About Hierarchical Xml Structures, Replacement of Relational Data Structures in Construction and Implementation of Erp Systems

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The projects essential objective is to develop a new ERP system, of homogeneous nature, based on XML structures, as a possible replacement for classic ERP systems. The criteria that guide the objective definition are modularity, portability and Web connectivity. This objective is connected to a series of secondary objectives, considering that the technological approach will be filtered through the economic, social and legislative environment for a validation-by-context study. Statistics and cybernetics are to be used for simulation purposes. The homogeneous approach is meant to provide strong modularity and portability, in relation with the n-tier principles, but the main advantage of the model is its opening to the semantic Web, based on a Small enterprise ontology defined with XML-driven languages. Shockwave solutions will be used for implementing client-oriented hypermedia elements and an XML Gate will be defined between black box modules, for a clear separation with obvious advantages. Security and the XMLTP project will be an important issue for XML transfers due to the conflict between the open architecture of the Web, the readability of XML data and the privacy elements which have to be preserved within a business environment. The projects finality is oriented on small business but the semantic Web perspective and the surprising new conflict between hierarchical/network data structures and relational ones will certainly widen its scope. The proposed model is meant to fulfil the IT compatibility requirements of the European environment, defined as a knowledge society. The paper is a brief of the contributions of the team research at the project type A applied to CNCSIS "Research on the Role of Xml in Building Extensible and Homogeneous ERP Systems".
Keywords: XML structures, database management system.

Introduction

ERP systems have become a popular subject in very few years, as companies, markets and products are trying to signal the need for integrated system implementations. The context of the informational society and business globalization triggered a new orientation for software development industry and careers. Among the many definitions for ERP systems, some are presented hereby as working definitions:

ERP is an informational-accounting system based on a graphic user interface, relational database, 4th generation languages, CASE instruments and client-server architecture [Fotache04].

ERP systems support all functional areas within an enterprise: planning, production, marketing, distribution, financial, accounting, human resources, project management, stocks, maintenance, services, e-business.

American Production and Inventor Control Society defines ERP systems as follows: "method for efficient planning and control of all the resources needed in the efforts of receiving, managing, delivering and accounting of orders within production, distribution or service companies". [www.apics.org]

Davenport defines such systems as "application packages that promise complete integration of all the information within an organization". [Davenport01].

The advantages for implementing ERP systems are well promoted by many companies that are currently using them. Many specialized web sites (intelligeteenterprise.com, intelligenterp.com, www.technologyevaluation.com) provide a positive position towards these advantages, which can be resumed as follows:

• ERP offers quality information through unique database, consistent data exchange and improved reports;

• ERP avoids redundancy by controlled concurrence;

• ERP decreases response timing for information delivery;

• ERP provides flexibility, extensibility, maintainability;

• ERP are collaborative systems, by opening to clients and suppliers with SCM and CRM modules;

• ERP provides e-business interface.

Nowadays, ERP systems can be considered a foundation for e-business applications. Mirghani M., in his article "Points of Triangle"(2002), proposes the following evolution scale:

• 1960-1970 -Material Resource Planning (MRP)

• 1970-1980 -Manufacturing Resource Planning (MRP2)

• 1980-1990 -Enterprise Resource Planning (ERP)

• 1990-2000 -Enterprise Resource Planning with modules and extensions (ERP2)

"The implementation of the informational society in Romania raises a series of difficult problems triggered by both subjective and objective factors" consider some authors [Ghilic02]. These factors occur also in the field of ERP implementation. Still, since 2002, a spectacular growth can be observed for ERP assimilation.

The first big companies (SAP, Oracle, BaaN) came to Romania with complete and modular ERP solutions too expensive for quick implementation. Later, a few medium sized companies offered their own ERP products: QAD, Scala, LLP Group, Siveco. Such companies come with more than 40 years of tradition, which cannot be compensated by local companies. Still, there is an interest on a local level for developing ERP system, by small software companies involved in the local business environment. Crisoft offers CROS, Transart offer B-Org, Bit software offers Socrate, EBS offers Clarvision, Intellisense offers B-logic. These solutions are already validated by their users. Even if more than 1000 companies are involved on the ERP market, more than 60% of this market is still being hold by BOPSE (BaaN, Oracle, People, SAP, JD Edwards).

Most of these ERP systems are driven by a relational database. In the Internet context, relational data sets tend to be replaced with hierarchical structures based on pointers (or hyperlinks) and markup languages such as XML provide means to embed semantics, validation and visualisation rules for all types of data available on-line.

The Romanian legislative context for ERP systems is provided by some criteria regarding economic software applications emitted by the Ministry of Finance:

-the results of the computer processing have to respect the laws that regulates the use and significance of such results.

-a software solution should not permit insertions or alterations of data for a closed period, with respect tot the principles of chronology and exactity.

-a software solution should provide the content requested by the forms approved by the Ministry of Finance (mfinante.ro)

In the field of e-business, regulations are more precise. As many authors show ([Rosca04][Bucur02]) security and privacy issues are well regulated by Romanian law. Law 365/2002 regarding e-commerce, published in M.O.483/5th July 2002, covers the most important aspects of data protection. It contains a chapter that regulates caching, searching and hosting of data, rules that have to be followed by the model proposed in this project. E-payment, e-signature are other essential aspects of a software-controlled financial operation.

2.ERP systems based on XML

Practice has imposed the three-tier architecture:

• *level 1(presentation)* consists in the graphic interface and all the means of accessing the systems functions.

• *level 2(application)* consists in the business rules, the logic and functions of the system, the agents that provide data access.

• *level 3(data storage)* manages data and metadata.

The following implementation strategies are proved to be valid:

1.Minimal risk strategy: for large scale projects, refers to following all the activities described for an extended period of time (2 years).

2.Budget strategy: refers to minimizing the budget, with few activities

3.Big Bang strategy: fast methodology (4 weeks) refers to minimizing the implementation period.

4.Self supported strategy: refers to the development and implementation of an ERP system by the company that is going to use it.

5.On Key strategy: similar to the minimal risk strategy, activities are supported by external resources.

6.Partnership strategy, refers to partitioning the efforts and used resources between the company that uses the ERP and the company that implements it.

This project is intended to be a combination of self-supported strategy and minimal risk strategy.

The most recent ERP systems tend to extend with more modules:

- supply chain management
- customer relationship management
- advanced planning and scheduling
- sales force automation
- business intelligence
- e-procurement

E-business applications based on XML provide a new way of developing and processing transactions in a global sense. ERP systems interfaced with e-business applications are the new direction for Business2Business software solutions current and future extensions. The next predictable step, as shown during the series of annual Extreme Markup Languages conferences in Montreal (www.extrememarkup.com) is the connection of enterprise to the semantic Web, with XML and its derivative technologies proposed by the Web Consortium (RDF, XML Schema, WSDL), Microsoft (SOAP) and DARPA Agency (DAML/OIL). New knowledgebase built with hierarchical/network data models defined with markup languages and the classic rules of first order logic promise to be the ontological basis for an automated global economy. Until then, an opening of the Romanian business environment must be forced towards experimental technologies and the first step should be an increase in the use of homogeneous and highly compatible formats both for transfer and storage of information resulted from automated processing. On a pragmatic level, we consider to be feasible the process of setting up an XML backbone for an on-line ERP system and of trying to conceive a managerial ontology as a basis of expression between modules or between the system and its extensions/environment (Web services for example). Text markups provide portability, homogeneity, black box modularity and, as an essential factor, it requires the lowest technological costs due to the universal acceptance and support of XML from the software companies. Front-end Internet applications based on XML can be easily integrated with the back-office applications of the ERP systems if these are XML-driven. This provides consistency, self validation (XML Schema), semantics (RDF) and "borderless" applications for all the operations that take place within a business relationship.

When it comes about communication and transaction processing, we are especially interested in the study of projects such as XMLTP (XML transfer protocol) and XMLTP-L (XML transaction processing) for managing data flows within an XML-based ERP system. XMLTP-L is available as GNU open source, with detailed documentation at www.xmltp-l.org. By using such methods of transfer and specialized query languages for XML data extraction, an essential step would be made towards global business homogeneity.

Many Romanian software companies are trying to impose their products before integrating them within the actual Internet environment. The markets of operating systems, httpd servers, browser or security solutions are unstable.

Adepts of free markets consider this to be a dynamic equilibrium necessary for innova-

tion and progress. They see dangers in any governmental interference or regulation and they make points about the self-regulative nature of the virtual economic space as a cybernetic system. The main arguments are made on the inapplicable national laws within a global environment and the dangers of technological monopoly.

Adepts of a controlled economic space are making points about the vulnerability of a heterogeneous virtual space, its lack of credibility and the dangers of the digital divide which renders it invalid. Many governments and corporations show real interest in subsidizing, censoring or taking over certain segments of the Internet.

Objectively speaking, we have here a classic conflict between the liberal theory and the interventionist theory. Its fairly plausible that the solution resides in the middle way: standardization of a foundation technology (security, privacy, fundamental services) which is able to support a free and valid digital economy. From a technological point of view what we have today is an increase in the use of heterogeneous systems, which are actually patched collaborative systems based on existing isolated elements. This project offers a homogeneous approach, as its intended to provide a model with implemented elements useful to small business companies who want to build and use their own ERP systems with lowest costs and extensible functionality. The need for homogeneity in management support systems its imposed by the dangers of the digital divide, as Romania is not one of the countries that lie on the advantaged side of this gap.

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