

Two Integration Flavors in Public Institutions

VLAD DIACONITA, IULIANA BOTHA, ADELA BARA, ION LUNGU, MANOLE VELICANU

Economic Informatics Department

Academy of Economic Studies

Piata Romana 6, Bucharest

ROMANIA

diaconita.vlad@csie.ase.ro, iuliana.botha@ie.ase.ro, bara.adela@ie.ase.ro, ion.lungu@ie.ase.ro,

manole.velicanu@ie.ase.ro

www.ase.ro

Abstract: - Integration within public institutions is useful in better aligning the IT with the core processes, but also helps the various parts of the business work with each other better, enabling important business strategies like straight-through processing, improved public service through single-view-of-customer portals, business activity monitoring and higher data quality. Portals and SOA can help this integration occur. In time, portals have evolved to meet the integration needs of companies. Even though not taken very seriously, they have slowly become leaders in turning new principles into practical experiences. In the beginning, portals focused on aggregating, organizing, and indexing unstructured data, but modern portals now do much more. A portal is a point of integration, useful to the organization by integrating internal business processes and by offering information to the outside world. The increased adoption of business process management (BPM) and Service-Oriented Architecture (SOA) initiatives are both driving portal usage.

Key-Words: Portals, SOA, Web services, public institutions, dynamic reports

1 Introduction

The actual IT context is dominated by user's desire to have access to the information they need and this desire is sustained especially by the unprecedented development of computer networks and the internet's spread world wide. This context has influenced all informatics fields and the development of new technologies which conditions them selves mutually. Nowadays, the public institutions in Romania have reduced possibilities to interchange data through informatics systems. Internationally, there are countries in which developing informatics systems between public institutions has a long tradition (as an example - in USA, in almost all the countries which form the European Union). This work will focus on proposing a solution of integration based on a portal, in a public institution, which should integrate the informatics systems which already exist and which will be offered, as a service, to the wide public.

The technical solutions will be analyzed (choosing the DBMS and also the middleware solution) and also the updates on the business process level will be advanced.

2 Problem Formulation

The integration solution chosen for public institutions must be guided by the following strategic principles, as shown in our previous paper [5]:

The informatics system should have an unique integrator;

Planning in detail the analysis steps, design and implementation:

Running at the same time of more than one process, for diminishing the execution time of the integrated system;

Choosing open technical solutions which are using the field's standards;

The possibility of extending the system at the level of new departments within the public institutions or potential new institutions with prerogatives in connected fields;

The communication improvement within the public institutions' departments and between the public institutions. On-line services offered to the public for diminishing the bureaucracy;

The solution's compatibility with Web technologies;

The achievement of a user friendly interface;

The possibility of implementing the system in English at the same time with the implementation in the national language.

Gartner, Inc. defines a portal as "access to and interaction with relevant information assets, knowledge assets and human assets by select targeted audiences, delivered in a highly personalized manner." [3]

The large data volume and the existing information within the public institutions, makes the intercorelated data and information management to be the central function for a good operation of the integration solution.

3 Problem Solution

3.1 Choosing the right platform

Choosing a software and hardware platform is one of the first things which can influence the success or the failure of any project. This choice can be an objective process based on a deep understanding of the perks and the downfalls of every solution on the market or it can be subjective one, based on the expertise and the tastes of the team who builds the solution.

While the use of open-source software (OSS) has expanded, especially in the operating system market, it has not found significant traction among enterprise portals. A Forrester study examined why the open-source concept is attractive to many companies. The most popular responses indicated the desire to remain open and not bound to a single stack, reinforcing the results of the study about buyers' habits regarding commercial software and their preference for best of breed products.

So why are open-source portals so unpopular when other open source applications are growing so rapidly? The most common reason is the lack of service and support. But this does not completely answer the question completely because other open-source applications also lack levels of service and support comparable to commercial software, yet still enjoy healthy levels of adoption. The biggest deterrent to open source portals is most likely the lack of product maturity. Unlike many other types of applications, a portal deployment does not end after the software is installed. Portals are development and application integration platforms. Just as with many application-based portals, the lack of integration features in open source portals makes integrating external applications more difficult. In addition, Open Source portal software suffers a deficit of skilled resources for deployment which makes implementation difficult. This is especially true for portal software since license costs tend to be a smaller portion of the total cost of ownership than with many other applications. As a result, as shown in [11], through 2008, less than 10% of Global 1000 companies will deploy open-source portals at the enterprise level, owing to a lack of compelling advantages in cost, support, functionality and finish.

Taking this in consideration we chose an Oracle Forms 10g solution for collecting data, Oracle Discoverer Administrator for data integration, Oracle Discoverer Desktop for reports building and a portal built using Oracle Application Server (OAS) that will integrate all this applications. This is not a cheap solution, but it's a solution that provides the speed, the safety and the support that is needed. The core of the solution is an Oracle 10g Database chosen for its performance in large and very large databases. In a 2006 study, conducted by the Transaction Processing Performance Council, Oracle 10g Database with real application cluster obtained a new record in data processing at the

TPC Benchmark H for a 3000 GB database. The TPC Benchmark-H (TPC-H) is a decision support benchmark. It consists of a suite of business oriented ad-hoc queries and concurrent data modifications. The queries and the data populating the database have been chosen to have broad industry-wide relevance. This benchmark illustrates decision support systems that examine large volumes of data, execute queries with a high degree of complexity, and give answers to critical business questions [7].

3.2 Database design

We aren't going to discuss the whole process of analyse, design and development of the solution in this paper, but we are going to focus on the central points of our approach. When using a portal approach for integration, developing an integrated database is optional because the integrated systems can communicate through a unified web interface. Still, we consider that every application should have a well designed database, and we consider it's best that every public institution to have a common core of tables. This doesn't mean that every institution uses the same database, just that in its schema we can have some common tables.

The following concepts should be taken into account in the process of databases application development: understandability, completeness, flexibility, reliability and data protection.

Understandability involves that developers should think from user perspectives and try to empathize with his problems, technological fear and rejection of the new. When changes are made, the target group is trained to cooperate with the new application.

Completeness is another important database quality metric. An application is complete when all the items from the model (such as the tables and columns from the database diagram) correspond to the user requirements. At every step (prototype) it is recommended to study if the stage is complete and if is not there should be made some corrections. Problems also appear if the end user requirements are not well defined, which leads the development team to confusion. The target group must be interviewed in the development process to find out that the partial outputs are accurate.

Flexibility makes an application economically efficient. The number of changes in the future is not supposed to be very big and also changes must be easy to accomplish. The more the application is flexible, the lower cost of changing and upgrading is.

It is also very important for the application to be reliable during the life cycle. We hope that our application would maintain all its functions and procedures for a long period of time without any irremediable, beyond repair errors. It is desired that it would work for a long period of time. The index of reliability is

$$I_r = \frac{ndat_\epsilon}{ndat}$$

where

- ndatc represents the number of datasets that generated the results;
- ndat , the total number of datasets. A good application is realized when the indicator has the value greater than 0,78 [14]. All this principles were taken in account when designing the database.

An important outcome of the system design is the database schema. By analyzing the existing systems, data flow diagrams were constructed, which describe the processes within the institution. Starting with the entity-relationship diagram and using Oracle Designer for refining the server model, a candidate database structure was created as shown in Fig. 1. In this

schema we find tables for storing information like:

- Citizens
- Counties
- Localities
- Jobs
- Addresses
- Studies
- Taxes

These tables don't just store static data about counties, jobs and citizens; they also take in consideration the time dimension. We need to know a person's current address but also his address three years ago.

It's a good debate if every institution should have access to the whole citizen database or just with people they came in contact.

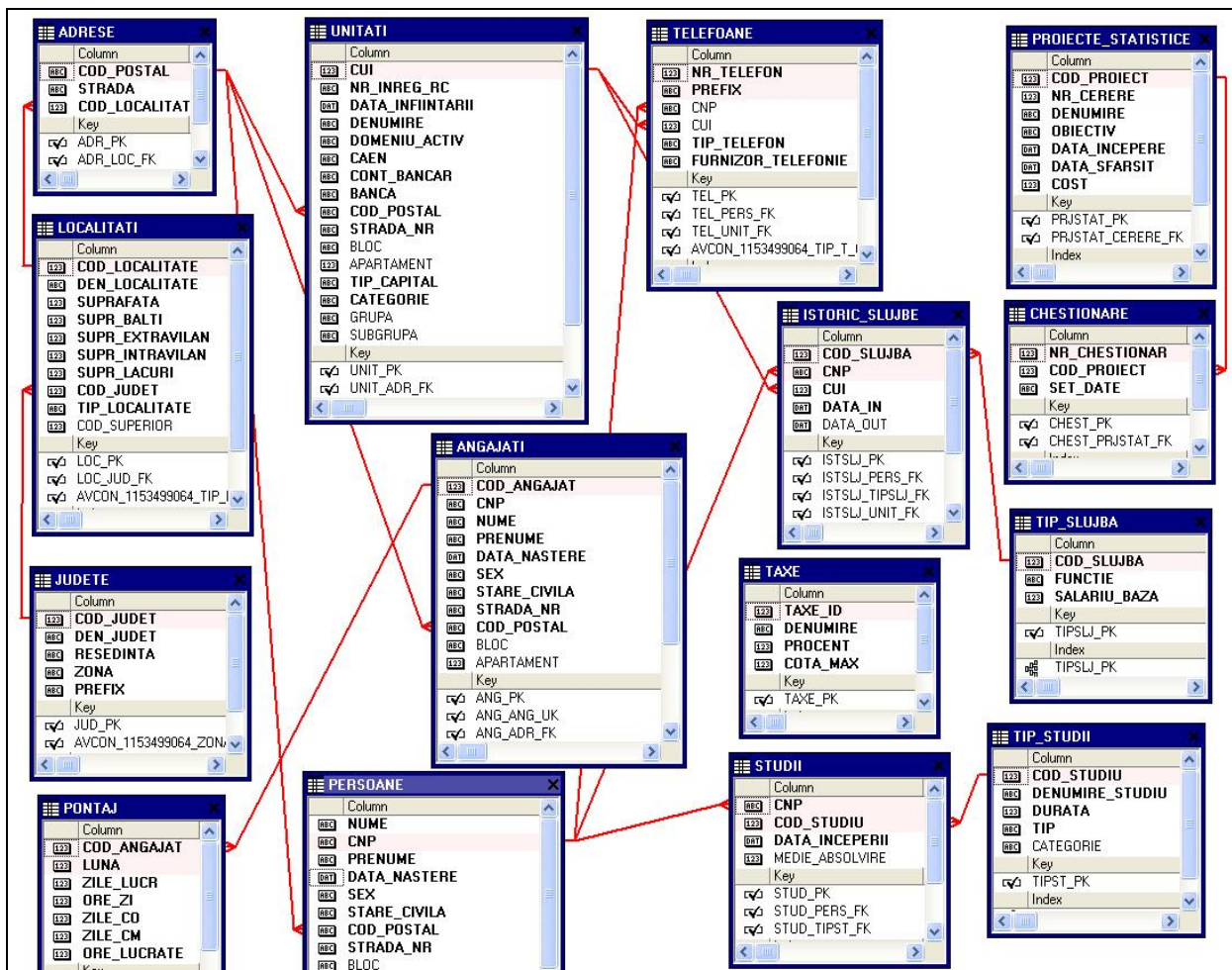


Fig. 1 – Database structure

3.3 Using portal oriented integration

While the rate of growth has slowed as the market has matured, the worldwide market for enterprise portals is still estimated to grow approximately 9 percent annually for the next several years [9] [10].

The enterprise portal market continues to grow over 9 percent annually, with an estimated \$1.4 billion in annual sales by 2011. CIO surveys [8] confirm that portals are a key spending priority for the sixth consecutive year.

Despite efforts to consolidate, the number of portals deployed in an enterprise is expanding. This expansion is not necessarily due to technical

limitations of software but to the increasing number of audiences being supported by portals, and by the improved flexibility of portal technology as a framework to speed application development and deployment. The recognition by companies of the revenue-generating opportunities provided by inter-company collaboration has spurred the growth of extranet portals for use by partners and customers. The unique business and security requirements of extranet portals are often better satisfied by using a separate extranet-specific portal deployment rather than the same portal used for the intranet.

The development of a portal in a public institution is a system integration approach from the institution's point of view with the main advantage that it can be easily offered as a service to the wide public. As an integration method, the portal oriented (POAI) approach has the following **advantages** [1]:

- It is a non-invasive approach, the organizations communicate through a unified Web interface;
- It is much faster to implement than real-time information exchange with back-end systems;
- The technology is a mature one, there are various examples from which we can learn.

The **disadvantages** are:

- The information does not run in real time and it requires human intervention for this to take place;
- The information must be abstracted through another solution by adding a new level, for example by using an application server;
- There must be taken in consideration the system's security, especially if the portal is visible on the internet and not only on the intranet.

Steps in developing a portal:

- The understanding of the institution and of the problem domain;
- Analyzing the significance of data and processes;
- Identifying the interfaces that have to be developed;
- Identifying the required data transformation scenarios;
- Choosing the technical solution;
- Applying the solution;

- Prototype testing;
- Performance testing;
- Maintenance procedures development.

In order to create a unified interface across multiple applications, a portal must have enough integration capability and be sufficiently application-agnostic so that the requirements of the host application do not impede the integration needs of other applications. The primary purpose of a portal is to integrate data and information from a wide range of applications and repositories, and to create and manage a volume and variety of composite applications from that integration. Without this ability, a portal is just a fancy web interface for a single application and limited to presenting a partial view of an enterprise. Enterprise or horizontal portals are generally more application agnostic and provide more integration capability than application-based portals because integration and composite application creation is their primary focus. Portal should be optimized for the audience they were intended to support, just like any other application, and external audiences have different needs than internal audiences.

In this paper we focus on the results of applying these steps in the development of a portal in a Romanian public institution. By analyzing the existing systems in such an institution, the performances and the limitations of the current procedures were measured. The way the public authorities and the public have access to the data that they need, and the way this information is produced, was studied. The system that is presented has the main purpose of facilitating real time access to the required information by the target audience. Both companies and citizens have the need to access information from the public sector by the means of the Internet. This is the reason that a Web application is suggested for offering on-line access to the information. The data extracted from the database is processed, transformed and centralized within a virtual data warehouse [2]. For obtaining advanced analyzes and reports Oracle Discoverer can be used [6]. An example of an obtained hierarchy is shown in Fig. 2:

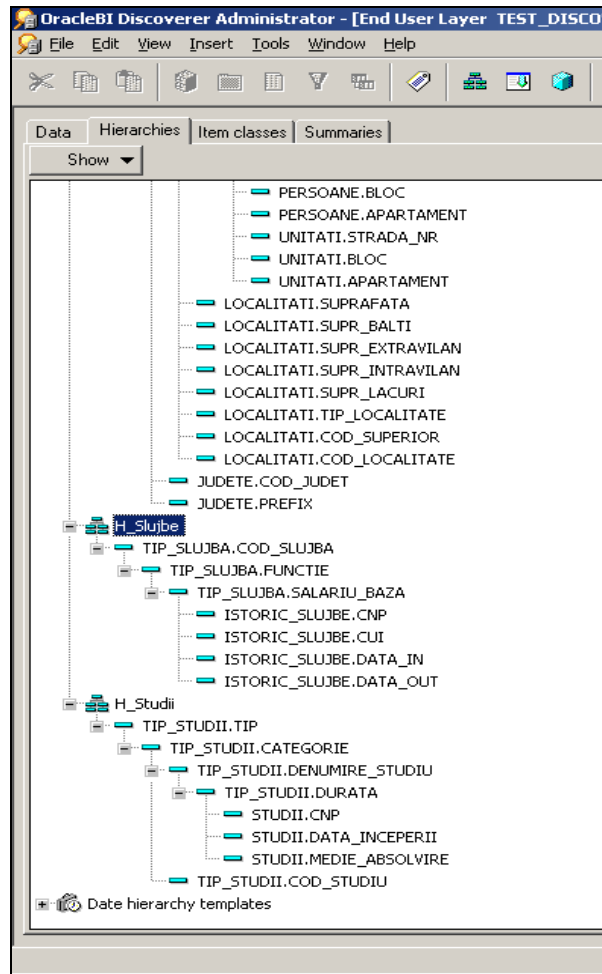


Fig.2 – Oracle Discoverer hierarchy

Oracle BI Discoverer Desktop environment allows building flexible and complex reports, by starting from the hierarchies previously defined in Oracle Discoverer Administrator.

An example of such report is presented in Fig.3. By using it, we can visualize the category of study which has a percentage 50% larger than the total of the district.

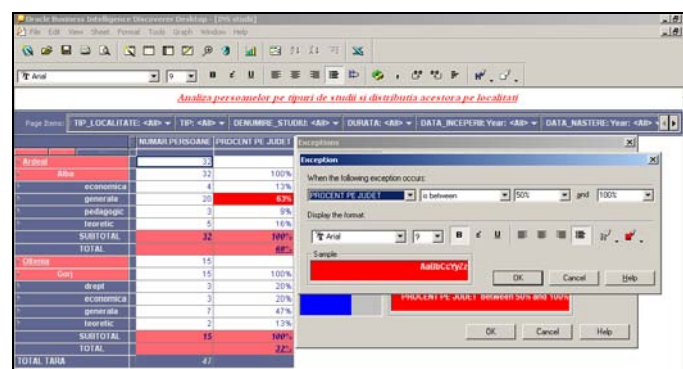


Fig. 3 – Parameterized Report

The user interface is made possible through a Web portal, which allows both the demanding of statistical data (that will be treated and presented in the reports created by querying the data warehouse) and the periodical update of the database tables (activity that is made by the

database administrator, after his authentication in the private administration zone). The activities of loading, analyzing, updating and presenting information are carried out by forms development instruments, which are completely integrated within OAS Portal.

Through OAS Portal and by using an on-line form we can obtain information from a person/source and we can store them directly into the database. Using Oracle Portal, we can easily construct forms that allow inserting, updating or deleting.

Also, we can create master-detail forms, which will display a master record and multiples details rows. The master-detail form allows to the end-users to insert, update or delete data from two tables or views as shown in Fig. 4.

Detail actions	Empno	Ename	Job	Mgr	Hire-date	Sal	Comm	Deptno
[[F&A]]	7782	CLARK	MANAGER	7839	09-JUN-81	2,450.0		10
[[F&A]]	7839	JONG	PRESIDENT		17-NOV-81	5,000.0		10
[[F&A]]	7782	MILLER	CLERK	7782	23-JAN-82	1,300.0		10

Fig.4. – Master-detail form

For constructing the application logic, starting from the portal templates, the components are build rapidly by using wizard type facilities. After organizing the application functions in Web pages and after establishing the navigation flux, we can design and build every page, by code or by using wizards.

One of the major advantages of Oracle Portal environment is represented by a set of controls with predefined properties and methods.

In fact, the application developer is no longer forced to program certain operations, while they can be easily realized by direct access to the methods and properties of the objects used.

The application is shared in two important modules, related to each access level: 1) the administrator module, used by experts in informatics, only after authorization; 2) the end-users module.

Fig. 5 – Portal start page

After the validation of the username and password, as shown in Fig. 6, the administrator of the application is able to access the portal administration area. In this area, he can easily

update data or pages and has access to specific controls for the configuration of the portal structure.

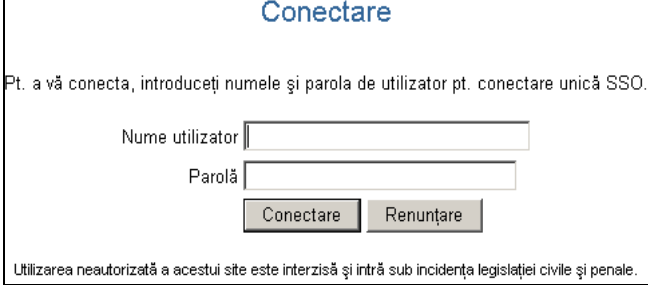


Fig. 6 – Administrator SSO

3.4 Using SOA for improving portal integration

The increased adoption of business process management (BPM) and Service-Oriented Architecture (SOA) initiatives are both driving portal usage. BPM without SOA tends to create one-off integration points with existing applications interfaces. When SOA is available, less custom integration is needed and more time is saved for BPM initiatives. BPM also identifies which areas of a business should be service-enabled, and because dynamic process reconfiguration is the single biggest promise of SOA, BPM becomes the fastest-growing component in SOA[12]. Studies show that BPM and SOA together provide greater benefits than either provide when implemented separately, and that portals are the best vehicles to promote both BPM and SOA initiatives to end users. This is because portals already utilize many SOA principles and can deliver and manage premium interaction and contextual experiences. As a result, companies that are looking to deploy BPM and SOA typically pair these projects with portal deployments to handle the management and development of composite applications. Although costs to create or convert SOA-based applications can initially be higher than standard development practices, many companies believe it is justified because of the promise SOA holds to improve business agility and flexibility and lower overall costs. Once SOA-enabled components are available, applications can be built from those components more quickly than from scratch. SOA also provides more consistent interfaces since common components are being reused.

After witnessing the impact of Web 2.0 companies on the consumer Web, leading-edge companies are embracing those principles for use in the enterprise. These companies are empowering end-users with greater control and flexibility over how information in an enterprise is used and shared. The effect is a more active user community and improved collaboration and sharing of enterprise knowledge. Portals once again are leading vehicles for implementation of Web 2.0 and enterprise social computing because of the rich user interface and interactive capabilities they offer.

We can say that portals can be expanded to take advantage of BPM, SOA, and Web 2.0. Because of the loosely coupled aspects of those technologies, the leaders in the portal market are those that can be the most open while still offering enterprise-grade capabilities like security, branding, personalization, and search.

In this section we we'll apply the principles of service oriented design to identify the service candidates for public institutions integration. We can say that the primary goal of the service-oriented analysis stage is to figure out what it is we need to later design and build in subsequent project phases. It is therefore helpful to continually remind ourselves that we are not actually implementing a design at this stage. We are only performing an analysis that results in a proposed separation of logic used as input for consideration during the service-oriented design phase. In other words, we are producing abstract

candidates that may or may not be realized as part of the eventual concrete design.

The reason this distinction is so relevant is because once our candidates are submitted to the design process, which will not be described in this paper, they are subjected to the realities of the technical architecture in which they are expected to reside. Once constraints, requirements, and limitations specific to the implementation environment are factored in, the end design of a service may be a significant departure from the corresponding original candidate.

You don't need Web services to build SOA. These are words are to be found in almost any book or article regarding SOA. However, we can add that using web services as the building block of SOA is a very good idea. Probably one day Web services will be outdated by a superior platform even more capable of bringing the world closer to pure service-orientation. For now, though, the Web services platform (and all that comes with it) is as good as it gets.

So, at this stage, we do not produce services; we create service candidates. Similarly, we do not define service operations; we propose service operation candidates. Finally, service candidates and service operation candidates are the end-result of a process called service modeling [13]. We aren't building a full service oriented architecture at this stage, we are using some of it's principles to help the portal(s) function better.

These services, also represented in fig. 7, can be used by all public institutions for their own needs:

Generic systems

We should be able to receive data from different external sources and to export existing data in popular formats (XML, XLS, CSV or SQL Inserts).

- Export data in a given format
- Import data from a given format

XML Transformation

- Transform documents to XML format
- Transform XML documents into native format (relational database)

Even if we have in generic systems an operation for exporting/importing, we should have a process especially for XML transformation because of the

popularity and the easiness of use of this format.

Citizen Information

It's important to have quick access at citizen information at any given data. We should know a person's current address and the taxes he has to pay this year, but we should also find out what was his address three years ago and if he/she changed his/her name since (because of marriage for example). The development of these services should take in consideration data privacy, restricting access to certain private information.

- Get citizen name
- Get citizen address
- Get citizen studies
- Get citizen taxes
- Get citizen paid taxes
- Get citizen jobs

Metadata processing

- Check if it's time to process the metadata
- Process metadata

Metadata (sometimes called metainformation) is "data about data", of any sort in any media. An item of metadata may describe an individual datum, or content item, or a collection of data including multiple content items. In our case we can use metadata to bridge the semantic gap. By telling a computer how data items are related and how these relations can be evaluated automatically, it becomes possible to process even more complex filter and search operations. For example, if we develop a search engine, it's important that he understands that *marketing manager* is a *highly paid job*, it can answer a search query on *best paid persons* with information containing peoples who are employed as marketing managers even if the words *marketing managers employees* never occurred. This approach, called knowledge representation, is of special interest to the semantic web and artificial intelligence. Metadata processing can be programmed to be done at certain intervals of time.

Integration service

We need some services to help integrating public institutions.

- Check if needed data is locally available
- Request data
- Answer data requests

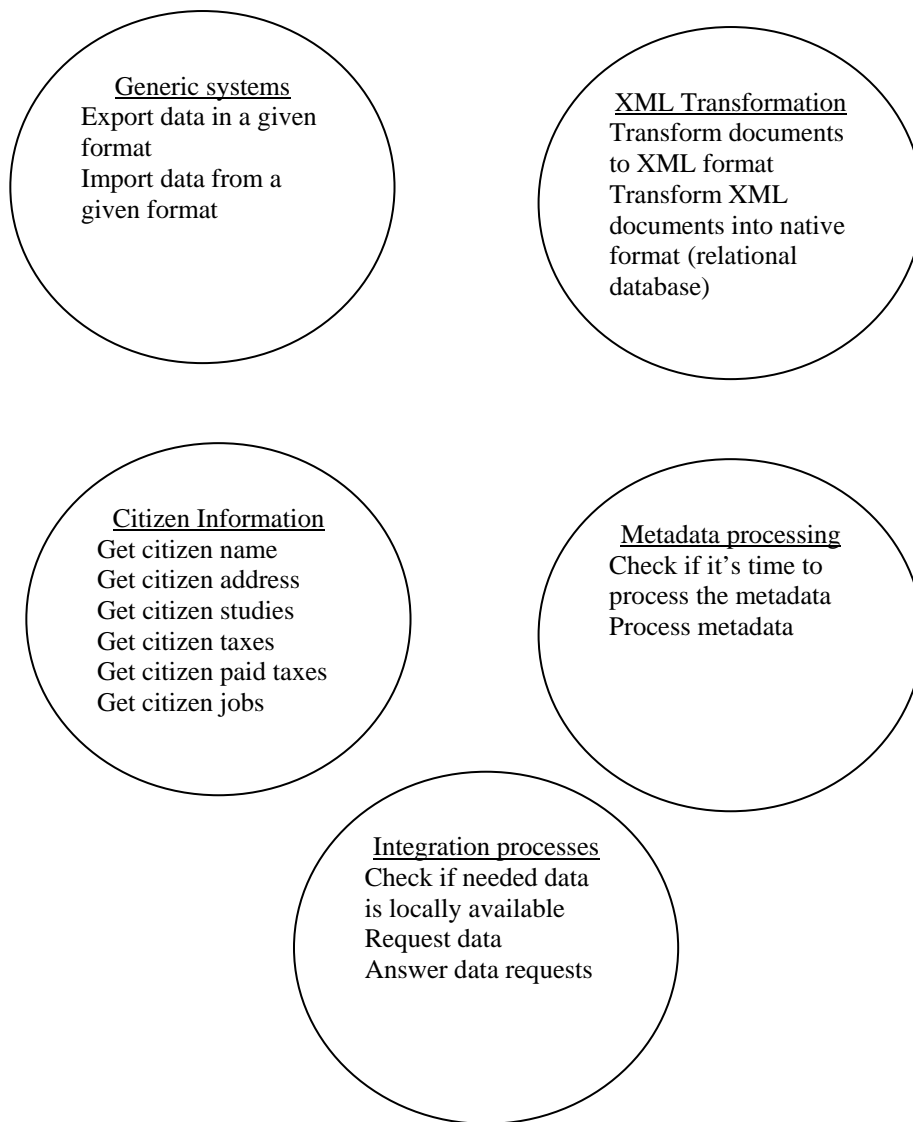


Fig. 7- Candidate services

Using SOA in our approach can add value because establishes an environment that promotes reuse on many levels and helps the portal(s) work better. For example, services designed according to service-orientation principles are encouraged to promote reuse, even if no immediate reuse requirements exist. Collections of services that form service compositions can themselves be reused by larger compositions.

The emphasis placed by SOA on the creation of services that are agnostic to both the business processes and the automation solutions that utilize them leads to an environment in which reuse is naturally realized as a side benefit to delivering services for our project.

4 Conclusion

The fast development for the IT&C sector represents a key point in Romanian development of the economy.

We find ourselves in a new era, in which the computer networks and the communication systems have become a part of the daily activities of the people. For integrating multiple public institutions we need a standardized database with shared objects, for these entities to share public interest data like: population data, addresses, statistical data and so on [4].

Therefore, the public administration must align with the new standards and must offer to the citizens applications easy to use, in order to realize a good interaction with the public services and to maintain the confidentiality of the used data.

Both the citizens and the enterprises have the interest to easily access the information from the

public sector through the Internet.

Therefore, we can conclude that the ideal application is a Web portal, which will assure on-line access to the public information.

But every automation solution, regardless of platform, represents a collection of features and functions designed to execute some form of business process in support of one or more related tasks. The requirements for which such a system is built are generally well-defined and relevant at the time of construction. But, as with anything in life, they are eventually subject to change. Service-oriented integration therefore empowers public institutions to become highly responsive to change, all the while building on the service foundation established by SOA.

Asheesh Raina, Gartner, "Forecast: Portal, Process and Middleware Software, Worldwide, 2006-2011," April 27, 2007.

[11] David Gootzit, Gartner, "Portals: Gateway to Business Value," March 2007, p. 19.

[12]. Eric Austvold, AMR Research, "BPM Vital for SOA Success," September 7, 2005, p. 1.

[13] Service-Oriented Architecture: Concepts, Technology, and Design, Thomas Erl, Publisher: Prentice Hall PTR, Pub Date: August 04, 2005, ISBN: 0-13-185858-0

[14] Internet databases in quality information improvement, Cosmin TOMOZEI, JAQM, issue 2/2007, ISSN 1842-4562

References:

[1] David Linthicum, Next Generation Application Integration: From Simple Information to Web Services, Addison Wesley Longman Publishing House, Reading, 2003.

[2] Sam Anahory, Dennis Murray, Data Warehousing in the Real World, Addison Wesley, Longman Publishing House, Reading, 1997.

[3] The Evolving Role of Portals in Today's Leading Businesses - An Overview of Portal Technologies and Benefits for the Service-Oriented Enterprise, BEA White Paper - http://www.ebizq.net/white_papers/7992.html, 2007.

[4] Ion Lungu, Manole Velicanu, Adela Bâra, Vlad Diaconița, Iuliana Botha, Technologies for system integration in public institutions, CNCSIS Contract, 2007

[5] Vlad Diaconița, Iuliana Botha, The Level of system integration in Romania, The Preecedings of the Eighth International Conference on Informatics in Economy, 2007, pp. 169-174

[6] Ion Lungu, Adela Bâra, Vlad Diaconița, Building Analitic Reports for Decision Support Systems-Aggregate vs. Analyic Functions, Economic Informatics, no.1-4, 2006, pp. 17-20

[7] Transaction Processing Performance Council (TPC) reports <http://www.tpc.org>

[8] Merrill Lynch CIO Spending Study, "What Are Your Top Spending Priorities," July 2006.

[9] Kathleen Quirk, IDC, "Worldwide Enterprise Portal Software 2007-2011 Forecast Update and 2006 Vendor Shares: Solid Growth Ahead Fueled by Mashing Up the Portal with New Web 2.0 Collaboration and Development Technologies," Doc #207534, July 2007, p. 3.

[10] Michele Cantara, Fabrizio Biscotti, and