The Level of Information Systems Integration in Romania

Vlad DIACONIŢA, Bucharest, Romania, Diaconita.Vlad@csie.ase.ro
Iuliana BOTHA, Bucharest, Romania, Iuliana.Botha@ie.ase.ro

Integration is an activity that unites people, equipments, programs but also managerial practices and helps a company to put its knowledge into good use. In Romania, more and more private companies choose to have integrated systems to help them grow. Public owned companies and institutions, for example The National House of Pensions and Other Social Insurance Right, invested large amounts of founds in the development of new information systems to help them gather, process and disseminate data from the population.
Keywords: *integration, information systems, standards, data integration, application integration.*

Basic concepts regarding integration
The beginning of integration in IT can be considered the day the integrated circuit was developed. In 1959 this circuit integrated many discoveries like: transistors, residences and capacitances in one silicone chip. In 1965, Gordon Moore stated his famous law [5]: *The complexity for minimum component costs has increased at a rate of roughly a factor of two per year ... Certainly over the short term this rate can be expected to continue, if not to increase. Over the longer term, the rate of increase is a bit more uncertain, although there is no reason to believe it will not remain nearly constant for at least 10 years. That means by 1975, the number of components per integrated circuit for minimum cost will be 65,000. I believe that such a large circuit can be built on a single wafer.* Under the assumption that chip "complexity" is proportional to the number of transistors, regardless of what they do, the law has largely held the test of time to date. However, one could argue that the per-transistor complexity is less in large RAM cache arrays than in execution units. From this perspective, the validity of one formulation of Moore's Law may be more questionable. This is one of the reasons we need integration: to find our way out in the light of the complexity that continues to grow. The principles of managing complexity are simple: dividing in smaller and easier to handle parts, the development of a standard interface for these parts to communicate and also of a hierarchical structure where the information is more and more abstract while we climb in the hierarchy. The term of middleware appeared in the late 80's to describe network management software. From mid 90's the term is used large scale usually tied to relational databases to describe message based integration. As we showed, integration leads to complexity but also to quality, because putting together systems implies adding progressive and emergent components. Organizing leads to integration, integration to complexity and complexity to diversity. From the point of view of diversity, integration is the result of a cyclic but progressive evolution, helped by the performances and the expertise of professionals. Integrated systems refer to complex systems which incorporate business processes, managerial practices, organizational interactions, structural transformation and knowledge management.

Data integration
Data integration is the problem of combining data residing at different sources and providing the user with a unified view of these data. In practice, data integration is frequently called Enterprise Information Integration. The theory of data integration is a subset of database theory and formalizes the underlying concepts of the problem in first-order logic [2]. Its results tell us whether data integration is possible and how difficult it is to perform. While its definitions may appear abstract, they are general enough to accommodate all manner of integration systems.

Standards used in data integration
The **eXtensible Markup Language (XML)**

is a pared-down version of SGML, designed especially for Web documents. It allows designers to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations. In Romania there are more than a few systems which rely on the XML standard. For example, Labor Inspection developed a system which uses XML for the loading of data regarding the firms, employees and labor contracts. The structure of this document is described on a public webpage (see the link in References - [6]).

A firm can generate its electronic register in XML format using the ReviSal application, available on the web or by extracting the needed information from their own systems without loading them manually into the provided application. If a company runs an Oracle Database application, using PL/SQL can generate its register. Let's say we have the following table:

FIRMS

ANGAJATORID   NUMBER(7)
ANGAJATORNUMIRE   VARCHAR2(128)
LOCALITATEID   NUMBER(7)
....

Using the following procedure the data from this table can be converted in XML format. Of course, the data usually comes from more than one table which can make the procedure a little bit more complicated:

```
DECLARE
qryCtx DBMS_XMLGEN.ctxHandle;
result CLOB;
BEGIN
qryCtx := dbms_xmlgen.newcontext('SELECT * from firms);
DBMS_XMLGEN.setRowTag(qryCtx, 'UNITATI');
LOOP
result := DBMS_XMLGEN.getXML(qryCtx);
EXIT WHEN
DBMS_XMLGEN.getNumRowsProcessed(qryCtx) =0;
INSERT INTO temp_clob_tab VALUES(result);
END LOOP;
END;
/
```

The XML document, resulted either from ReviSal or direct from the database can be uploaded on a webpage using a provided username or password or can be put on a floppy disk and sent to a local Labor Inspection branch.

This is an example how a robust and flexible standard can be used in the easing of certain processes.

Other institutions are using less flexible standards for receiving data. For example the declarations required by the Ministry of public finance are to be sent in simple TXT (**ASCII** format). This text file has a fixed format, for example in the 205 Declaration: the first 13 characters are used for the ID of the payer, the next 2 characters for the nature of the incomes, the next 12 characters for the total amount restrained by the payer, and so on [7].

Enterprise Application Integration

Enterprise Application Integration (EAI) is defined as the uses of software and computer systems architectural principles to integrate a set of enterprise computer applications.

In today's competitive and dynamic business environment, applications such as Acquisitions, Production Planning, Accounting, Business Intelligence and Integrated Collaboration environments have become imperative for organizations that need to maintain their competitive advantage. Enterprise Application Integration (EAI) is the process of linking these applications and others in order to realize financial and operational competitive advantages.

EAI intends to transcend the simple goal of linking applications, and attempts to enable new and innovative ways of leveraging organizational knowledge to create further competitive advantages for the enterprise.

When different systems can't share their data effectively, they create information bottlenecks that require human intervention in the form of decision making or data entry. With a properly deployed EAI architecture, organizations are able to focus most of their efforts on their value creating core competencies instead of focusing on workflow management.

Enterprise Resource Planning

Enterprise Resource Planning systems (ERPs) integrate (or attempt to integrate) all data and processes of an organization into a

unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data for the various system modules.

The term ERP originally implied systems designed to plan the use of enterprise-wide resources. Although the acronym ERP originated in the manufacturing environment, today's use of the term ERP systems has much broader scope. ERP systems typically attempt to cover all basic functions of an organization, regardless of the organization's business or charter. Business, non-profit organizations, nongovernmental organizations, governments, and other large entities utilize ERP systems. The introduction of an ERP system to replace two or more independent applications eliminates the need for external interfaces previously required between systems, and provides additional benefits that range from standardization and lower maintenance (one system instead of two or more) to easier and/or greater reporting capabilities (as all data is typically kept in one database). Examples of modules in an ERP which formerly would have been stand-alone applications include: Accounting, Acquisitions, Manufacturing, Supply Chain, Financials, Customer Relationship Management (CRM), Human Resources, and Warehouse Management.
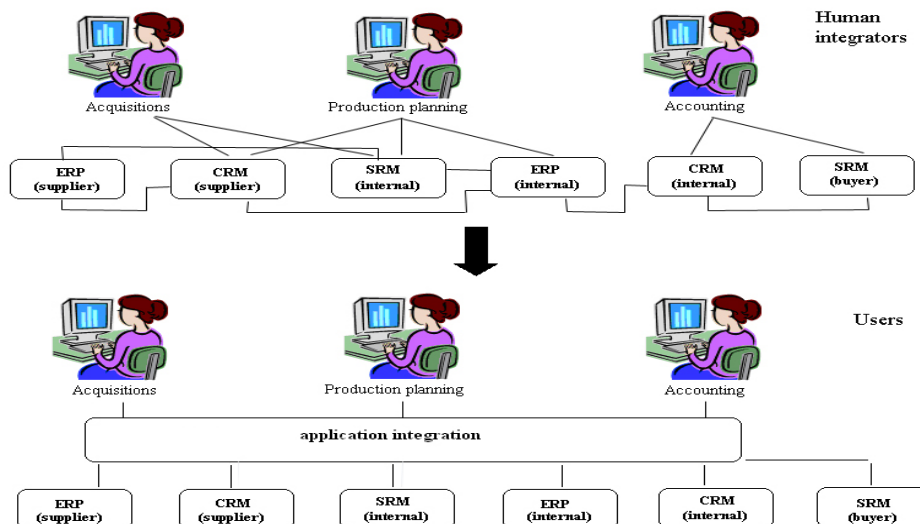

Fig.1 **Integration using ERP software**

Service oriented application integration

Service oriented application integration allows enterprises to share common methods. This sharing is accomplished either by defining some methods to be accessed by all applications and thus being integrated, either by offering an infrastructure for such methods, for instance Web services. The methods can be accessed by storing them on a central server (distributed objects) or by a Web services standard, for instance .NET [4].

The Web service used to access trade information, offered to the agreed Intermediaries (Investment Firms) by the Bucharest Stock Exchange(BSE), is an example of using web services by Romanian institutions. The web service is accessible through messages sent by the means of standard Web protocols. The protocols being used are SOAP (http://www.w3.org/TR/soap/), for the format of the requesting and answering messages, and WSDL (http://www.w3.org/TR/wsdl) for describing the interfaces.

Simple Object Access Protocol (SOAP) defines the XML based message format used by the Web service-enabled applications to communicate and interoperate with each other over the Web.

Web Service Description Language (WSDL) is a collection of metadata about XML based services used for describing the businesses scope and how to access their services electronically. Based on SOAP, WSDL specifies the procedures to discover functional and

technical information about Web services over the Internet.

For the system provided by Bucharest Stock Market, the WSDL file can be obtained at the address:

http://www.rasd.ro/bsews/intraday.asmx?wsd l. The web service is described at http://www.rasd.ro/bsews/intraday.asmx. The access is restricted at IP level.

Based on this service, any investment firm can build its own system for requesting quotes on five different levels.

Simbol	Ora ultimei actualizari	Stare Piata	Volum cumparare	Pret(Bid) cumparare	Pret(Ask) vanzare	Volum vanzare	Volum tranzactionat	Valoarea tranzactiilor	Numar tranzactii	Pret ultim	% Abatere
SIF2	14:14:41	Closed	15.800	2,8400	2,8500	103.900	3.087.900	8.662.523	603	2,8400	2,90
SIF5	14:21:32	Closed	2.000	3,2100	3,2200	103.800	2.523.700	8.021.384	670	3,2200	2,88
SIF3	14:20:34	Closed	105.200	3,2000	3,2100	10.600	1.955.400	6.203.413	578	3,2000	2,89
BRD	14:18:41	Closed	7.420	22,0000	22,1000	3.600	276.490	6.037.885	272	22,1000	2,31
SIF1	14:27:24	Closed	1.100	2,9200	2,9400	62.600	1.512.100	4.352.419	371	2,9400	4,26
TLV	14:14:43	Closed	1.409.900	1,0900	1,1000	176.300	3.033.700	3.335.182	275	1,0900	0,00
RRC	14:17:02	Closed	100.000	0,0962	0,0942	10.000	33.966.000	3.199.930	212	0,0963	2,45
SIF4	14:20:55	Closed	12.500	1,8000	1,8100	39.700	1.765.900	3.140.926	371	1,8100	3,43
SNP	14:26:07	Closed	317.700	0,5800	0,5850	355.400	2.970.300	1.722.828	179	0,5800	0,87
TEL	14:28:00	Closed	1.000	47,6000	47,6000	310	26.550	1.261.857	94	47,6000	0,00

	Vol. cump.	BID	ASK	Vol Vanz			Vol. cump.	BID	ASK	Vol Vanz	
Nivel 1	15.800	2,8400	2,8500	103.900	Ora ultimei actualizari 14:30:00	Nivel 1					
Nivel 2	25.900	2,8300	2,8600	135.300		Nivel 2					
Nivel 3	194.200	2,8200	2,8700	38.100		Nivel 3					Afiseaza
Nivel 4	1.000	2,8100	2,8800	220.000		Nivel 4					
Nivel 5	182.700	2,8000	2,8900	23.500		Nivel 5					

Fig. 2 **Integrated BSE trading system**

Portal oriented application integration

Portal oriented application integration allows one to view a multitude of systems, both internal enterprise systems and external enterprise systems, through a single user interface or application. The use of portals to integrate enterprises has many advantages. The primary one is that there is no need to integrate back-end systems directly between or within enterprises, which eliminates the associated cost or risk. With portals, the user simply connects to each back-end system through a point of integration (user interface, database, application server etc.) which externalizes the information into a common user interface (Web browser).

There cannot be integrated information systems and implicitly, integrated systems for the citizens if the interoperability is reduced to a department's own system or, in best-case scenario, one of an institution.

The Public Administration Information Systems Professionals Association (PAISPA) has launched a project in 2004 that had the purpose of creating the pre-requisites of using unique information portals by standardizing the databases that are already in place in the Romanian institutions [8].

Conclusions

System integration is an activity that you no longer read about only in books. It's something that takes place in Romania. Even though it's not as large scale as it might have been desired, companies use it to gain a competitive advantage in an evolving market.

References

[1] Ion LUNGU, Manole VELICANU, Ion ROSCA, Adela BARA, Vlad DIACONITA, Iuliana BOTHA - „Technologies for system integration in public institutions", CNCSIS Contract, 2006.
[2] Maurizio LENZERINI - "Data Integration: A Theoretical Perspective". PODS, pag. 243-246, 2006.
[3] Lawrence A. CUNNINGHAM - "Language, Deals and Standards: The Future of XML Contracts", Washington University Law Review, 2005.
[4] David S.Linthicum – „Next Generation Application Integration: From Simple Information to Web Services", Addison Wesley Publisher, 2003.
[5] http://www.intel.com/technology/mooreslaw/index.htm
[6] http://www.inspectiamuncii.ro/fisiere/format%20fisier%20xml.pdf
[7] http://www.mfinante.ro/link.jsp?body=/contribuabili/sistemul_fiscal/programe11.htm
[8] http://www.aniap.ro/index.php?option=content&task=view&id=54&Itemid=73