

Collaborative Systems Aggregation

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Abstract: *It presents collaborative systems architecture and their similarities between them and web applications. It defines characteristics of e-commerce applications as collaborative systems emphasizing functional aspects. E-commerce applications are complex distributed systems expected to run smoothly commercial and financial transactions. There are described aggregation types of software processes. E-commerce applications need to use process aggregation to offer a range of web services in order to have competitive advantages. High quality e-commerce applications, based on strategic decisions, need integrate with one another to increase their revenues. Main goal of e-commerce integration is to add to customers experience not only a larger set of available functions but to increase their satisfaction degree. Experimental results on e-commerce applications are described.*

Keywords: *collaborative systems, integrability, aggregation, software, e-commerce.*

1. Collaborative systems

The key feature of collaborative applications and systems is the facility it offers, professional groups and economic entities, to initiate and manage joint flows and processing operations on a common data set. Document management applications are a good example for collaborative applications. A user, having access rights defined to application resources, create documents available to the working group document. Documents are accessed by other users with the right to view, change, by creating working versions. Provides facilities for retrieving documents based on multi-criteria access rights defined in the application on its individual documents or collections of documents.

From the architectural point of view collaborative applications differs depending on the number of composing modules and the way they are appeal one another:

- linear structure, figure 1, represents a cascade sequence to execute different components, first C_1 component is executed, after that C_2 component and last component C_n :

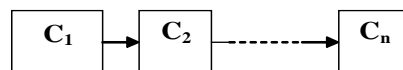


Fig. 1. Linear running scheme of components

- tree structure, in which the components are organized by level, this structure is appropriate when there is no need to launch all the modules at a time to meet a request, as appropriate with linear structure, so that the modules were built in a dependency tree in which nodes are represented by modules and arcs indicate the subordination of the way to another;

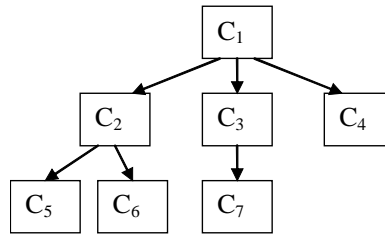


Fig. 2. Tree running scheme of components

- graph-type structure, there is a program coordinator working various processing sequences or chains of programming in this type of structure is defined: node originator, which has incident arcs outwards, but inwards, inner hub, which has both outer and inner arcs and the final node, which has incident arcs inwards but not outwards

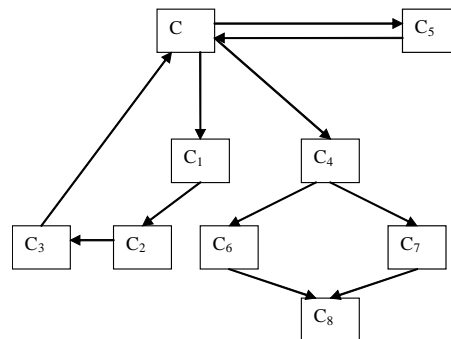


Fig. 3. Graph running scheme of components

In many of these structures, software quality features are identified and it gives a first insight into their complexity. For example, the level of modularity, which is reflected in the degree of software reuse, increases from the linear structure towards the network structure, with increasing complexity.

2. E-commerce applications as collaborative systems

E-commerce applications characteristics include:

- easy access to the Internet in terms of efficiency and performance;
- Factors related to privacy and security of transaction's data;
- difficulties in assessing the profitability of e-commerce applications as the foundation of investment decision in their implementation;
- applications with easy to use user interfaces, robust and suggestive;
- simple and consistent legal framework at national and international level, on the tax system, the commercial laws, customs and banking practices commonly used;
- environmental information to reduce cultural differences;
- extending the company's activity in various local markets, national and international, in order to maximize market share;
- reduction of costs associated to order management, stock inventory due to dedicated system information;
- quickly identify customers' wishes;
- reducing marketing costs by ensuring the presence on the Internet;
- reducing transport costs by optimizing distribution routes;

- available to customers 24 hours a day for transactions, covering also the time zone differences;
- customers are better informed through product comparison tools, ads and contact real time via electronic mail;
- customers are able to find the lowest prices in selected appropriate supply needs;
- providing goods and digital services;
- offers traditional goods and services;
- transaction and on-line payments security as well as using digital certificates;
- electronic signature concept evolution;
- Internet search engine development.

Out of electronic commerce applications facilities presentation similarity elements with collaborative applications are deduced. E-commerce applications allow trading of wide range of product categories and services. Therefore economic entities and individuals meet their needs of consumer goods into the virtual environment and by working together by initiating orders, payments related products and services. Features of e-commerce applications are described of which the most important aims:

- information published on the Internet about the business;
- a first contact with customers and suppliers;
- information exchange is done, the company creates a profile with customers preferences and virtual customers get familiar with the features and specifications of products and goods that are offered;
- product catalog which contains technical and business descriptions of each offered product, stored, usually in databases;
- administration of virtual shop by product catalog management and customer orders;
- shopping cart creation and product inventory management;
- on-line payments using credit card, electronic transfer, electronic checks;
- company's marketing tool instrument through customer surveys and customer response processing;
- customer support by providing support for handling exceptions of situations facing buyers before and after the products and services purchasing;

Figure 4 gives a schematic picture of functionality an e-commerce distributed software application offers.

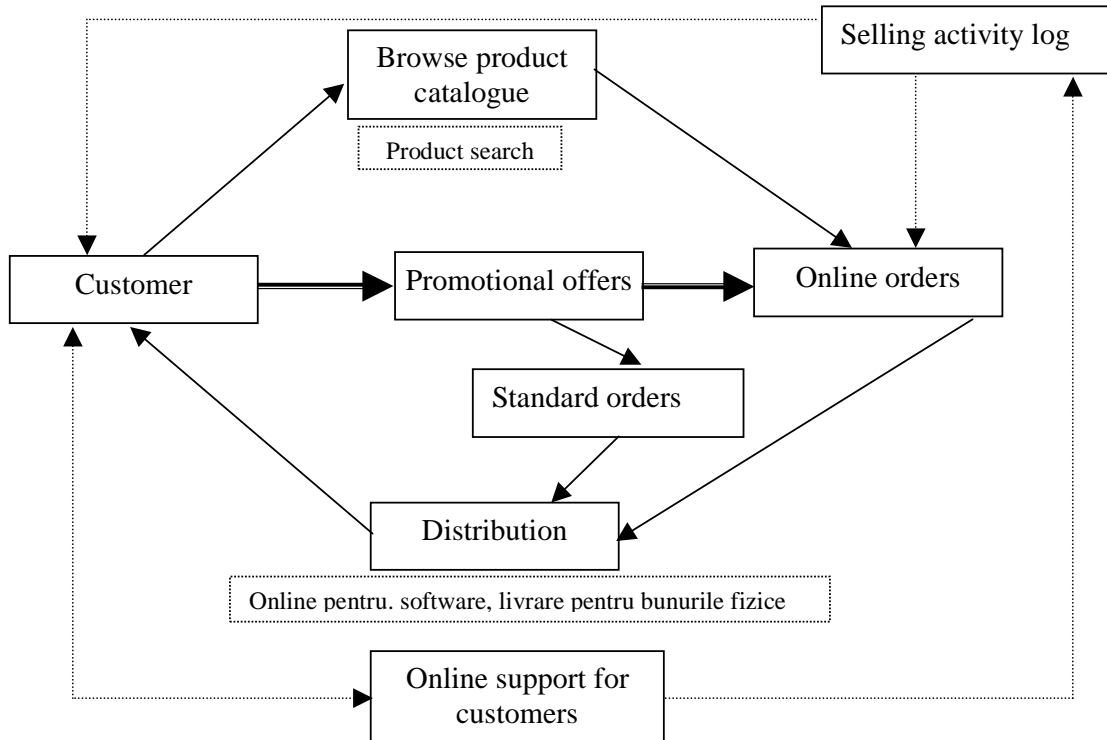


Fig. 4. Minimal set of functions of e-commerce shop

Customers access the e-commerce application's available product catalog that provides simple or advanced filters, multi-criterion filters, search products and descriptions of products and consulting services. The buyer places on-line or standard orders. The organization provides customers an electronic support service to resolve problems that might occur in connection with the use of its products or transactions. Client accesses the virtual store in contact with various promotional offers and ads. Electronic payment arrangements must allow the safe transfer, fast and convenient, of money from customer to supplier. But should it put emphasis on the need to have highly secured financial transfers, ensuring confidentiality and privacy of the transaction. Electronic payment service must be a decentralized service, internationally available, with the standard character to be accepted by the widest possible user community and economic organizations.

3. Aggregation of software processes

A large number of useful applications are available in the organizations that were developed over the time using various programming techniques and technologies. These applications must be reused by using processes of integration.

The advantages of computer application integration are:

- introducing into operational state with high efficiency of new applications;
- business processes modification according to current organization requirements;
- set of automated operations and processes to replace those manually conducted;

Given distributed software applications A_1, A_2, \dots, A_n , that manages transactions that operates on sets of data included in disjunctive sets. Software applications are installed on sets of servers S_1, S_2, \dots, S_n that are independent with one another. Direct integration means to form a set of software applications, A_1, A_2, \dots, A_k that meet certain conditions:

- homogeneous functional structure;
- data security and confidentiality of selected sets of data have a similar level of trust;
- software reliability and quality level are similar;
- user interface is simple and easy to use;

Integrating application has an important task, to thoroughly verify certain conditions are met to accomplish a high utility and efficient integration. Testing processes must be engaged to determine the following:

- determination of quality indicators of integrating software applications;
- generation of test data sets;
- clear evidence of differences recorded by testing procedures.

Test result determines software applications selection by high rates values of their characteristics. Direct integration requires:

- objective specification of integrating software to define requirements it must have;
- building sets of interfaces to allow access to all integrated entities of software applications as distributed computing;
- making of functional connections between of all n applications.

It presents simple direct integration scheme. User of software integrating distributed applications accessing distributed systems A1, A2 and A3 through software references of software interfaces.

Another approach is to integrate by concatenation. A k software application processes the same set of data. Software application A_i , $i=1 \dots k$, process sets of data $D_{i1}, D_{i2}, D_{i3}, D_{i4}, \dots, D_{in}$. Although belonging to the same class, each software application has its specific, leading to empty intersections processed data classified in sets. Integration by linking calls for a software integrator that takes k data processed by the application, merges them, resulting in a new data set. Integration by concatenation assumes implementation of software integrating that takes data sets processed by k application, concatenates them, to result a new data set.

E-commerce distributed software applications A_i $i=1\dots k$, manages product lists $A_1: P_{11}, P_{12}, P_{13}, P_{14}, \dots, P_{1n}, A_2: P_{21}, P_{22}, P_{23}, P_{24}, \dots, P_{2n}, A_k: P_{k1}, P_{k2}, P_{k3}, P_{k4}, \dots, P_{kn}$.

Integrating software provides customers with concatenated product list:
 $P_{11}, P_{12}, P_{13}, P_{14}, \dots, P_{1n} \parallel P_{21}, P_{22}, P_{23}, P_{24}, \dots, P_{2n} \parallel \dots \parallel P_{k1}, P_{k2}, P_{k3}, P_{k4}, \dots, P_{kn}$.

M1 : books: a, b, c, d, M2 : books : m,n, o, p, M3: books : x, y, z, w;

By concatenation technique integrating e-shop offers the following list of books: a, b, c, d, m,n, o, p, x, y, z, w.

Uniform access to resources is the way of integrating distributed applications at data level. Note that to create uniform access to resources, transformations have to be made so that processing a variety of heterogeneous electronic commerce shops integration leads to obtaining a virtual e-commerce store. E-commerce store will have a virtual database containing databases of e-commerce stores subject to integration procedures. Extraction and processing of data to build virtual database does not access integrity restriction mechanism of used data.

4. Aggregation of e-commerce applications

It examines cyberspace integration of successful e-commerce distributed applications. These applications have the following characteristics:

- basic functionality is widely appreciated by the user community as being complete and correct;

- user interface leads customer in a flexible way through purchasing processes and transactions;
- provides additional functionality associated with the basic functionality to create a framework that should not be left to initiate, conduct or complete of an operation included in the set of offered functions;
- interfaces sets to access application's resources, based on recorded history, is evaluated as reliable or extremely reliable by their customers.

Given companies providing goods and services A_1, A_2, \dots, A_n . Following the identification of commercial opportunities on products and services markets, company A intends that in exchange for a fee to their respective companies, to integrate online applications into one application to provide online consumer products and services most wanted. With expertise gained from the companies concerned, the company has created computer software which proposes to implement the following features:

- offers online product catalog consisting of selected products and services as promoted marketing policy;
- the products are easily found by using configurable software components according to the characteristics of product groups sought;
- detailed images of products are available ;
- technical characteristics of products are presented in standard templates to ease rapid comparison of products;
- client has at his disposal software tools to compare products;
- surveys are conducted to make multiple hierarchies of product categories, the most appreciated product, purchase the most effective cost / performance, lowest priced items;
- allows users to introduce their opinion on purchased products;
- online purchasing of products, making payments to one or several companies in the set A_1, A_2, \dots, A_n , under the apprehension of the commission;
- storing of financial data transactions;

Products catalogue are created based on codes of products and services used by supplying companies, depending on intended purpose. Products with little market share are included, wanted by the manufacturer to be promoted, repackaged products, products with high performance features, new entry products. Catalogue formation process must be fast, flexible, with prices updated according to initial provider offer. Retrieval tool based on specific characteristics of the products has an important role. Potential customer wants to find his way quickly in integrating software application offer by specifying the values we want for the different characteristics of the product of interests. Presentation of product images improves the customer experience, help to make the decision to buy. Client seeks high quality, high-resolution images showing the whole product detail from different angles. For those who decide harder to implement software tools to make products comparisons by acquiring data from databases, using the standard templates. Quality implementation of this instrument contributes to formulating a firm decision to potential clients.

Figure 5 presents the concept of three e-commerce distributed applications. Every customer accesses integrating application functionality through its web interface.

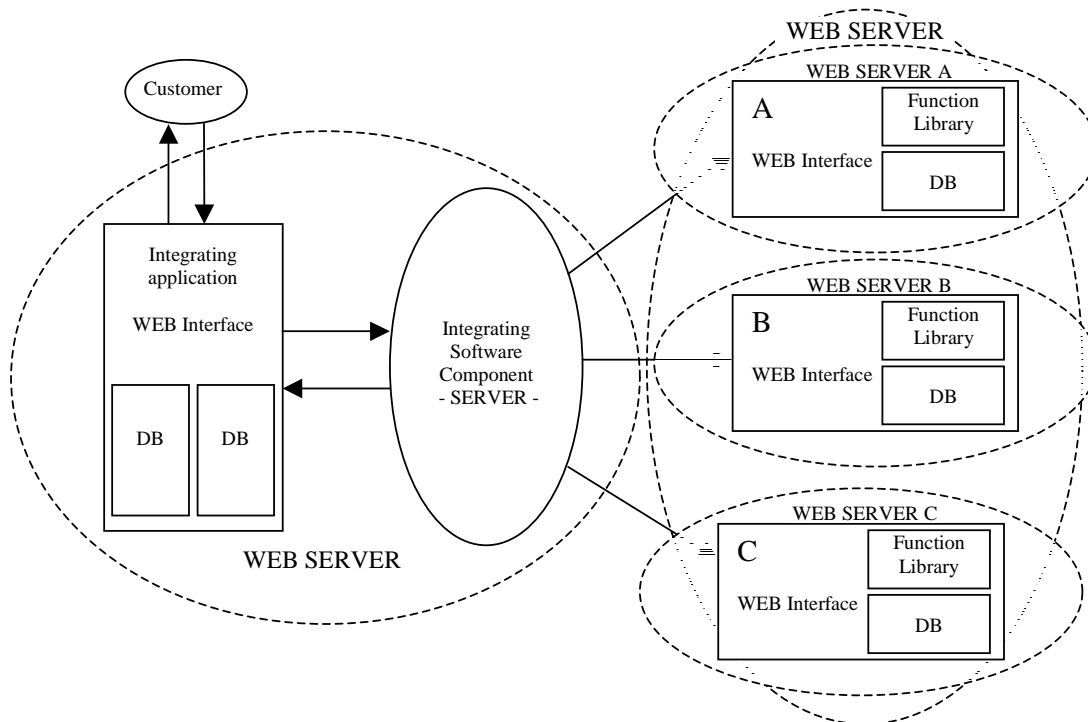


Fig. 5. Concept of structural integration for three applications

Integrating software stores transactions data on database servers and access software that integrates through a software component to select data and functionality wanted.

To promote the application is important to provide a broader framework to guide the customer choice to meet the intended use of the product. To this end, polls conducted and recorded uncensored views of users. Storing and managing a large number of views and opinions, their exposure in an easily accessible and compelling experiences that lead to providing customer satisfaction to ensure the return so the delivery, the price offered, but also software tools available formulation available for purchase decision.

Complex data processing chains are identified using the concept of directly integrated application that meets requirements in various economic and social environment of knowledge-based society. Chain of processing are proposed:

- linear type;



Fig. 6. Linear scheme of integration

- tree like type;

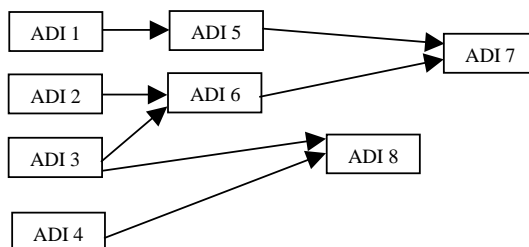


Fig. 7. Tree like integration scheme

- graph type;

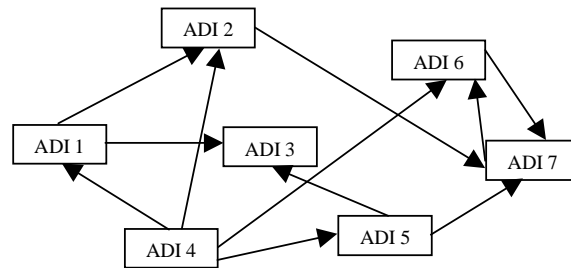


Fig. 8. Graph integration scheme

- special needs of data extracting from multiple sources, primary processing, cascade type browsing and processing, data analysis and extraction of particular subsets of final data set:

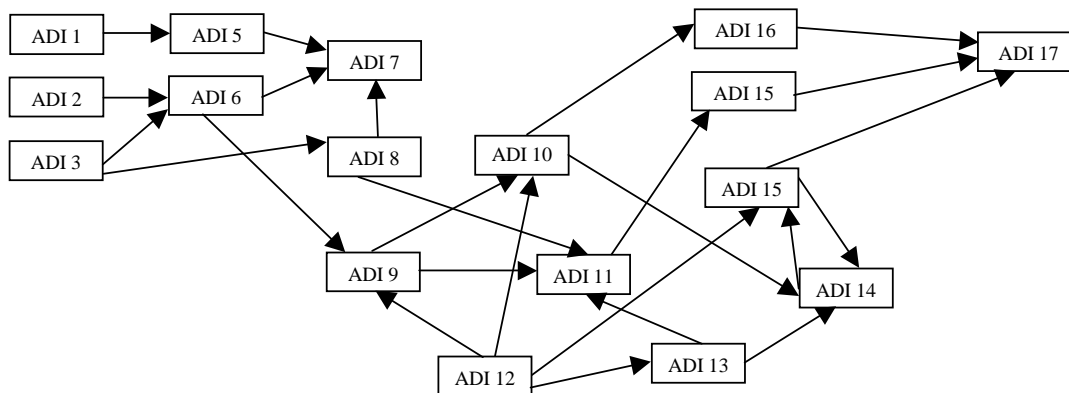


Fig. 9. Complex integration scheme

An e-commerce distributed application must have characteristics of easy integrability. Integration feature is considered as the way a distributed software application accepts various operation flows and streams of data from different sources as input, which after processing, data out streams accepts customization. An application that is relatively easily adapted for the purposes mentioned in the introduction is an acceptable candidate for integration chain provided to achieve high levels of quality indicators sets. There are libraries of procedures for reading data from data sources S_1, S_2, \dots, S_k and procedures for writing the results in output files in various types of data streams. When building a software distributed application with direct integrability characteristics, it includes libraries of functions and procedures and gives developers access to these routines, input and output call parameters in customizable data streams. Integration feature of distributed computing applications is very important in the current environment characterized by dynamic data processing exacerbated in statistical studies, estimates of the evolution of economic phenomena. Low integrability characteristics of computer software makes things harder for different business to be integrated at their software distributed systems levels.

5. Results of collaborative systems aggregation

Three virtual shops have been designed and implemented starting from this prerequisite:

- stores selling different products: wine, clothes for babies and books;
- implementation was done using the same technology, working environment and PHP support for data storage in MySQL database;
- shops are available on different web domains;
- stores are designed with a similar structure providing visitors similar functions: categories and products view, add products to the shopping cart, payment and completing the delivery info;
- virtual store manager interface is available by adding product categories and products accompanied by relevant details.

In table 1, function provided for customers are presented.

Table 1. Virtual shops functions

Function	M ₁	M ₂	M ₃
Category browsing	yes	yes	yes
Product browsing on every category	yes	yes	yes
Product details browsing	yes	yes	yes
Image product presentation	yes	yes	yes
Shopping cart	yes	yes	yes
Manage shopping cart	yes	yes	yes
Order management	yes	yes	yes
Online payment	yes	yes	yes

It is noticeable a high degree of homogeneity regarding functions available to users. Homogeneity brings advantages to customers:

- skills using a virtual store enables seamless assimilation into use and other shops, part of the mechanism of integration;
- assimilation with the same confidence in the composition of integrated structure of new virtual shops.

The three virtual stores organize products in categories offering details about the characteristics, origin and price. Home page presents potential buyer product categories. Customer selects a category to view and browse products in this category. Selecting a product, available product description are accessible, a product can be added to a shopping cart. The customer has the opportunity to view products added to the shopping cart by accessing the shopping cart icon above every page. Buying products is made through the pages "Home", "Payment" and "Checkout". Thus in terms of online advertising may be a cascading effect that may increase the success of integration, the business plan.

A successful online store that integrates sets of virtual shops can determine its current customers to access pages of other stores, they have the guarantee of having a similar experience in terms of high satisfaction. A successful shop can also benefit from integration, even having lots of visitors, other visitors could discover it, ones loyal and accustomed to other virtual shops. Thus in terms of online advertising may be a cascading effect that may increase the success of integration, the business plan.

First let's consider k virtual shops are distributing the same classes of goods.

Virtual shop M_i ; $i=1\dots k$, distributes products P_{i1} , P_{i2} , P_{i3} , P_{i4} , ..., P_{in} . Although they are the same class, every virtual shop has a specific marketing policy that make product lists

intersection to be disjunctive. In this context integration by concatenation assumes that integrating online store online store lists of products that take k shops, concatenates them, resulting in a new list consisting of products:

$P_{i1}, P_{i2}, P_{i3}, P_{i4}, \dots, P_{in} \parallel P_{21}, P_{22}, P_{23}, P_{24}, \dots, P_{2n} \parallel P_{31}, P_{32}, P_{33}, P_{34}, \dots, P_{3n} \parallel \dots \parallel P_{k1}, P_{k2}, P_{k3}, P_{k4}, \dots, P_{kn}$.

The products are listed and placed in alphabetical order. The customer should not see who the primary supplier is, which the distributing marketing shop is. The customer selects the product, in original application the product is also selected, two shopping carts are created. The customer makes other product selections from other shopping sores. Customers manage their shopping carts by adding, removing products, alter quantities. A client can select products from one shop or different shops to go, and put this product into his shopping cart. Customers have the option to delete the shopping cart. Customers create a shopping cart that contains products from the same class supplied by a number of t stores less than k . Customer create the order by giving payment details and shipping address. As a consequence of payment conformation integrating shopping cart initiate a transaction to pay every shop that has to deliver goods for the order in question the percentage that was agreed upon..

As a consequence integrating distributed e-commerce application is acting like a number of T customers that creates orders, offering the same delivery address. But this customer had made the payment to integrating shop. Integrating shop will make payments to every shop in accord to their agreement.

It is analyzed the situation of integrating by concatenation three virtual shops M_i ; with $i=1\dots3$. Virtual shops deliver wine products. As a database management system they use mysql.

The home page of integrating shop presents the list of products, acquired from M_i ; with $i=1\dots3$, by including identical products having the smallest prices and distinct products. Building concatenated product lists is made by the use of temporary table to assure the acces of every customer to this. Integrating virtual shop maintains temporal references to products offered by those three shops. The references are kept during user's session for every customer. Mysql database management system is used to create product list. This technical solution is backed up by following advantages:

- scalability is equal to database management' s version used, a feature with high values for nowadays database management systems, commercially available or open-source;
- source code portability for product list creation; script can be easily translated on another database management server without restrictions regarding scripting software, type and web server version, operating system;
- high performances offered by database management systems;
- clarity and simplicity of SQL code;
- high quality software achieved by elimination of source code complexity for building product list by using an algorithm written in a classic or object oriented programming language.

The implementation of integration structure should be done given the variety of platforms, operating system, management systems database, available from various sources, commercial and open source.

6. Conclusion

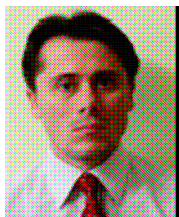
Integration of computer applications is not a new goal. Economic and social context is one that brings back into focus this approach, reusability, coupling and combination of old and recent applications. Diversity of technologies and proposed facilities have progressed

remarkably. Thinking of recipients developed computer applications. Find and use forward applications to help in daily activities, do not give up the old computer applications that have proven performance. Knowledgeable user would like a working environment able to offer access to cyber resources they need at a time when communicating with friends, work or entertain themselves circles. Economic organizations are no exception and calls for applications, control panel easy to use and low cost of purchase. Not only for financial reasons is very difficult willing to give up effective computer applications to fully satisfy the needs. Integrating e-shops is a near necessity if customers seeking a wide range of possible products and services on a similar quality, quality products and ways to purchase and return them. Designers of technologies and applications must respond to requests recipients computer applications, users are actually those who require new trends, new approaches, they are still validating the proposed implementations.

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