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THE CAUSES OF USE OF THE DASHBOARD IN EARLY WARNING SYSTEM

Abstract: Analysts and executives alike recognize the stumbling blocks of contemporary analytics: endless columns of data, inflexible charts, disparate reports and delayed information that impede timely decision making. The quick obtainment of critical business information is very significant problem. The aim of the following article is to analyze characteristics of dashboard as tool to support monitoring the key performance indicators in early warning system. The first part briefly characterizes early warning system. The next part describes characteristics of information visualization to show business information. The last part of this article contains analysis of dashboard as technological solution facilitating identifying chances of advancement and threats of the establishment bankruptcy.

1. Introduction

The establishment works better on competitive field if it tries to identify chances of advancement and threats of breakdown connected with leading activity. This requires implementation of information system letting gain, process and detect the connection between different signals. The usefulness of these systems is not decided by amount of information to receive, but amount and type of information which is required at the right moment. However many organizations struggle with enabling their employees to make effective decisions because they lack a complete view of how the business is performing. In a study, 77% of business users said they made bad decisions due to insufficient information[1].

The preview of most of the future changes are some symptoms (so called weak signals), letting recognize their oncoming. But the problem is to choose and identify

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[1] BusinessObjects and BusinessWeek survey 2003 (see [*BusinessObjects…* 2008]).

properly the dependence between them. What's more the critical factor is the moment in which they are identified. The right fast identification of chances and risks of establishment is necessary reason of the optimization current and strategic decision which are taken on the variety levels of management (see [Mączyńska 2007, p. 27]). There are researches which concentrate on: elaboration methods of early warning (the problem is for example the right choice of indicators), architecture of information system (letting for example identify the data which announce important action for enterprise), the conceptual model of early warning system and the way of information's presentation for managerial stuff. The adopted form of presentation has also influence on speed of getting essential information at right time. That's why there is more and more concern of the solution which allows making information visualization.

The researches (see among other things [Mączyńska 2005]) corroborate usefulness of models of early warning in identification threats of the establishment bankruptcy. However they were interested also with managerial stuff by their solution (see [Mączyńska 2007, p. 31]). Similar conclusions are shaped by L. Fuld. According to a survey, more than 93% of strategists believe that their companies will experience competitive shocks in the near future, yet only 3% of them have any kind of early warning system (see [Fuld 2004]. There are many reasons of this situation. That is why you have to focus also on the user's interface and method of presentation in early warning system.

This article's aim is to present circumstances and benefits which point on necessity of adoption of solution like dashboard in early warning system. This elaboration is continuation of earlier publications of the author, which come off from leading researches connected with development of Business Intelligence.

2. Concepts of early warning system

Since the beginning of 1970's managers of establishments started to think about methods which allow early discovering of chances and threats occurring in their environment. It turned up early warning systems, which were to signal oncoming threats and chances as early as possible and explore their weak signals. Early warning is a process which allows an organization to systematically anticipate and address competitive threats.

Early warning system as organizational and information solution has to monitor the key performance indicators (KPIs). They are a business metric used to evaluate factors that are crucial to the success of an organization and help an enterprise assess progress toward declared goals. Early warning system is the identification with constant monitoring, collecting and processing information, even in real time on strategic management's need. This technological solution is essential, especially for firms in countries proceeding integration with European Union (see [Nguyen 2007, p. 24]). The problem of firms' bankruptcy also refers to countries of European

Union. That's why in 2004 European Union undertook operations in this direction, among other things throughout project named "Stigma of failure and early warning tools". One of its aims is elaboration of early warning tools, which aimed at preventing bankruptcy of firms (see [Mączyńska 2007, p. 28]).

Regardless of the area of tasks' adoption, early warning systems do not change: there is early information about oncoming threats and/or chances. It requires creation of solutions which help and enable identification symptoms. They should be delivered with so much time earlier as to be a possibility of raising the best at right moment operation and having ergonomic helping early warning system. Making early warning system one should follow also adoption of such solutions which would minimize period of time between identification of weak signals announcing important events for each of business and transmission information about them to managerial stuff (a wide review of the problem is presented in [Dudycz 2008]).

The most fundamental element of early warning system is the way of presentation information (signals). That system should deliver right pointer at right time and place and ready reports which contain also simulation of variety of operations as scenarios in variants: optimistic, pessimistic and realistic, to avoid threats, to be able to quickly react on unexpected changes in the field and make decision. Particularly the research shows that the information systems which management stuff valued as bad, presented information only in form of text and table. However, information system, which was valued as very good by management stuff of large companies, was able to present information in shape of text, tables and graphs in 100%, and schema constituted nearly 67% (see [Dudycz 2005a, pp. 41-44]).

3. Features characteristics of information visualization
to show business information

In the last few years one can see increasing interest of visualization's application to presentation of business information. It has three basic reasons. Firstly, information visualization is characterized by high efficiency, which is the consequence of graphic scene's perception, being quicker than the reception of verbal speech or written text, because the eye notices first the whole of the scene and then catches its details. Secondly, the right adopted visualization improves the reception of imperative information, what consequently enables to pick up the right decision in shorter time. Thirdly, development of information system in the last decade made easier creating and using visualization in helping to manage enterprise (see [Dudycz 2005b, p. 199]).

Visualization is the process of representing data as a visual image (see [Gray 2003, p. 24]). In other words, visualization allows decision-makers to use their natural spatial/visual abilities to determine where further exploration should be done. This implies that visualization, when used appropriately, can allow the decision-maker to find the information in the data (see [Tegarden 1999, p. 6]). Information visualization allows first of all (see [Dudycz 1998, pp. 26-27; Tegarden 1999, p. 6]):

–   to exploit the human visual system to extract information from data,
–   to provide an overview of complex data set,
–   to assist in identifying exceptions in data and prompt users into action,
–   to identify structure, patterns, trends, anomalies, and relationships in data,
–   to assist in identifying the areas of "interest".

Visualization technologies have been used in many areas of business because graphical representation of the data makes analysis easy and aids the user to make informed and quick decisions. Visualization enables to easily identify oddities in detail data, isolate them, and investigate their source much faster than with traditional analytical methods. Business information has been visualized in the form of tables, outlines, pie charts, line graphs, and bar charts for a very long time. However, today business information is typically abstract, discrete, multi-dimensional and can be either historical or generated in real-time. That is why multidimensional graphics are used so often to represent business-related data or information. They can be presented using information delivery mechanisms like: dashboards for performance monitoring, reports, cubes, graphs, dials and cubes for operational and performance reporting data, alerts, triggers and indicators (that can be delivered by numerous channels like desktops, mails, wireless, etc.), impact diagrams and strategy maps.

Application of user-friendly graphics and interactivity enables users who are not analysts to use data visualization, making the technology perfect for the business setting as well as statistical research. In particular, executives in a corporate organization can use the technology for faster and better decision making. With interactive graphs, users can examine information from multiple perspectives and in various forms while incorporating as many variables as they want. In the past, an analyst would have had to build and run multiple queries against large data sets to gain insight – now visualization technology draws an immediate picture of trends and relationships by allowing users to run visual queries (see [Curtiss 2007]). Common data visualization tools have three notable functions to represent key performance indicators (see [Quinn, 2006]):

1. Use of color – the connection of colors between the related charts and the data they represent.

2. Isolation and chart interactions – all related charts immediately react to selections made in the others to quickly isolate business issues.

3. Detail charts to expose outliers – some of the most unique chart types are used to spray tens of thousands of rows of detailed data into the small space of a single chart, so anomalies in data stand out.

Additionally more and more business visualization tools enable to (see [*SAS® Enterprise BI Server* 2007]):

1. Allow users to summarize and present data using a variety of highly customizable charts, including: vertical and horizontal bar, pie, donut, sub-grouped pie, star and block charts. Allow users to generate scatter, line, area bubble and overlay plots.

2. Generate static or dynamic interactive charts and graphs.

3. Provide highly interactive business graphics, including animated bubble plots, 3D scatter plots, trellis plots, summary charts and needle charts.

4. Visually query and filter data for interactive tabulation and ability to rearrange data at will.

5. Provide visual analytics, including interactive simulations and optimization and state-of-the-art time series modeling.

A data visualization tool's job is to point out what is abnormal or unusual in records of data. These unusual records are often referred to as outliers because they lay outside the norm (see [Quinn 2006]). Information visualization charts are excellent for surfacing the outliers in data. If the charts are combined with others in a data visualization dashboard, the outliers can be selected to focus on the problem.

4. Adoption of dashboards for monitoring key performance indicators in early warning tools

A dashboard is a visual display of the most important information needed to achieve one or more objectives, consolidated and arranged on a single screen so the information can be monitored at a glance (see [Few 2006]). This tool is the new genre of popular Business Intelligence data visualization and the interesting concoction of the most basic data visualization features with a mix of animation and interactivity, blended with a simulation of speedometers and thermometers (see [Malik 2007]). The dashboard is a type of display, a form of presentation, not a specific type of information or technology. It involves multiple technologies, processes and methodologies working together to present a complete picture for strategic change in an organization and to provide a consolidated view of the enterprise.

Dashboards are used to generate and deliver the right information, to the right person, at the right time – enabling better decision making. Effective ones display meaningful analyses and actionable information in an easy-to-read format. Dashboard catalog of analytic templates includes several types of data visualization: speedometer, barometer, thermometer, traffic lights, interactive metric trend, Pareto chart, map, statistical analytics and other forms of graphics.

The dashboards support users business, because it enables to:

a) communicate strategy effectively – dashboards support business strategy by expressing important information, key drivers, performance expectations, and the results – to make strategy relevant to everyone,

b) monitor performance against targets – dashboards inform quickly on critical performance measures in real time,

c) communicate complex information quickly – dashboards translate corporate data into a rich, graphical presentation using gauges, maps, charts, and other graphics to show multiple results together,

d) personalize screen's look – dashboards can be personalized for individual users or groups of users.

Dashboards are no longer exclusive to executive management, because all users need access to relevant business information in order to make the right decisions. Flexible options in dashboard enable administration of information system to create custom dashboards for different users or groups of users (Figure 1).
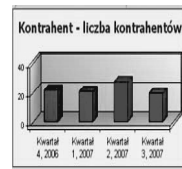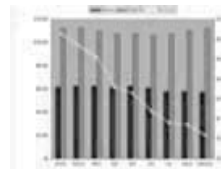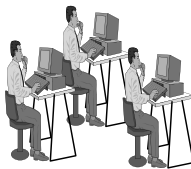
Long Time Span – Low Level of Detail

Executive Management
Cross functional corporate performance metrics. Trends that span months and years. Supports improved corporate performance.
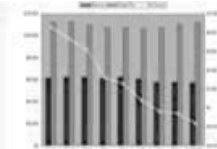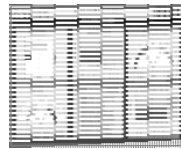
Line Management
Business function specific key performance indicators reports. Trends that span mounths. Supports improved business unit performance.

Kontrahent - liczba kontrahentów

Executive Management
Job specifickey performance indicators reports. Trends that span weeks and months. Supports improved job performance.

Kontrahent - liczba kontrahentów
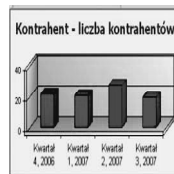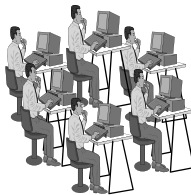
Short Time Span – High Level of Detail

Figure 1. Personalized dashboards for all levels of the organization
Source: based on [*Making Dashboard & KPI Reporting Easy* 2007].

The personalized and interactive dashboard improves business performance at all levels of an organization. The introduction of dashboards allows business' users to enhance visibility of enterprise's strategy, align actions with that strategy, and to track key performance indicators and assign goals. Dashboard layout and interactive visual analytic capabilities help users gain quick insight into their business performance and alter business rules as conditions change.

The dashboards display KPIs at a glance to help users monitor anything that drives organizational performance. The ability to actually visualize key performance indicators to assess the present state of the business or alert users once the

needle has dropped "in the red" clearly communicates to business users of all levels the sense of urgency or need to prescribe a course of action (see [Malik 2007]). The dashboards convey how efficiently a corporation is performing and facilitate quick response to changes in business scenarios. They enable presentation of information for decision-makers of an organization *via* alerts on portals, desktop applications, e-mail clients and wireless devices (see [Sadananda 2007]).

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Data visualization dashboards can provide a unique and valuable perspective on business. Exemplary screen showing KPIs is presented on Figure 2. This screen represents combination of diverse sources, to provide a single, customized view of all critical business information, based on this report's exception alerts (where outliers are highlighted in red). Decision-makers will immediately know when business conditions change.
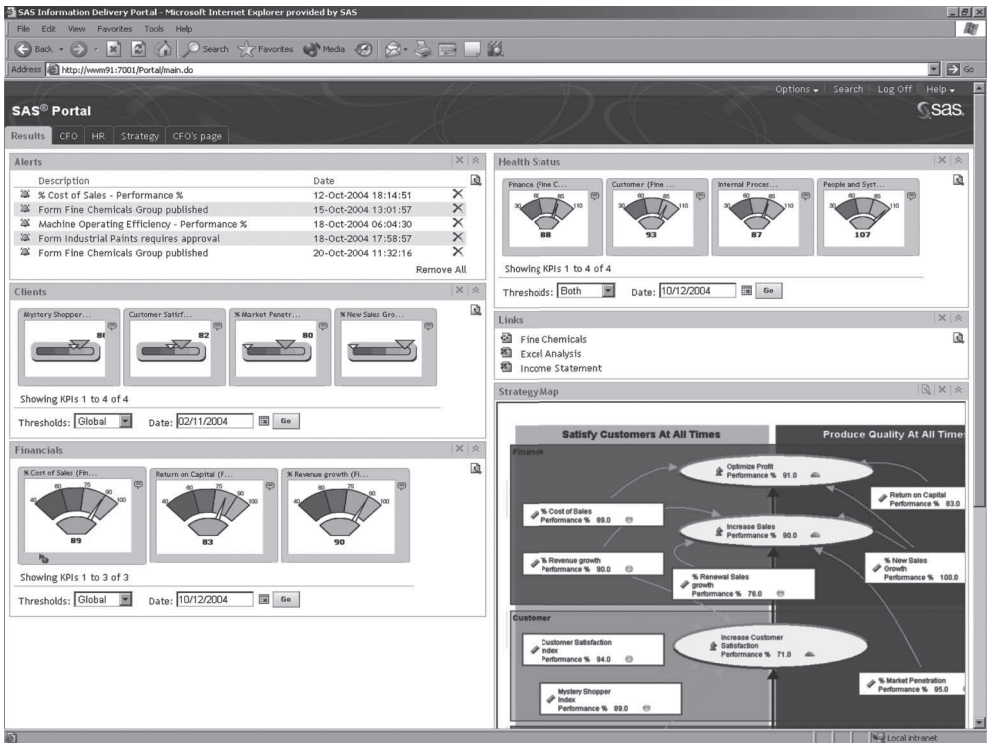

Figure 2. Exemplary screen showing actual visualization of key performance indicators
Source: based on SAS®Portal.

The fundamental features of portal functioning as dashboard are (see [*SAS® Enterprise BI Server* 2007]):

1) providing point-and-click wizards to enable users to create, delete and reorder pages, add and remove content, and modify page layout to organize content in their personal workspaces;

2) extending portal capabilities with a comprehensive set of portlets, extendable to include new portlets created in-house;

3) providing a comprehensive search facility to locate all content types within the security confines set by IT;

4) displaying customized graphical or tabular dashboards so that users easily understand key indicators and link to more detailed information;

5) accessing various content types easily, including reports, advanced data explorations and other structured and unstructured content from one location based on IT security restrictions.

Accurate forecasts and predictions in the dashboards can act as an early warning system. When predictive analysis is available on demand, all of decision-makers will be able to make forward-looking decisions. The real value of dashboard products lies in their ability to replace hunt-and-peck data-gathering techniques with a tireless, adaptable, information-flow mechanism.

5. Conclusion

Dashboard and visualization are cognitive tools that control over a lot of business data. These tools help people visually identify trends, patterns and anomalies, reason about what they see and help guide them toward effective decisions. That is why they could be the technological solution of monitoring the key performance indicators and exploration their weak signals in early warning tools. Though they appear deceptively simple, dashboards are not easy to build. From identifying the proper metrics to selecting the right tools to organizing data, there are multiple challenges that must be addressed in dashboard implementations. Dashboards can provide a unique and powerful tool to present information.

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