrative costs. On the other hand, suppliers wish to have new distribution channels, a wider customer data base, and new means to increase sales, reduce excess inventory, and reduce the cost of goods/services for sale. The use of E-procurement applications is expected to provide these benefits for both buyers and suppliers [5].

Through the use of technological tools we will propose an e-commerce-based model, which will facilitate interaction and

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control through an electronic business portal (website). This portal is intended to develop commercial aspects and production services throughout a particular supply chain.

2. Background

E-commerce is the buying and selling of products or services through electronic means such as the Internet and other information-based networks. The application and use of e-commerce makes it easier for sellers to access tight segments of the market that are widely spread while buyers enjoy the benefits of having access to global markets with a bigger stock. This ultimately helps to improve the quality of products and contributes to creating new forms of business [6].

Commercial activities through electronic means have increased significantly since the spreading of internet services [7]. A great variety of commerce events are conducted this way, promoting the creation and use of novel tools such as the electronic funds transfers, the supply chain management, internet marketing, online transfer processes, electronic data interchange, inventory management systems and automated data collection. The role of supply management in organizations may have a direct impact on firm performance, especially in terms of cost reduction [8,9].

Electronic integration has caused dramatic changes in the definition of enterprises, e.g. the appearance of virtual enterprises whose ability to offer products for the market is defined to a large extent by its ability to organize and manage a business relationship network instead of relying on its ability to manufacture a product or offer a service.

The aforementioned electronic integration covers both the configuration of virtual enterprises and the generation of inter-organizational networks. This requires significant levels of trust between information systems and the convergent participation of several organizations (either virtual or not) to deal with a certain market [10].

Provided that the Internet is an effective channel for business, several suggestions have been made about the way in which enterprises should develop an e-commerce strategy.

E-procurement can then be described as the electronic integration and management of all procurement activities including purchase request, authorization, order, delivery and payment between a purchaser and a supplier [11]. E-procurement can then be viewed as e-processes within e-commerce [12], namely processes that define priorities, rules, interfaces and sourcing.

The application of models like e-procurement provides conditions to reduce transaction costs for organizations, including buyers and sellers. Initially, the first e-procurement tools were designed to facilitate the search of products in the Internet and to allow buyers to send their shopping orders by using electronic catalogs. Some of the advantages of e-procurement technologies include the following: improved information coordination with suppliers, lower transaction times, lower costs, higher flexibility, and better supplier integration [13,14]. Enterprises are increasingly considering procurement as a strategic-level concern for developing competitive advantages [15].

E-procurement encompasses a number of specific elements, including e-sourcing, e-coordination and e-communities [16]. E-sourcing includes forward and reverse electronic auctions and online bidding and tendering, which are also referred to as electronic requests for quotations or proposals [17]. In a reverse auction, multiple suppliers are vying for a single buyer, thereby decreasing prices, so that the supplier that had the lowest offer wins the auction [18]. In contrast, traditional auction usually involves a seller offering one or more items for sale while potential buyers complete with each others for purchasing an item of common interest [19]. During this type of competition, the price increases until no buyer is willing to go any higher. Potential benefits of reverse auctions include: reducing direct costs, clearly establishing market prices, shortening cycle times and expanding aspects like reach, price visibility and market knowledge [20].

Increasing the use of e-procurement may improve the transparency and accessibility of tender opportunities and thus increase the participation of SME, contributing to the promotion of greater competition across a particular market as well as providing new sources of economic growth and employment. The implementation of this kind of solutions in the Latin-American context represents an innovative proposal [21] since governments and enterprises are promoting electronic hiring.

The national government procurement agency conducted a study that included 18 Latin American and Caribbean countries [22]. The evidence reported in this study indicates that Chile, Costa Rica, Argentina and Mexico bear top ratings in many aspects. Countries other than Jamaica, Grenada Antigua and Barbuda achieved scores above those associated to Basic Functionalities (including characteristics associated to front-offices, increased number of buyers, suppliers, and a unique record strategy that minimizes the risk of fraudulent transactions). This suggests that most countries already have interactive business portals. Colombia obtained a surprisingly low score regarding "Institutionalism and organization of acquisitions", particularly when compared to Colombia's high scores in other assessment aspects.

3. Proposed solution

Business-to-business (B2B) electronic reverse auctions appeared first in the mid-1990s and since then have dramatically changed corporate sourcing practices. This type of auctions has become an alternative way to procure goods and services among firms representing a widely applied business model for conducting B2B e-commerce [23].

The conditions required for success in reverse auctions are clear and comprehensive specifications of product or service, a purchase large enough to provide an incentive for the supplier to participate and appropriate supply market conditions and infrastructure [24]. A reverse auction should be considered a tool within the strategic sourcing process [25].

Based on research evidence, we created a business portal (website) that provides users with access to a sales channel in a quick and simple way. The portal allows users to interact with enterprises from all economic sectors, which represents a suitable solution within the whole buying and selling process with complete transparency and security [26].

Fig. 1 shows the portal's user interface. Fig. 2 illustrates a mental map of the application as a knowledge instrument that represents the functionality of the application.

Portal www.almejor.com is an electronic commerce channel that proves effective, profitable and capable of creating and addressing new commercial and saving opportunities as part of the production processes of enterprises. The portal also provides fair chances for everyone to access the same market opportunities, creating a state of perfect competition.

The portal is intended to improve performance regarding the following aspects:

- Providing a modern business platform that satisfies the needs of the business sector through the most suitable available technologies.
- Creating a modular technological solution that is interoperable [27] and distributable into layers, admitting multiple clients (interfaces).

Fig. 1. User interface.

- Creating a technological solution to take advantage of the transactional licensing environments and implementations under a particular software model (provided as a service).
- Creating a technological solution with a product-oriented vision, subject to the type of management of its life cycle. This approach makes it easier to maintain and develop new characteristics by integrating multiple clients. The approach also simplifies the construction and distribution of updates and revisions, allowing full control of such aspects.
- Incorporating concepts like usability and user experience into the development of products.

3.1. Conceptual model

Purchase transactions through the portal are carried out using the electronic reverse-auction mechanism and sales operations together with traditional electronic auctions. The behavior of the portal for both operations is virtually the same, since the only modification is the user's change in terms of roles (either buyer or seller). Fig. 3 shows how the purchase operation is carried out.

Portal www.almejor.com is an efficient tool for completing the corresponding processes behind the purchase of goods and/or services. The portal provides customers with financial, operational and administrative benefits. The advantage is that these benefits can be transferred to those users that act as suppliers, since they can also use the tool for their purchases. This occurs with each of the users involved in the supply chain. These circumstances favor the appearance of significant savings in the purchase processes.

This last feature allows developers to reuse the software components and thus avoids the need for recurring investments in terms of time and money [28]. In addition to this, the profitability of the enterprises also rises due to the decrease in costs. This situation allows enterprises to reduce their sell prices and so become more competitive. This situation also implies that the costs associated to the supply chain experiment reductions and achieve an increased profit for all users involved.

The competitive advantages offered by the portal include verification and classification of users, safe policy-compliant transactions, a search engine with more than 21,000 standard products, access to new markets for users (through a network of businesses with purchase and sell aims), a low cost distribution channel (which allows quick introduction to value chains), information delivery with the same conditions to all users, operational reports through e-mail and work session in the portal. All these features are enabled for purchases since the portal manages legal provisions and contains analysis tools and tutorials for the correct evaluation and execution of purchase processes.

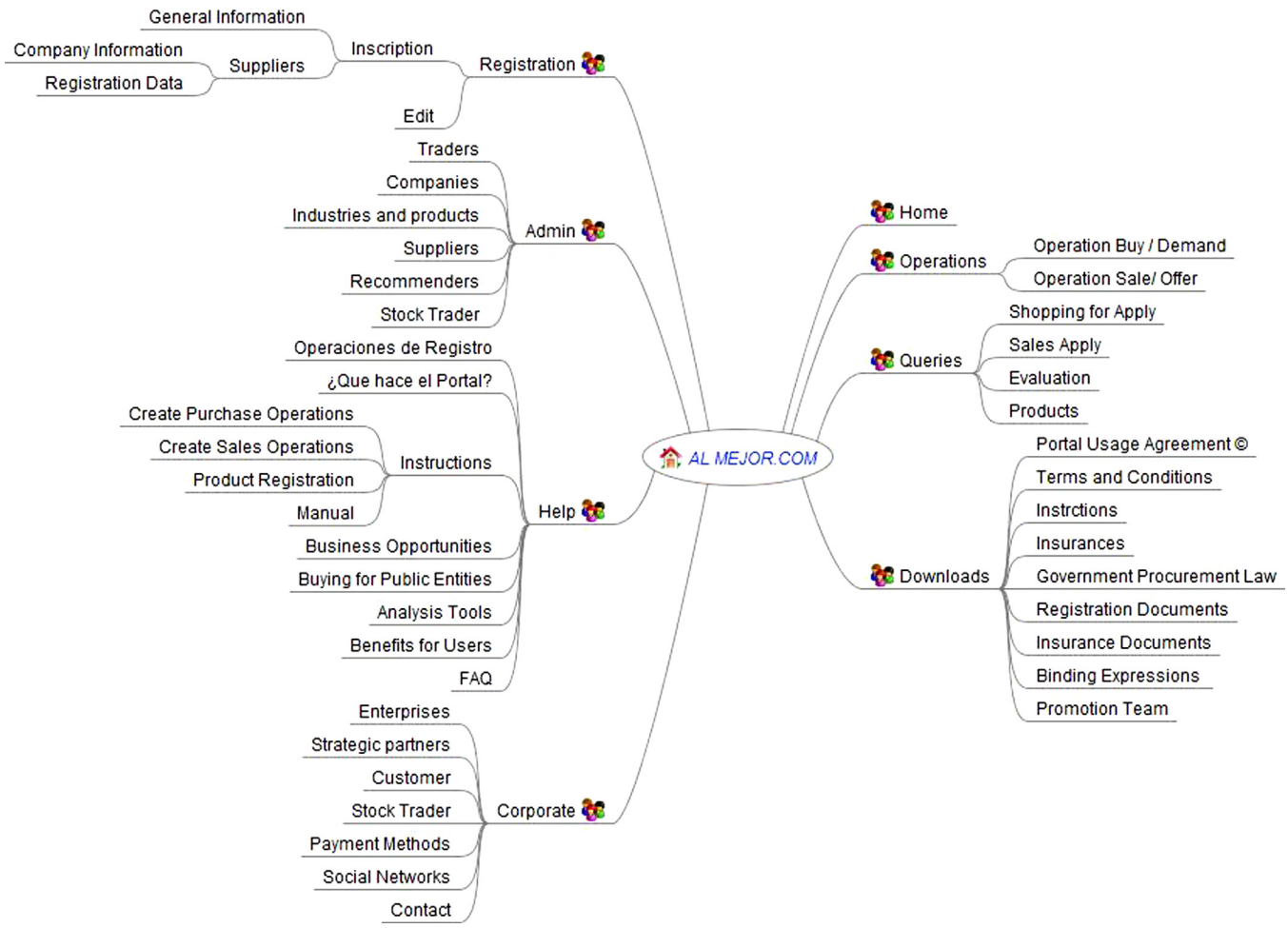

Fig. 2.

3.2. Technical aspects

Portal www.almejor.com is a Web application [13] that can be accessed through Internet. The production environment is a Hosting scheme with one (1) application server, where a Web application is installed, and one (1) database server. This environment includes also one (1) Windows service, which is in charge of closing purchase and selling operations. The operations are to be completed in a background process according to time intervals established by users.

The application's architecture resembles a three-layer architecture that consists of the presentation layer (for accessing the portal through web forms and Infragistics presentation components), the application layer (containing the business logic and a Windows service), and the data layer (which includes the database for the business scheme).

The portal was developed using technologies such as ASP.NET, Infragistics ASP.NET Controls, NET Framework SP1, Ajax, Visual Studio TeamSystem, and SQL Server.

Fig. 4 shows a functional overview of the system, Fig. 5 describes the deployment view for the application, Fig. 6 shows the design of the technological platform. Fig. 7 and Table 1 show classes within the System and their corresponding description.

4. Experience and growth of the portal

Portal www.almejor.com emerged as a business idea to provide enterprises with the mechanism that would ensure proper supply

Table 1
Classes and description.

Class	Description
Operation	Base class representing the information of the purchase or sell operation, containing the basic attributes
Inverse auction	Class derived from the base class Operation. This class represents the information of the purchase operation
Auction	Class derived from the base class Operation. This class represents the information of the sell operation
Enterprise	Class that represents the information of the companies involved in the operations
Supplier	Class that represents the information of the supplier regarding the enterprise that is registered in the portal
Product	Class representing the information of the product associated to the purchase or sell operations
Unit	Class representing the information of the unit where the product is required for the purchase or sell operations
Sector	Class that represents the information of the economic sector the product belongs to
Score	Class that represents the score obtained by the supplier based on the fulfillment of the operation's conditions. This score is given when the operation is about to be closed
User	Class representing the information of the user accessing the portal. The user is associated to an enterprise

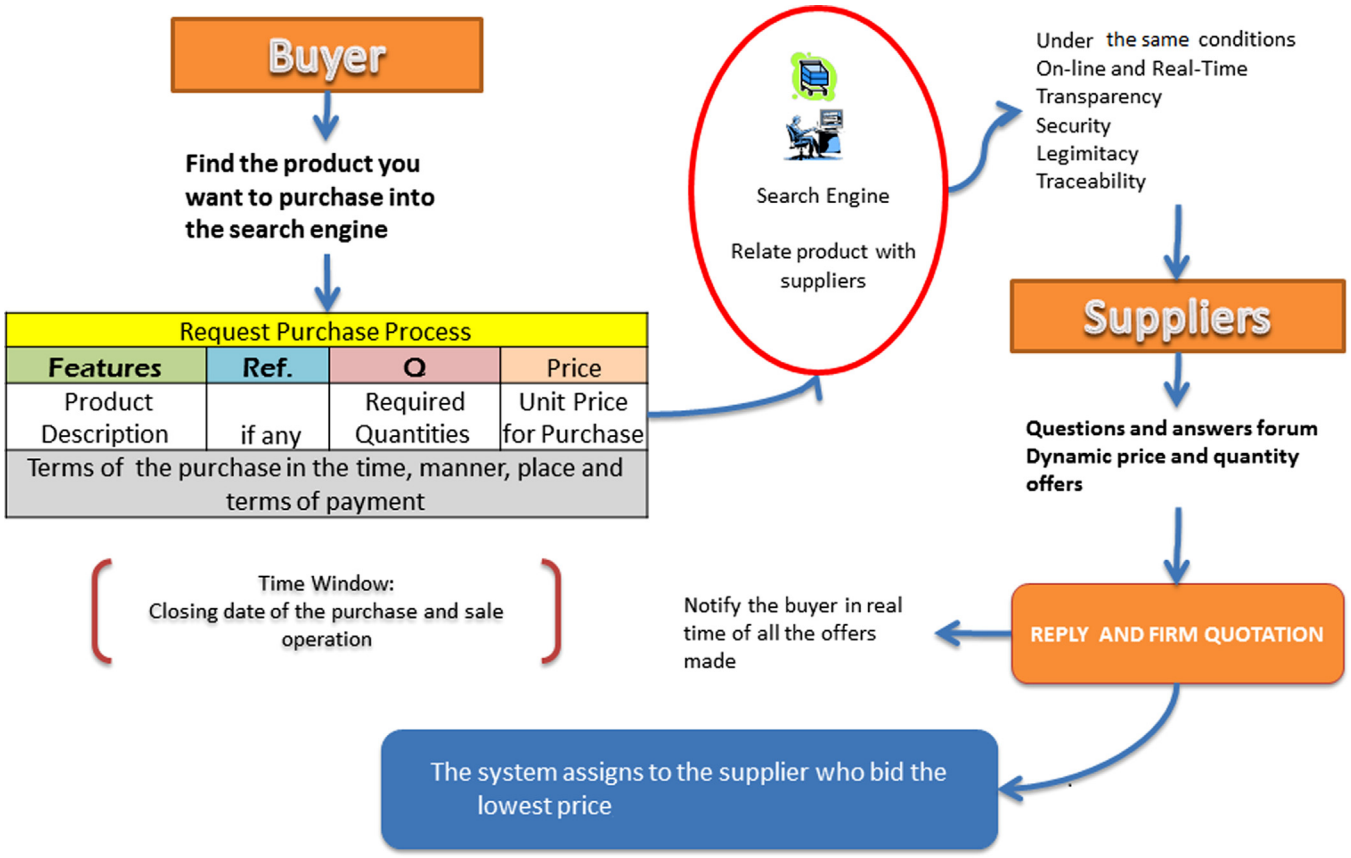
Buyer
Find the product you want to purchase into the search engine
Request Purchase Process
Features
Ref.
Q
Price
Product Description
if any
Required Quantities
Unit Price for Purchase
Terms of the purchase in the time, manner, place and terms of payment
Time Window:
Closing date of the purchase and sale operation
Search Engine
Relate product with suppliers
Under the same conditions
On-line and Real-Time
Transparency
Security
Legimitacy
Traceability
Suppliers
Questions and answers forum
Dynamic price and quantity offers
REPLY AND FIRM QUOTATION
Notify the buyer in real time of all the offers made
The system assigns to the supplier who bid the lowest price

Fig. 3.

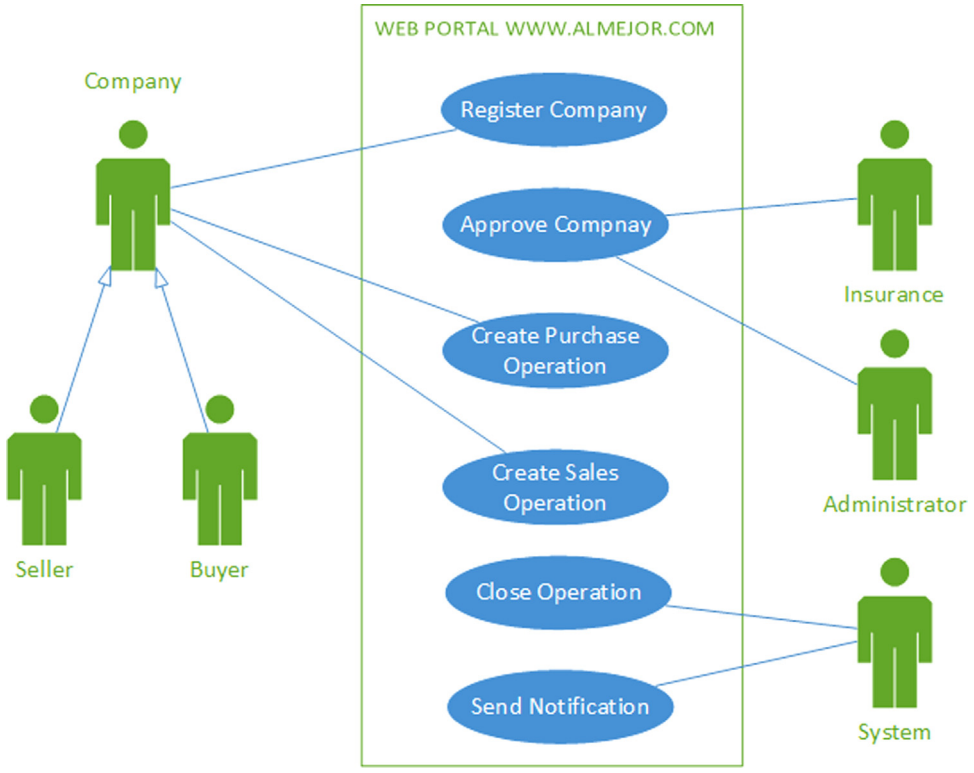
WEB PORTAL WWW.ALMEJOR.COM
Company
Register Company
Approve Compnay
Create Purchase Operation
Create Sales Operation
Close Operation
Send Notification
Seller
Buyer
Insurance
Administrator
System

Fig. 4.

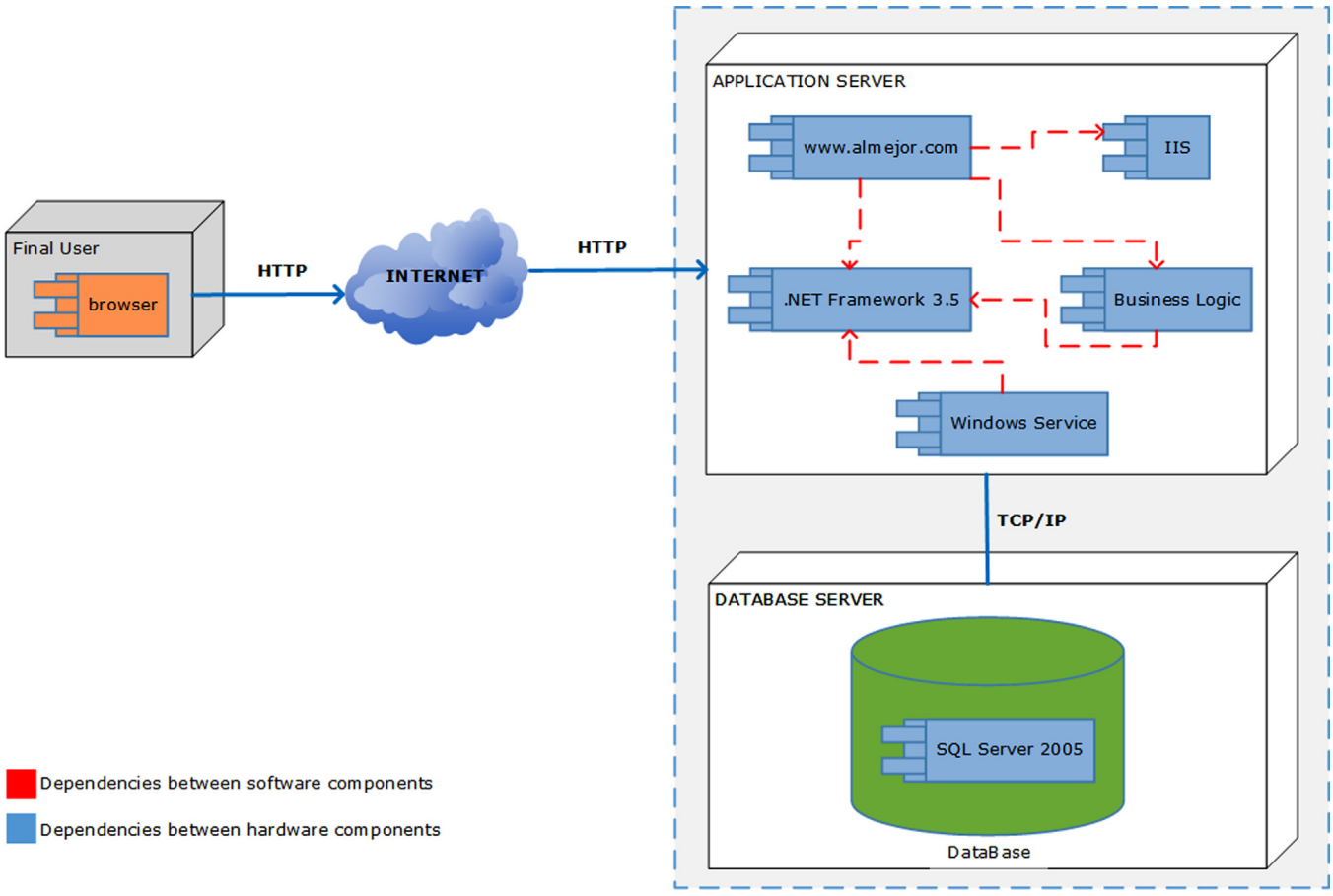
APPLICATION SERVER
www.almejor.com
IIS
.NET Framework 3.5
Business Logic
Windows Service
Final User
browser
HTTP
INTERNET
HTTP
TCP/IP
DATABASE SERVER
SQL Server 2005
DataBase
Dependencies between software components
Dependencies between hardware components

Fig. 5.

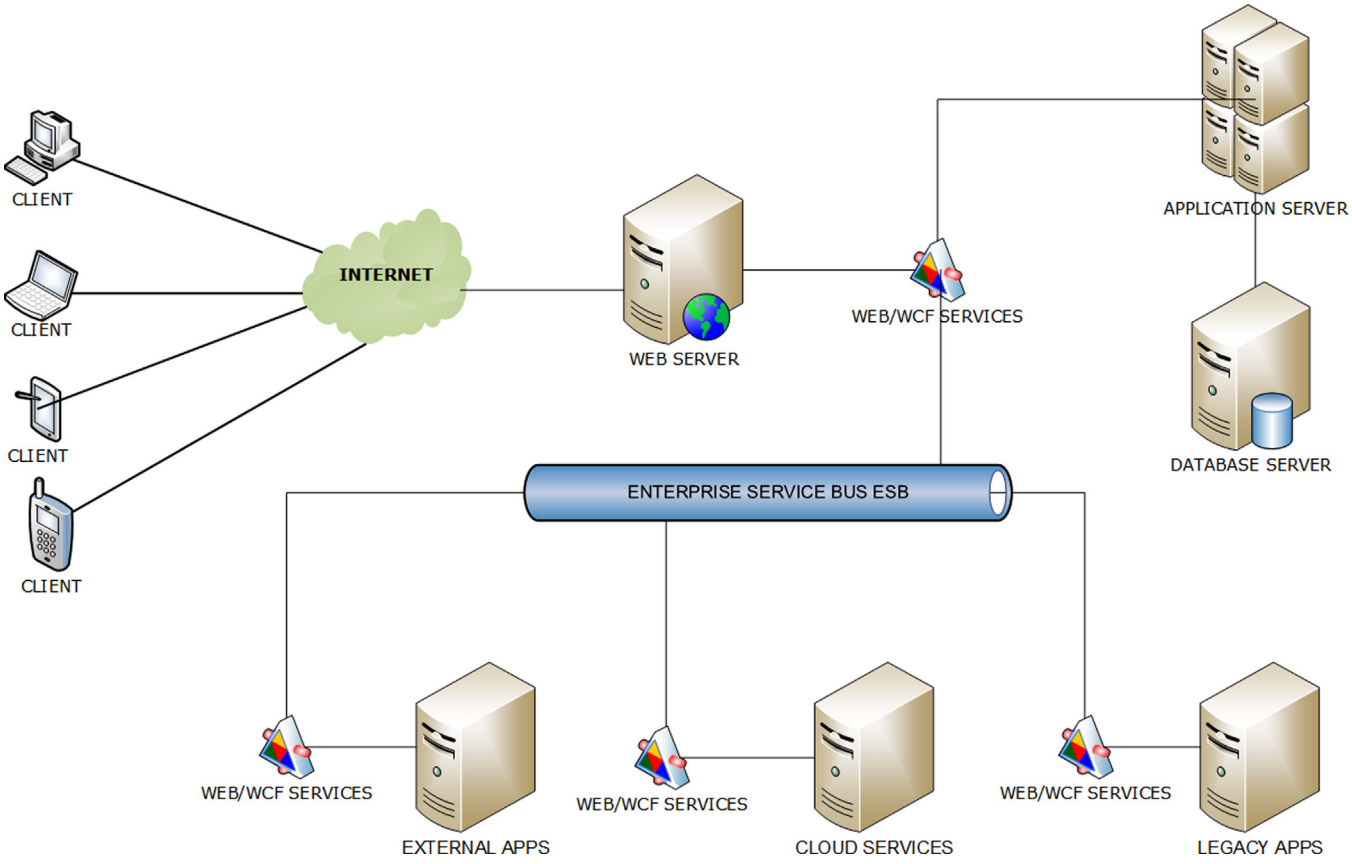
CLIENT
CLIENT
CLIENT
CLIENT
INTERNET
WEB SERVER
WEB/WCF SERVICES
APPLICATION SERVER
DATABASE SERVER
ENTERPRISE SERVICE BUS ESB
WEB/WCF SERVICES
EXTERNAL APPS
WEB/WCF SERVICES
CLOUD SERVICES
WEB/WCF SERVICES
LEGACY APPS

Fig. 6.

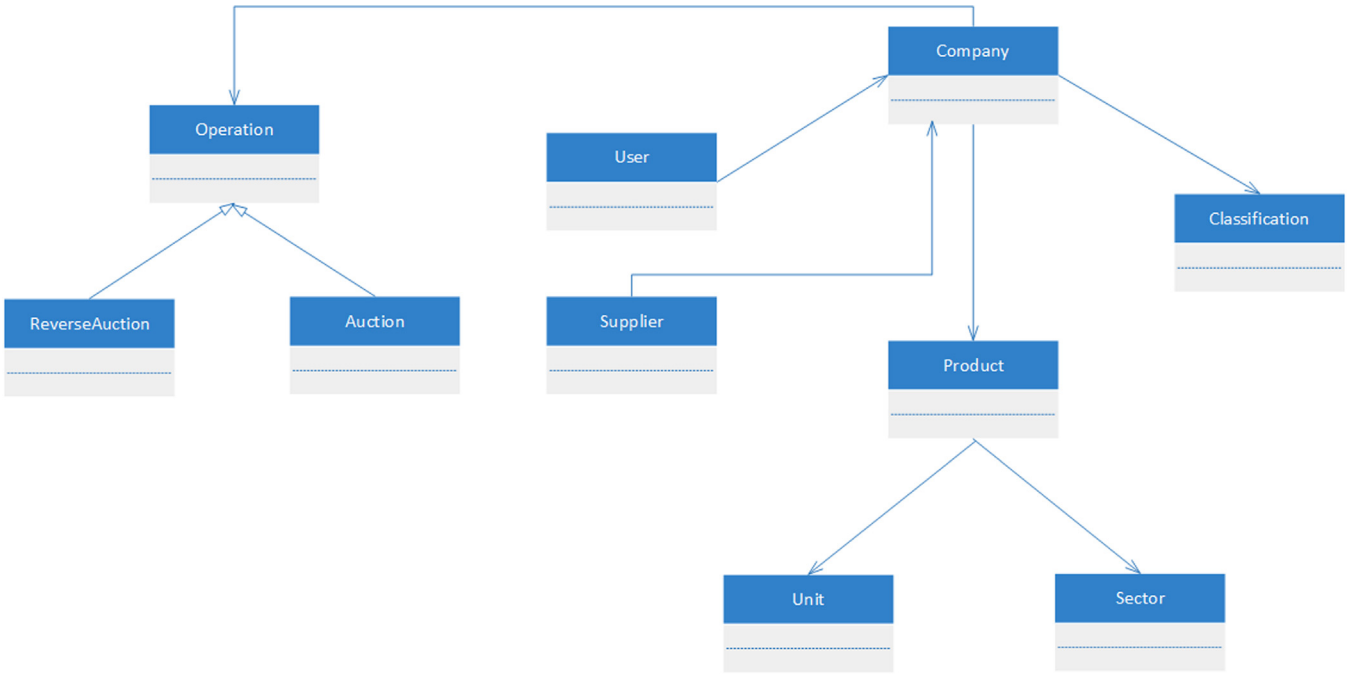

Fig. 7.

of goods or services under the best acquisition conditions. This also promotes access to the demand of goods/services that exists in a particular market in a timely, confident and transparent way. This approach has received support form Colombian research group in e-commerce Gicoecol, at Universidad Distrital Francisco José de Caldas (Bogotá, Colombia).

The initial development focused on basic functionality in order to attract potential investors to the business plan and model proposed. In addition to previous information, social networks like Facebook are used as a way to introduce the portal and also to communicate events such as business conferences involving various economic sectors.

The portal has one hundred and fifty (150) registered users enabled to carry out operations. Within the portal, it is important to have strategic partners for developing a business plan and a particular economic activity. The partnerships can be divided into three (3) classes, namely Technological, Operational and Commercial.

4.1. Benefits for buyers

One of the main benefits is that the portal allows access to market information through direct links that connect users with those sellers wishing to provide buyers with their target products in a direct fashion and with no intermediaries. This benefit is obtained since the portal represents a direct link for thousands of suppliers with the sole intention of safely negotiating and buying specific goods online.

Another benefit lies in the possibility of carrying out purchase processes for more than 21,000 standard goods and services in an agile and dynamic way, namely the use of a transparent and dependable tool for performing purchase processes, connecting buyers with the supplier offering the best price for certain desired products. The portal relies on a service that offers security based on an insurance policy issued by a known local insurance company. This allows easy manipulation of options like programmed buying-processes in a way that benefits users' cash flow. The automation of the purchase system helps to reduce times and costs when performing buying processes, having the same effect in the administrative expenses and introducing an increase in the reliability and information accuracy. The system also offers automatic formalization of the buying process right at the exact moment it ends; furthermore, it is possible to easily obtain reports regarding transparent purchase management, traceability and confidentiality throughout the entire buying process.

4.2. Benefits for sellers

These benefits include access to all the information related with the client's requirements in a transparent, timely way and under the same conditions of other buyers. Additionally, the portal offers quick response for the received purchase requests together with greater business possibilities derived from the opening markets provided by the system. The portal is intended to become the preferred communication channel due to the possibility of accessing a greater number of clients under the same conditions as other enterprises. The sale process offers transparency and reliability and there is a good negotiation environment between sellers and clients. Other advantages lie in the quicker access to information regarding the exact situation and demands of the market as well as in the reduction of administration costs. This is possible due to the integration and automation of purchases managing processes. Moreover, fewer products are returned, since processes ensure purchase reliability. Finally, customers will rely on a service that offers security through an insurance policy issued by a known local insurance company.

5. Successful use cases

In July 2011, Dorado Investments conducted four (4) purchase operations for the tourist accommodation sector (mattresses, safe boxes and mini bars) obtaining, on average, a savings rate of 27.67% from the initial purchase budget. As a result of these purchase operations, 18 suppliers registered in the portal. In April 2012 a project for the provision of 1500 shops (Fenaltiendas) begun. This project is currently in its initial supplier phase, and purchases are

Table 2
Operation results.

Purchase	Quantity	Budget (EUR)	Purchase value	Net savings	% Saving
Spring mattresses	94	35 292	30 241	5051	14.31
Spring mattresses	96	26 031	14 417	11 614	44.62
Chairs and furniture	150	25 030	24 022	1008	4.03
Refrigerators–mini-bars	142	38 504	21 633	16 871	43.82
Total		124 857	90 313	34 544	27.67%

expected to begin in July 2012. Table 2 offers information related to the previously mentioned operations.

6. Conclusions

Reverse electronic auction offers benefits such as cost savings for organizations, increased competition, real -time market pricing, time savings, process efficiency, an increased number of suppliers, and sustainability of cost savings, among other benefits. Moreover, reverse auctions allow vendors to improve access to new markets and new competitors while working toward ensuring a fair playing field in which small businesses can effectively compete.

Electronic Reverse Auctions have become a strategic sourcing toolkit, allowing goods and services that are highly standardized to have sufficient volume and to be replicated by a reasonable number of qualified competitors, entailing insignificant switching costs.

Unlike procurement in the private sector, public sector procurement requires bureaucratic procedures to be followed due to the very nature of such institutions. A key characteristic of the public sector lies in the regulation of procurement processes by local, regional, national and international authorities. The solution presented herein is the result of an academic initiative intended for business ventures in both the public and private sector.

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