International Journal of Management and Economics Invention ISSN (e): 2395-7220
||Volume||4||Issue||02||Pages-1652-1659||February-2018||
Index Copernicus ICV: 72.76, DOI: 10.18535/ijmei/v4i2.04

Implementation of the Architectural Level of an Integrated Web-Based E-Commerce Management System

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Abstract: The work has developed mechanisms for implementing the architectural level of the integrated Web-based e-commerce management system. The architectural organization of information systems of the enterprise management loop is implemented on the basis of SOA and ESB technologies. To integrate the information systems of the management loop of web-showcases was implemented the MVC method and ASP.NET MVC Framework technology. Presented the scheme for organizing the interaction of subjects of e-commerce in the framework of the functioning of the Web-system. Modern software is chosen as a means for software implementation of the Web-system: MSSQL, ASP.NET MVC Framework, ADO.NET Entity Framework, MS IIS 7.0 and software programming language C#.

Keywords: e-commerce, architecture model, integration technologies, Web-based e-commerce management system

I. INTRODUCTION

The processes of trade globalization lead to the creation by large operators of the market of multi-brand stores and hypermarkets with the aim of increasing turnover and reducing costs through the sharing of common resources. New trends are reflected in e-commerce, causing the consolidation of companies, the emergence of online stores networks, allows to increase turnover and differentiate the trading strategy based on an almost unlimited number of online showcases.

Automating the mechanisms of management of large-scale business processes, which directly affects the effectiveness of e-commerce systems, remains one of the most difficult problems for large enterprises of electronic commerce [1, 2]. Known theoretical and practical solutions for small and medium-sized businesses do not meet the requirements of large companies, their functions and development tools, as well as the level of integration of the Web environment and enterprise management systems of electronic commerce.

Effective IT support for large-scale e-commerce systems is constrained by the architecture and capabilities of information systems that are not focused on the creation of a linked electronic trading network. Launching new Web-stores is generally accompanied with provision of redundant IT infrastructure leading to the increase of maintenance costs, misallocation, worse process governance and considerable losses. This problem is especially topical in the field of managing goods

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flows in the network of online stores with an assortment of hundreds of thousands of positions.

The development of models and methods for constructing integrated information systems for the automation of business processes of large e-commerce enterprises remains relevant due to the emergence of new mechanisms and tools for electronic commerce. Therefore, the considerable interest of scientists in the problem of the functional, architectural and technological integration of the information environment as the basis for building effective management systems for the economic activity of large electronic trading enterprises is fully justified.

II. MODELS, METHODS AND TECHNOLOGIES OF INTEGRATION

The basic architecture of the integrated Web-based e-commerce management system is developed in accordance with the architectural model presented in Fig. 1. The architectural level of the Web-based e-commerce management system is implemented as follows. Information environments within the framework of enterprise management (EM) and showcases management (SM) loop are integrated according to the "point-to-point" pattern. Integration is achieved through the use of common data, the logic is placed on the level of the database management system. EM loop is integrating for typical information systems (IS), and SM loop – for online stores network. The integration pattern "bus" is implemented on the basis of SOA [3] and ESB [4]. IS of EM loop and IS of SM loop are separated and interact at the information level only through the architectural and technological implementation of the communication through the "point-to-point" pattern. At the same time, the separation of information environments, which is provided by the developed architecture and methods of integration, is achieved, among other things, by the organization of network infrastructure. To protect information exchange channels, various encryption technologies and methods can be used, such as the organization of VPN over IPSEC channels [5] or the hardware method [6]. External connections to environments are not allowed, except for direct interaction with end users through the web-interface.

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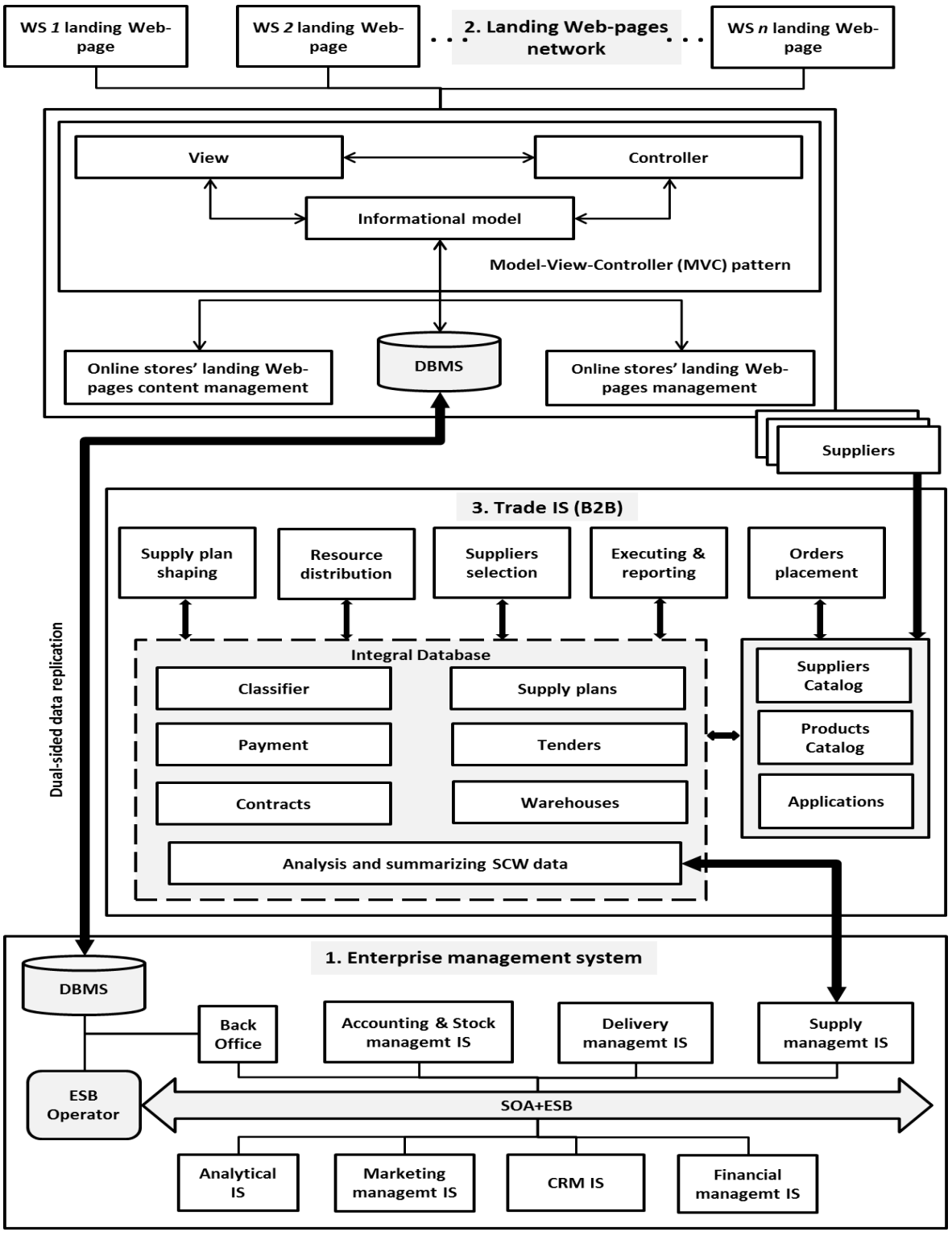

Figure 1. Architecture model of integrated Web-based e-commerce management system

Thus, the principle of separation of information loops of an integrated Web-based e-commerce management system is implemented both at the architectural and network level. The software

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objects of information environments are separated, and the core entities (for example: "goods", "user", "route") are defined in such a way that their structures remain relevant, at any time for both environments, by storing structures and data processing functions in the database management system. Algorithms and programs of the environments use their own copies of data and two-way data replication.

In integrated Web-based e-commerce management system (Fig. 1), implemented a central control IS that uses to provide aggregation of data from typical IS systems for managing databases MSSQL 2008 [7], and has its own application interface, created using the software programming language C#. The logical functions of the database management systems are combined with the logical functions of the SM IS and are identical. Thus, full connectivity with distributed copies of IS management of online stores showcases is achieved.

The interaction of interactive elements of the Web-system interface with the database is realized on the basis of ADO.NET Entity Framework [8, 9]. The event management pattern is implemented by an ESB controller developed on the basis of MS IIS 7.0 [10]. The connection to the ESB controller is performed through a special secure gateway based on the Openssh encryption protocol [11], which uses public and private keys and 256-bit cryptographic protection of messages.

Direct communication increases the efficiency and uniqueness of the operation of the control loop. The central management IS is integrated on the basis of SOA [3] and ESB [4] mechanisms. The central control IS aggregates data representations from other ISs and provides them to users. For operational work and communication with the database, an open gateway is used based on XML exchange [12] with the ability to encrypt data packets. The gateway is a php-interface that provides the generation of queries to databases and the generation of query results [7, 13]. The connection between the Web application and the php-gateway is via the http protocol. Based on the parameters of the GET method HTTP protocol, corresponding database requests are generated [13]. Resulting samples are serialized in *.JSON format, to be sent to a Web application. To save data in the database, the Web application forms an object in the *.JSON format, the php-gateway deserializes the object received by the HTTP protocol POST method, and also creates the corresponding database queries (REPLACE or UPDATE) [14]. The same gateways use the typical IS, included in the EM loop.

Thus, due to the universal transformation of data packets of typical IS, it is possible to aggregate their data into the database management system of the central control IS. According to the developed methods and models of integration, the connection of additional ISs to the EM loop is allowed not only to the ESB bus, but also from the point-to-point pattern. Such integration technology is used in case the data of the new IS that is integrated is not needed for the operation of other IS of the loop.

To implement the integration EM loop was applied MS IIS 7.0 (Microsoft Internet Information Services) [10]. To integrate the SM loop IS applied the “star” pattern based on the MVC framework and ASP. NET MVC Framework technology. Such programs work closely with developed applications to implement web sites as client-side applications. To manage the markup and code insertions in the view, use the Razor view generator [15]. MVC-framework is the basis for the implementation of showcases of online stores based on MS IIS 7.0 technology [10].

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The main component of MS IIS 7.0 is a web-server that allows you to place web-sites on the Internet. MS IIS 7.0 supports protocols HTTP, HTTPS, FTP, POP3, SMTP, NNTP [10]. Web-server MS IIS 7.0 - this is essentially a WWW service that provides clients with access to sites via HTTP protocols. One MS IIS 7.0 server can serve a certain number of web sites (MS IIS 7.0 and higher). Each website has the following attributes: the IP address of the site, the TCP port on which the WWW service is waiting for connections to this site, and the host name (Host header name) - the value of the Host header of the HTTP request, indicating, as a rule, the DNS name of the site.

Thus, one MS IIS 7.0 server, with a single IP address, can serve multiple sites on a single TCP port. To do this, create several DNS records that point to the IP address of the server and distinguish the sites by the host name. Web server MS IIS 7.0 provides several ways to differentiate access to sites and web applications. The WWW service in MS IIS 7.0 differs from other web-servers in that the security functions in it are closely integrated with the Windows operating system, on the basis of which it functions. In particular, to gain access to a protected resource, a visitor must enter the user's login and password that exists in the Windows operating system on which MS IIS 7.0 is installed. After that, the user works with the web-site in the same way as when performing interactive login to the Web-system on the server. MS IIS 7.0. supports such authentication mechanisms [10]:

- Basic access authentication - login and password are sent to the network in plain text;
- Digest access authentication – procedurally, the user's password is processed by a hash function before being sent over the network, which makes it impossible to reproduce the password in case of interception;
- Integrated Windows Authentication - the authentication on the web server is performed directly on the credentials under which the user's browser is running;
- NET Passport Authentication - authenticated by the network user ID.

The main advantage of MS IIS 7.0 is that all configuration information is stored exclusively in configuration XML files, not in the metabase. The server has a global configuration file that contains the default settings, and each root virtual web directory (as well as its subdirectories) can contain a web.config file in which the global settings are expanded or replaced. Changes made to these files are immediately effective.

MS IIS 7.0 administration is implemented on the basis of modern MMC-technology (Microsoft Management Console) [10] with its advantages such as the taskbar and asynchronous operations, with ASP.NET settings even more integrated into the administrative interface of MS IIS 7.0. MMC is a technology that is aimed at solving the problem of unification and standardization of the administration process. With this technology, you can programmatically create management tools that have a unified graphical interface. This technology provides the ability to build a single integrated management environment for the entire corporate infrastructure [10].

III. SCHEME FOR ORGANIZING THE INTERACTION OF SUBJECTS OF E-COMMERCE

The integrated Web-based e-commerce management system, which includes a network of online stores, directly integrates, manages and organizes the interaction processes of e-commerce

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entities. In Fig. 2 presents the scheme for organizing the interaction of subjects of electronic commerce within the framework of the integrated Web-based e-commerce management system. Within the functioning of the Web-based e-commerce management system, the integration of the interaction processes is carried out at three levels: the level of customers, the level of online stores and the level of the Web-system for managing interaction in electronic commerce (Fig. 1). Customers directly interact with the online store, viewing goods and services, ordering and buying goods, selecting various delivery services for purchased goods. To carry out the purchase procedure, the customer must be registered in the system. In the developed Web-system, customer registration can be carried out in a variety of ways (convenient for customers). For example, registration by phone, e-mail, residence address or payment card number. The main requirement for registration is the availability of uniquely identifying information. It should be noted that the registration of customers can be carried out automatically when placing an order or in the mode of filling in a registration form with a set of client data.

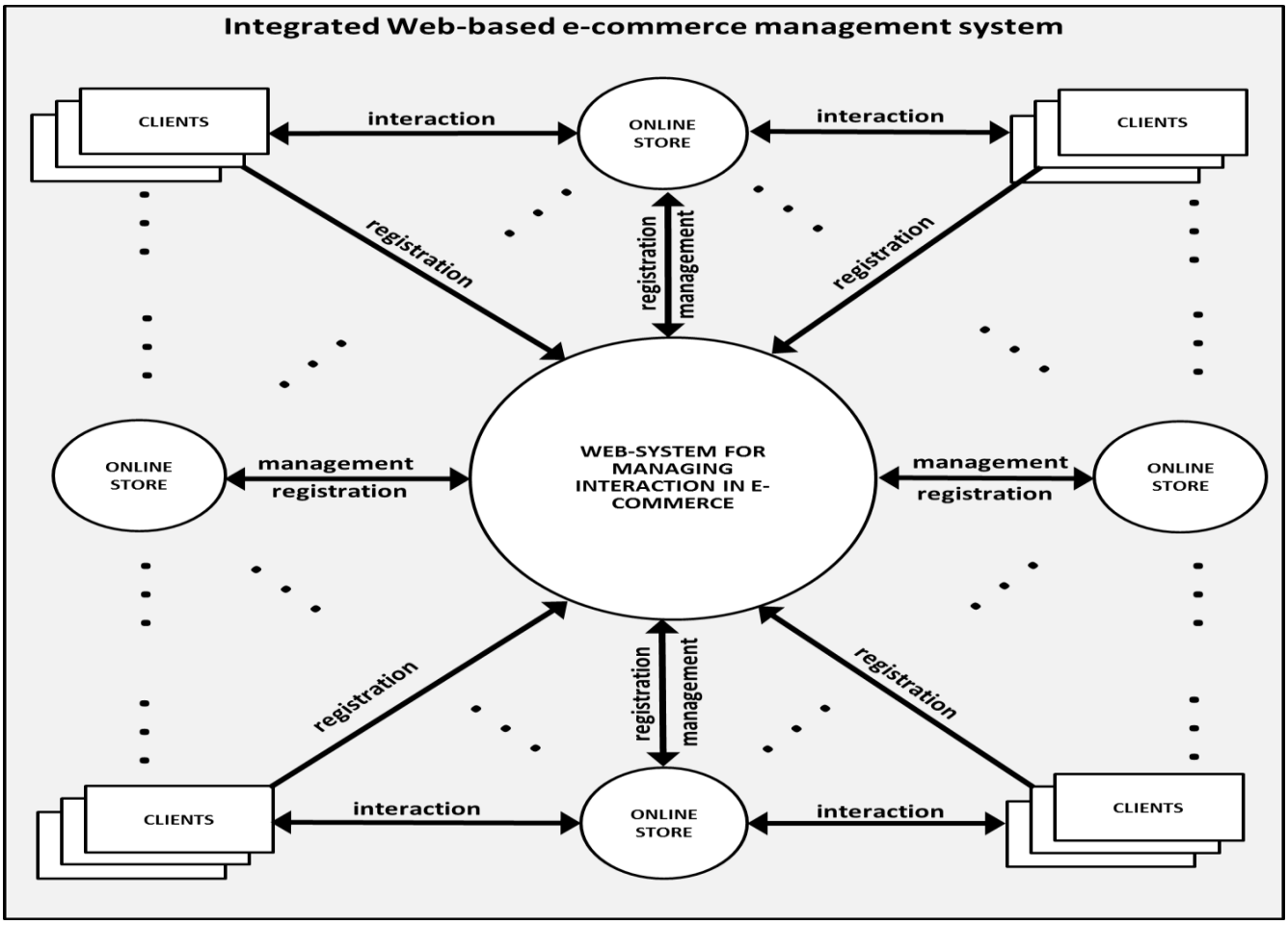

Figure 2. Scheme of organization of interaction between subjects of e-commerce in the framework of an integrated Web-based e-commerce management system

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Thus, a unique identifier is created to which the statistics of the indicators for a specific client are attached, which allows to determine its consumer priorities and build effective mechanisms for interaction with the client.

The online store interacts with customers and is managed using a Web-based e-commerce interaction management system. Web-based system for managing interaction in electronic commerce, implemented on the basis of the architecture model of the integrated Web-based e-commerce management system, which is presented in Fig. 1. To create and maintain an online store, you need to register in a system with a "manager" access level. When registering an online store, the responsible person (usually the store manager) enters information about the online store, responsible persons, contact information, etc. And only after completing the form, registration and confirmation by the administrator of the access level "manager" to the resources of the Web-system, the procedure for creating an online store Web page for a standard template is activated and access to the resources of the Web-based system for managing the interaction of subjects of electronic commerce is provided. After that, the manager, carries out the content of the Web site of the online store and carries out the implementation of business processes in electronic commerce using the Web-based system for managing interaction in electronic commerce. Registration of another manager in the system, initiates the creation of a new online store with a typical template of the Web page, its database and separate access to the resources of the Web-system.

At the level of the Web-based system for managing interactions in e-commerce, carried out administrating access to resources and overall management of the integrated Web-based system, and also automation of settlement mechanisms and procedures of formation of routes of delivery of the goods and cross-browser support of work in a computer network the Internet is realized, that provides access to its resources of all geographically distributed users, regardless of location.

IV. CONCLUSIONS

Thus, the developed Web-based e-commerce management system is integrated not only at the architectural level through the use of standard IS and integration within a single system of enterprise control loops and showcases management, but also at the level of direct interaction between subjects of electronic commerce, combining business processes related to purchase / sale, customer service, online store operation and e-commerce management procedures in a single information environment.

V. ACKNOWLEDGMENT

This study was supported by the Ukrainian Ministry of Education and Science, Project No. 0117U000507, “Modeling the mechanisms of international e-commerce operation”.

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