An Integrated Dashboard and Balanced Scorecard Solution

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ABSTRACT

Access to information has always been a stringent necessity for any organization. This necessity has become more stringent in the actual economic context, as decisions must be taken in the shortest time. That is why since the early sixties, the Decision Support Systems appeared. These have evolved together with the client-server technology, during the eighties, towards the today’s Executive Support Systems. Nowadays, these systems tend to be replaced by Dashboards and Balanced Scorecards (BSC), which fulfill the more and more sophisticated and growing information needs of the decision factors. In this article, we shall present an integrated solution for creating dashboards and scorecards using an enterprise portal. In the same time, we will analyze the advantages and disadvantages of a such integrated solution vs. independent solution.

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1. Introduction

Dashboards are instruments used in information systems for assisting decisions since 1960. The goal of any Dashboard building instrument is to create a platform for sharing and using data, a platform that would add value to data and help decision factors make the best choices (Dunoff, 2009). Modern solutions for building Dashboards fulfill the needs of decision factors in a practical and concrete way, offering both synthetic indicators and detailed transactional data. Often, the term Dashboard is also used to describe a Balanced Scorecard (BSC), or the other way around, the term Balanced Scorecard is also used to describe a Dashboard, the terms being mixed. The confusion occurs because of the fact that both solutions use the same graphic elements to display data and also to the fact that generally, the same instruments and software products are used to build them. So following, we shall try to emphasize the difference between a Dashboard and a BSC, this explanation allowing for a better understanding of the Dashboard concept.

Although there are graphical similarities in the way the Dashboard and the BSC are presented, there are major differences concerning the objectives and the content (figure 1) Unlike the BSC, which monitors the way the enterprise achieves its strategic goals, the Dashboard is used for real-time monitoring of the way the organization achieves its short-term tactical and operational objectives (Hannabarger et al., 2007). The values of displayed indicators in a Dashboard are permanently changing (how many orders are waiting to be processed, how many production units are built during a day’s work etc. Unlike the BSC, which is destined for the higher management, so that it could monitor the achievement of the enterprises’ strategic goals, the Dashboard is intended to be used by employees and managers responsible with the achievement of daily and short-term goals. The image in figure 1 synthetically presents the main differences between Dashboards and BSCs from many point of view: theirs purpose, theirs users, the frequency of updates, level o aggregation of data presented, graphic elements they use etc.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Dashboard</th>
<th>BSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used for</td>
<td>Monitor Operations</td>
<td>Performance Measure</td>
</tr>
<tr>
<td>Used by</td>
<td>Department</td>
<td>Corporate</td>
</tr>
<tr>
<td>Goal</td>
<td>Achieve operational and tactical objectives</td>
<td>Achieve strategic objectives</td>
</tr>
<tr>
<td>Users</td>
<td>Managers, staff</td>
<td>Executives, managers, staff</td>
</tr>
<tr>
<td>Updates</td>
<td>Real time, right time</td>
<td>Periodic snapshots</td>
</tr>
<tr>
<td>Data</td>
<td>More transactional</td>
<td>More summarized</td>
</tr>
<tr>
<td>Graphic Interface</td>
<td>More charts and tables</td>
<td>More symbols and icons</td>
</tr>
</tbody>
</table>

Fig. 1. The main differences between Dashboards and Balanced Scorecards
(adapted after Eckerson, 2006a, 2006b)

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The creation of a Dashboard assumes processing very large amounts of data, mostly provided by different applications, which must be transformed from individual transaction data into synthetic indicators. To process this data requires some integrated enterprise systems or some integrating solutions for the already implemented enterprise applications. Lots of nowadays ERP (Enterprise Resource Planning) systems also include instruments for calculating and monitoring performance indicators like the ones composing a Dashboard or a BSC. The most advanced ERP systems already include modules that allow building complete Dashboards or BSCs. But the number of ERP systems offering such modules is very low and in Romania they are almost inexistent. Independent solutions for building Dashboards and BSCs also must include instruments for integrating different existing enterprise data sources. The need for this kind of integration makes Dashboard building solutions rather complex and complicated from a technical point of view. In this article we present a solution for building Dashboards as a component of an enterprise portal.

2. Our solution vs. existing solutions

Often a implementation of a Dashboard Solution sounds too elaborate and expensive. Many organizations don’t wish to be involved in or initiate a project that will cost hundreds of thousands of Euros and take months or years to complete. Most of them just want something quick, simple and cheap to replace their Excel spreadsheets or the multitude of reports that must be combined in order to take a decision. In the past years, many developers have begun to offer solutions that promise to implement a departmental Dashboard or a BSC in a short time (few days or weeks) at lower prices. Often, these solutions automate existing Excel spreadsheets with many graphical control elements, extract and integrate data from multiple sources and/or systems using new federated query technology and display it using multi-panel web pages or compounded reporting tools. Also, these solutions can be visually attractive and can offer powerful functionalities, but mostly they cause problems on a long term.

- Most Dashboard solutions present the following problems (Eckerson, 2006b):
  - They offer limited capability for drilling down or interacting with underlying data. If data can’t be drilled down to transaction level details or across dimensions to explore root causes of a problem, the Dashboard or BSC will only serve to alert that a problem exists. It won’t help identify the source of the problem or how to fix it;
  - Many Dashboards and BSCs work well in demo version, but require a lot of expertise and time to make changes. The best systems must let users add and modify metrics, targets, thresholds, alerts, charts, tables, layouts, and so on without the developer’s intervention. They also must automatically capture large data volumes from diverse source systems, but must also allow manual data entry when necessary;
  - A big problem with existing solutions is that they may meet immediate business needs, but compromise the organization’s ability to obtain a single, consistent view of information across units, products, customers, and so on. These solutions are almost always information silos. Eventually it will take to integrate or consolidate them with other performance Dashboards or analytic systems in order to preserve business views and eliminate redundant operations;
  - At any time these solutions display information from multiple systems, or worse, merge this information into a single table or chart, and the probability to deliver in accurate, incomplete or inconsistent information is high. Merging data from multiple systems requires experts from both the business and IT sides to analyze source data and systems and create accurate SQL code that reflects the Dashboard users needs. Existing solutions may claim to automate this step, but this task must not be underestimated or assumed to be solved by technology.

Compared with other existing solutions, our SharePoint Dashboard solution presents the following advantages:

- It can be set to automatically gather summarized information regularly. This allows the organization to identify its trends and adopt any necessary corrective measures if the trends are not progressing in the desired direction;
- It can measure and display results in a graphical manner that allows users to decide whether the KPI is on-target or not. Such graphical views of the KPI are provided in order to help decision makers determine whether their targets are being achieved or not;
- It accesses information stored in different systems of the organization. A SharePoint Dashboard can organize and view key business data from corporate applications, Internet and Intranet sites and personal files. The purpose is to present its data in a summarized, user-friendly manner. It’s also capable of tapping into the information contained within SharePoint. It’s common to create a Dashboard that analyzes information stored in SharePoint lists;
- SharePoint Dashboards are delivering a set of building blocks (called “web parts”) that can be used to build an entire Dashboard within a web browser without writing any custom code and, in addition, include dynamic, interactive data capabilities, such as drill-down, filter and sort. Also, they take advantage of the user’s familiarity with Microsoft Office Excel, making use of PivotTables, Excel charts, and formulas. Through integration with Microsoft Excel Services, technical and, more important, non-technical users can use and enhance their existing knowledge of Excel in order to create the interactive views of data and integrate that data into a Dashboard;
- Users can customize their own Dashboards with the easy-to-use interface by selecting from lists, KPIs, reports, worksheets and other resources to build their own individual data view. MOSS also includes a
When we designed the portal, we intended to achieve the following goals:

- A SharePoint Dashboard helps solve information overload by delivering focused business data by using filters, user-specific categories and summaries. Filters enable Dashboards to be personalized by using shared parameters among Web Parts on a Dashboard. This versatile filtering capability is the key to the power of personalization. It gives to individual decision makers or users unique data views. They can access high-level information in relevant business reports directly from their Dashboards.

To justify all the above and to demonstrate the functionality of our solution we present below a Dashboard that addresses to the organization accountants and which aims to monitor due payments in order to avoid liquidity problems.

3. The overall description of our solution

Our solution for building and implementing Dashboards is a component of an enterprise portal that we built as a general collaborative and integrating solution for enterprises. The portal's building technology is based on Microsoft Office SharePoint Server 2007, for several reasons, that we shall further present.

Microsoft Office SharePoint Server 2007 (MOSS) is part of the Microsoft Office 2007 suite, which is based on an extremely complex enterprise architecture, which's design was possible due to the implementation of the following concepts (English, 2007; Bates, Smith, 2007):

1. **Modularity and reusability.** The Microsoft Office system is organized using independent and encapsulated services, interconnected by some known standards sets, named frameworks. In order to make their administration, organizing and developing easier, these services were grouped in applications composing the Microsoft Office system. Such an application is the Microsoft SharePoint Server 2007. The Microsoft Office 2007 system runs on Windows Server platforms with minimum dependencies to any version;

2. **Extensibility.** The SharePoint Server 2007 architecture is conceived so that it can extend its functions and services without the need to modify the basic platform;

3. **Scalability.** This is one of the most important features of the SharePoint Server 2007, and the one which determined us to choose this technology. On any of the 3 architecture levels there can be added at all times new web, application or database servers, without having to modify and redesign the other 2 levels.

   Scalability is also implemented at the services level. New servers, like indexing, searching, excel calculations, reports servers can be added any time;

4. **Separation of Concerns.** The SharePoint Server 2007 architecture was built to offer separation of concepts for different architecture levels and their functioning. The 3 level architecture of a SharePoint Server can be implemented either on only one server or on several servers in any combination. The logic architecture of a SharePoint Server does not depend on any particular physical architecture, because numerous aspects of the architecture were separated form each other.

MOSS 2007 is based on Windows SharePoint Services (WSS) which is already offered cost-free as a component of Microsoft servers (Windows Server 2003, Windows Server 2008). MOSS 2007 extends the functions of the WSS and is a combination between the prior versions of SharePoint Server and Microsoft Content Management Server.

WSS is the central component of the Microsoft integrated and collaborative applications platform. The functions provided by the WSS include: Document management; Collaboration support; Workflow support; User management; Security; MOSS 2007 brings more features to the WSS, like: Enterprise Content Management features ECM (Enterprise Content Management); Business intelligence features; Advanced searching features; Integration with application programs; Internet publishing features.

Another important consideration regarding the Microsoft Office 2007 system, which also drawn us into using it above all other products, is the SOA – Service Oriented Architecture, which is a growing trend in developing software applications. Microsoft Office 2007 groups services into specific applications making their developing, organizing, understanding and management easier and faster. The 2007 Microsoft Office version provides an architecture that can be implemented both bottom-up and top-down. From the bottom-up perspective, the system architecture consists of a series of independent and discreet services. From the top-down perspective it consists of services composed of specific applications.

The general solution architecture obtained using the MOSS 2007 is a 3 level architecture in which the component servers have the following roles:

- **Web Server** hosts web content and services that are strictly necessary for the portal to work, the component sites, the site directory and MySite;
- **Application server** – hosts the site’s dynamic content and services: search, indexing, user profile management services, Excel Services, Reporting Services etc;
- **Database server** – for this role, we used SQL Server 2005.

The power of the MOSS 2007 consists in the fact that the three level logical architecture can be implemented into a large variety of physical architectures, from only one workstation to a very large number, depending on the enterprise’s size and field of activity. For developing and testing purposes we implemented all these logical servers on one physical computer.

When we designed the portal, we intended to achieve the following goals:

- Managing and sharing in a secured and controlled environment the enterprise documents and situations;
- Automating the economic processes within the enterprise using workflows;
Building and securely sharing in a controlled environment situations and reports created in Microsoft Excel;
Building an integrated enterprise reporting solution;
Communication and collaboration within the organization using the newest collaborative technologies: blogs and wiki sites;

In order to build the portal and the necessary components to achieve the goals we previously mentioned, it took to install, configure and implement several software products (table 1).

Table 1. Solution’s software infrastructure

<table>
<thead>
<tr>
<th>Product</th>
<th>Version</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Server</td>
<td>IIS 6.0 and ASP.NET 2.0</td>
<td>POP3 and SMTP installation and configuration</td>
</tr>
<tr>
<td>E-mail Server</td>
<td></td>
<td>Provides the .NET primary environment for building and developing software products using the Microsoft and .NET technologies. Also required in order to run .NET Framework 3.0.</td>
</tr>
<tr>
<td>.NET Framework</td>
<td>2.0</td>
<td>Provides basic workflow components</td>
</tr>
<tr>
<td>.NET Framework</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Microsoft Office SharePoint Server (MOSS)</td>
<td>2007</td>
<td>SharePoint Server, Forms Services included, necessary for building sites.</td>
</tr>
<tr>
<td>SQL Server</td>
<td>2005</td>
<td>Database Server</td>
</tr>
<tr>
<td>SQL Server Reporting Services</td>
<td>2005 with SP2</td>
<td>The Reports Servers, necessary for building an integrated reporting solution</td>
</tr>
<tr>
<td>Reporting Services Add-in for SharePoint</td>
<td>2007</td>
<td>Component required in order to integrate the reporting server with the SharePoint server. Together with the SQL Server Reporting Services it is used to build and implement Dashboards</td>
</tr>
<tr>
<td>Excel Calculation Services, Excel Web Access and Excel Web Services</td>
<td>2007</td>
<td>Extension of the portal features in order to accommodate accessing of Excel external data sources and integrate them into the portal. It is also required in order to build and implement Dashboards</td>
</tr>
<tr>
<td>Office Applications</td>
<td>2007</td>
<td>Microsoft Word, Microsoft Excel, Microsoft Outlook, Microsoft InfoPath, SharePoint Designer</td>
</tr>
</tbody>
</table>

The solution we designed including all these products provides a means to respond to all critical problems that can occur in an enterprise, like: efficient management of business content and processes, easy, real-time access to the information for users and tools which help take better decisions.

4. A dashboard implemented with our solution

Among the most frequent problems that professional accountant must confront and which gets more and more serious during crisis periods there is the lack of cash for covering due payments and also collecting debts from suppliers in time. That is why, especially during crisis periods, organizations frequently run out of cash. Using the features provided by the integration of SharePoint with Microsoft SQL Reporting Services and Microsoft Excel Services, we designed and implemented in the portal a Dashboard which provides real-time monitoring capability for accountants so that they can foresee the due payments capacity 10 days ahead.

Figure 2. Due payments monitoring Dashboard
As one can see in figure 2, the Dashboard has four components, all of them linked to the accounting database through ODBC connections.

1. **Key performance indicators:**
   - **Capacity to pay due payments** – shows if the organization has enough cash to cover due payments for the next 10 days. This is calculated applying the following formula:
     \[
     \frac{\text{Available Cash} + \text{Available Bank}}{\text{Total Due Payment}}
     \]
     This indicator is considered to be satisfying and will be marked with a green light icon if the available cash can cover 50% of the total due payments for the next 10 days. If the available cash reaches 30% of the total due payments, the accountant will be drawn attention by a yellow traffic lights icon. All indicators dropping below 30% and thus representing a real problem, as the organization risks not to be able to honor its due payments, will be marked by a red light icon.
   - **Default.** The indicator shows a default is imminent by adding to the available organization cash the cash to be collected in the next days. This indicator is monitored with the help of the following inequation:
     \[
     \text{Available cash} + \text{Available Bank} + \text{Cash collection} - \text{Payments} \geq 0
     \]
     By analyzing cash collection and payments on a 10 days period, there can be established an optimal level for this indicator. This is established according to an average volume of cash collection and payments on 10 days periods. We considered this indicator to be optimal if the available cash and cash collections for the next 10 days are at least 15000 RON greater than payments for the same periods.

2. **Due payments monitor graphic** – it shows in a graphical manner the total of available money in cash, in banking accounts, collections and payments for the next 10 days.

3. **Reports** created with the Microsoft Visual Studio Business Intelligence application with an ODBC connection to the accounting database:
   - The **Due payments to be paid** report – shows details for the entry number, code and name of the supplier, date of the overdue payment and the sum left to be paid for each entry. The report also provides the total sum to be paid.
   - The **Due payments to be collected** report – displays in detail the outgoing number, code and name of the client, date of the overdue payment and the sum left to be collected for each sold product or service. Also, the report provides the total sum to be collected.

The overdue monitor Dashboard, by its components, allows the accountants to continuously monitor cash collections and payments so that they can avoid penalties or prevent the organization from going into a default. The two reports, **Due payments to be paid** and **Due payments to be collected**, show at all times the collections and payments for the next 10 days period.

If indicators reach their critical values, accountants can take early measures in order to avoid the company’s going into a default. For example, they can propose contracting a short term loan or they can postpone certain small penalty or no penalty payments.

If the two indicators are around their optimal values, accountants can use the **Due payments to be paid** report in order to choose the payments according to their overdue term, value and the available cash. They can order reports by all of the 5 columns, so that they can be compared according to different criteria: date, sum, client, supplier etc. According to the values shown by the indicators and the graphic and comparing data from the two reports, accountants can choose the best payment strategy:
   - They can choose to pay a greater sum with a long term overdue instead of a smaller sum with a short term overdue, thus having smaller penalties in the event of a delayed payment;
   - They can choose to honor payments with priority for certain suppliers, for whom the due sums are greater so that in the event of a delay, the due sums should be smaller;
   - They can choose to honor payments with priority for the suppliers who are not clients and who are not in debt to the organization;
   - In the event of critical situations, as an imminent default, they can choose suppliers who are also clients for the enterprise, in order to negotiate compensations;
   - They can use the Dashboard to choose the best moment to make significant payments, like VAT to the state budget;

An accounting application cannot offer accountants all this information on an aggregated, unitary form. In order to obtain it, they must operate at least 4 or 5 different reports. Such a Dashboard increases the efficiency and promptness of the accountants, providing access to precise and relevant data for their activities. The important thing is that any of the components of the Dashboard can be connected to the databases of any enterprise application with an ODBC or OLEDB connection available. Thus, better Dashboards can be made, Dashboards that integrate data from several applications, providing precise and relevant data to the users and their activities, independently of the applications that they came from.
5. Conclusions

The nowadays Dashboards and BSCs are capable of offering all information that decision factors need in order to better understand the economic situation of an organization and to foresee in a realistic manner its short term evolution, thus being able to make the optimal choices in order to achieve both their short term and long term goals.

To conclude, they contribute to a better knowledge and understanding of critical enterprise data and to taking the most appropriate actions according to this information, at the most appropriate moments.

Office SharePoint Server 2007 contains very powerful tools for gathering business intelligence information for enterprise users. Offering the right information at the right time and in a proper format, Office SharePoint Server 2007 provides decision factors with an advantage when it comes to making the right choice.

Created using the SharePoint technology, the solution we presented in this article allows to create dynamic, interactive Dashboards, which can combine and integrate data from multiple sources and which can provide the most appropriate information for their users, according to their roles within the organization and consequently, to their need for specific information. By combining Web Parts, filters, key performance indicators (KPIs), graphic figures, reports and other elements, these Dashboards are capable of offering ideal information mixes, formatted and presented according to the specific needs of each user.

While organizations are becoming more and more dependent on information, collaboration and integration of multiple sources of information, both internal and external, decision factors are confronted to a raising challenge to manage the ever growing flux of information, provided by a very large number of carriers: events, numbers, documents, reports etc. In a more and more dynamic working environment, our solution provides the necessary instruments to organize, manage, share and efficiently offer all this content to both decision factors and all enterprise users.

References