Data Visualization on Information Tables - Dashboards

Nedim Smailović

Pan-European University APEIRON, Banja Luka, Bosnia and Herzegovina

Summary: Today's level of the information technology development allows gathering of large amount of data relevant for a company. The issue of way and method of data gathering has been solved, however, at the same time the need also arises for extraction of the most important ones, since the quantity of the input data itself is not enough. In the contemporary business activities, being pursued in the circumstances of high competition, changes, speed and risk, management of the company may be compared to driving a fast car. Therefore, the information tables - dashboards have been created for the purpose of data processing as an analogy to the car dashboard, which, by means of several indicators, provides for the driver an instant insight into various data related to driving and the engine running. Display of the data in the form of charts and diagrams undoubtedly helps in obtaining new knowledge however, an individual visual displaying is seldom sufficient thus they should be combined in different variants. The work presents concrete examples of the dashboards creation both locally and globally.

Key words: Dashboard, information tables, business inteligence (BI), visual language, charts and diagrams.

Introduction

Along with high increase in the number of in-habitants on our planet, the quantity of infor-mation, processed every day, increases as well. The degree of improvement is shown in certain research fields, al-most unknown until recently, since there were nei-ther knowledge nor technological preconditions for such research. Nowadays, resources and efforts are put into new discoveries such as: human genes, vir-tual reality, quant computers, internet, digital com-munications, laser and optic fiber, cloning, cosmic technology… This is not just a curiosity of human mind seeking new knowledge, but more and more the precondition for survival. The planet earth is not boundless and human population shows the fast growing trend. The relevant institutions' forecasts show that, in 2050, there will be over 9 billion peo-ple living on Earth [1].

Such reality leaves trace in all the pores of eve-ryday's life. Business operations are not excep-tion as well. Digital era changes the world from its core. The year two thousand seemed to be a psychological border of a new age, and since then, almost a decade has passed. We are the witnesses of constant changes around us and, in such a context, ten years is a very long period. At the beginning of the book „Busi-ness @ the Speed of Thought", the autor, Bill Gates, writes that since the nineteen-eighties were about quality and the nineteen-nineties were about re-en-gineering of business, than the two thousand would surely be about speed, the speed of business transac-tions, the speed by which the access to information would change the lives of the people and their idea of business. Improvement of quality and business pro-cesses will go much faster. According to him, when the speed of business becomes high enough, the very nature of the business opera-tions changes as well… and all these changes will happen due to one very simple idea: digital information flow. [3]

In order to make this flow much smoother, it is necessary to create awareness on significance of correct and timely information required for business operations. For too long, we have lived in business information darkness and, even nowadays, we sometimes accept this as reality not realizing how much we need correct and timely information. Some companies try to change it solely by purchasing contemporary informatics equipment. The offices are crowded with computers, printers, scanners… but this is only a part of the solution.

In the business world, a digital infrastructure similar to human nervous system has been de-veloped, which offer necessary information for thinking about certain facts or for passing timely and appropriate decisions.

Visual Presentation of Data

Visual language is defined as functional and harmonized connection of words and visual elements and it represents a special way of communication which has both similarities and differences in terms of a natural communication by speech. Sometimes it is called visual-verbal language. Recently, at the presentations, on the Internet and other multimedia contents, visual language is more and more used as a dynamic link of words, pictures and forms. Visual language has significantly changed man-to-computer and man-to-man communication, having made it more efficient, more complex and more meaningful. By using it, we may express much of what was not possible to convey with just words. Given that communication is in the core of every form of business, the application of visual language crates real preconditions for creating a new quality of communication in many spheres of activities. An important ques-tion is: How to visualize the data? One of the tasks of a well conceived visualization is to "speak" clearly and directly. Computer program cannot do it by itself – a creative man is needed. A good picture is the communication by which a clear message is sent and, in order to make it the quality transfer, some esthetic principles must also be satisfied. This means that the elements of design (line, form, color, texture, …)

must be carefully combined. This combination must also satisfy the principles of design such as: balance, contrast, emphasis, rhythm, uni-formity… Information table is one of the ex-amples of a very efficient use of visual lan-guage.

Complexly structured data is the reality of contemporary business operations but, in the informatics-wise underdeveloped business environments, written textual reports are still the dominant ones. They may include many necessary data, but the reader needs much time to see the most important contents in the abundant textual context. The higher quality reports contain important data placed in the tables. It is easier to recognize the required information in a table. The table itself may be considered a basic form of visual presentation of data. However modest, the table and the data therein may be (conditionally) formatted thus the important ones are sufficiently clearly presented. The next phase in data visualization contains graphs and diagrams while the highest degree is the level where the interactivity is added as well. Interactive graphs are unique and powerful solution for an organization which seeks the solution however, in practice, this potential is still not used enough.

Information Tables

The Dashboard (information table) is a new name for the Executive Information Systems (EIS) developed in the eighties of the last century. Its intention was the presentation of key financial indicators to the executive managers on a simple inteface. Final key information was not clearly visible on one place but was approached indirectly from several separate sources.

In the nineties, as the consequence of a fast development of information technologies, there have emerged: Data Warehousing, Online Analytical Processing (OLAP) and Business Intelligence (BI). Everything was directed towards gathering, unifying and saving the data thus having made possible the creation of timely, accurate and useful information.

At that time, the author of „Dynamics of Presenta-tion Graphics", Dona Z. Meilach, wrote at the begin-

ning of the book:

„It`s hard to imagine what most people mentally conjure when the term computer graphics is mentioned. Something futuristic? Games? Film and television production? However you picture it now, if you`re in business – any kind of business – computer graphics will have an impact on your future: not the arcade game graphics variety, or the superslick television and movie displays, but business graphics in a broad brushstroke of applications. Computers will be used to produce visuals quickly for use in and out of the office, for every conceivable type of presentation.“ [7]

The word *dashboard* has been in use only since June 2003. It was mentioned above that the dashboard has been applied in one half of the 135 observed companies. However, it was not given a clear definition what exactly is understood under this word [2].

Powerful contemporary technology is not solely a passive "creator – observer" any more, it has become an active assistant. Hardware and software, in a developed business system, provide speed, accuracy and abundance of information which is made available to the "workers of knowledge".

The word dashboard in English denotes the control (instrument) board that a car driver sees in front of him/her, which indicates the important main parameters of the car and driving. On the basis of the status of various instruments and indicator lamps, the driver receives the information on the engine status and all other things, which enables him/her to drive properly and safely. In the contemporary business operations, performed in the environment of high competitiveness, changes, speed and risk, a company management may be compared to driving a fast car. Therefore, a company management needs clear, accurate and firm indicators of the status in the company and in its environment. Thus it needs dashboards, similar to those a car driver has. Today's level of the information technology development allows gathering of large amount of data relevant for a company. The issue of way and method of data gathering has been solved, however, at the same time, the need also arises for extraction of the most important ones, since the quantity of the very input data is not enough. It is like looking directly in the Sun – the light, being the precondition for seeing anything, there is plenty, even too much, thus nothing can be seen. Another comparison is also known – the squirt from the firefighting hose cannot fill a glass with water. It can be concluded that more does not necessarily mean better. In terms of infor-matics, this means that the data gathering must be followed by its quality analysis. One of the solutions is the application of the information tables.

Quality information tables are obligatorily preceded by a good knowledge of the information graphics principles. Although the computer graphics has significantly advanced recently, the book Information Graphics by Robert L. Harris, from 2000, can still be considered to be one of the most important books in this field. The author writes as follows: „To many people, information graphics are the images frequently used in presentations at formal meetings or the stylized charts and graphs used in newspapers and magazines. Many are used for these purposes; however, for every chart, graph, map, diagram, or table used in a presentation or publication, there are thousands that are utilized for what are called operational purposes. Informational graphics for operational purposes are used by millions of people on a daily basis for such things as improving their efficiency and effectiveness, improving quality, solving problems, planning, teaching, training, monitoring processes, studying geographic distribution of data, looking for trends and relationships, reviewing the status of projects, developind ideas, writing reports, analyzing census data, studying sales results, and tracking home finances... Fortunately, as a result of developments in computer equipment and software, most of the popular charts and graphs used on a daily basis can be generated rapidly, easily, and with little or no special training.“ [4]

At the time of making this extraordinarily written work, the expression information tables were not in use. As it has been said, this term did not appear in the dictionaries until 2003.

Big companies create information tables by means of the expensive programs made particularly for such purpose. There is no doubt that this produces good results, but there are many others who are not ready to pay such a high price for this purpose.

The Fig. 1 and Fig. 2 give two examples of information tables created by the purposed program.
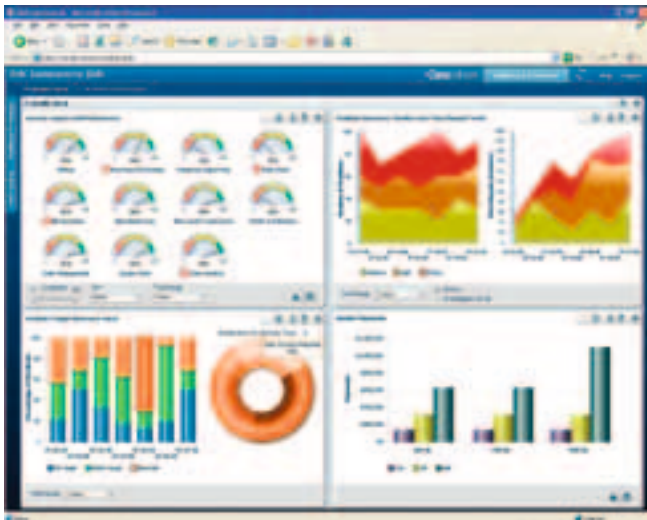

FIG. 1 INFORMATION TABLE - EXAMPLE 1[5]

Information tables may be used for various purposes. Depending on the purpose, they have different design, each being specific, in order to be as efficient as possible. However, the information tables almost always represent some quantitative relations and show the direction of their movement. Recently, a special accent is put on an interactive visualization.

A dashboard is a visual interface that provides at-a-glance views into key measures relevant to a particular objective or business process. A dashboard consists of three key attributes.

- Displays data graphically (such as in charts). Provides visualizations that help focus attention on key trends, comparisons, and exceptions.

FIG. 2 INFORMATION TABLE– EXAMPLE 2[6]

- Displays only data that is relevant to the goal of the dashboard.
- Contains predefined conclusions relevant to the goal of the dashboard and relieves the reader from performing his own analysis. [8]

A typical company may, for example, have the following data on its information tables:

Information tables often show some comparable parameters.

The comparisons may be various, e.g.:

Category	Contents shown
Finances	Profit, Prices, Budget, Earnings, Taxes …
Sales	Sales points, Purchase orders, Realization, Goods pricelist …
HR	HR statistics, Organizational structure, (Non)filled positions…
Production	Number of manufactured units, Faulty products, Supplies…
Marketing	Customers/clients statistics, Customer satisfaction, Marketing activities, Competition data …
IT	Hardware support, Software support, Network data, Statistics of the official site visiting, IT personnel data …
Vehicle fleet	Statistics of number, type and use of the Company vehicles …

Comparison	Example
Same data, same measuring unit, different time	Status on the same day of the previous year or at the beginning of the current year
Actual status related to the plan	Budget Plan Realization in the given period
Relation towards the future	Percentage of achievement of the planned annual production
Spatial comparison	Shows the same event at the same time on various locations

While making the information tables, it is recommended the adherence to certain general priniciples such are:

- Forget about the fancy formatting
- Skip the unnecessary chart junk
- Remove gridlines
- Remove borders:
- Skip the trend lines:
- Avoid unnecessary data labels
- Do not show a legend if you do not have to
- Remove any axis that does not add value...

Due to a large variety of the information tables application, they may be divided into several categories. One of the possible divisions is shown on the figure below:

Fig. 3 Dashboard types

Application of dashboard increases business intelligence (BI) of a company. The business intelligence is also described as a wide synergetic connection of applications and technology for gathering, analyzing and saving the data for the purpose of issuing a better business-related decision. BI is also the capability of an organization to mobilize its entire capacities and transform them into knowledge in order to release the right information to the right people at the right time. The final aim is achieving the competitive advantage on the market and lasting stability.

INFORMATION TABLES IN NATIONAL PRACTICE

It is possible to make a quality information table by means of less expensive programs, e.g. very popular MS excel. This program's version 2010 has been enriched with many new tools for this purpose. Once made a quality template, provides the making of new reports without constant repetition of sorting, calculation, formatting, aggregating and dividing… on new data. This offers more time for analysis of the obtained results rather than spending time on the very preparation to turn data into useful information.

In the national practice, even on the Internet, there cannot be found almost anything related to this subject, especially about concrete appli-cation of the information tables. This, certain-ly, gives more importance to the practical solu-tions developed by the Author of this paper, originated in the telecom-munication company "Telekomunikacije RS". One of the dashboard types may also be considered to be the applica-tion of the Digital Embroidery Method [9] Digital embroidery is a sophisticated visualization of the data, made by means of application of the possibilities offered by the most popular program for tabular calculation, Microsoft Office Excel 2007 or 2010. In the Digital Embroidery method, the basic principle is that worksheet cells, size of only few pixels, form a shape that will be colored depending on the numeric data joined to them. Prior to this, the criteria is defined for linking the number from the table and the color of the cell. Thus the Digital Embroidery Method links the position, number and color respectively. Change of the data in the table, automatically changes the color of the chart areas. The Digital Embroidery Method was developed for the purpose of automatic coloring of particular areas on the chart of Bosnia and Herzegovina and Europe according to the defined criteria. However, this method may be used for coloring other pictures e.g. city map, parts of various objects and everything else which contains the observed data expressed in numbers, e.g. number of inhabitants in certain area, number of students, number of registered cases or events, etc.

The picture below shows a colored map and the criteria on the basis of which certain municipal areas of Bosnia and Herzegovina were colored.
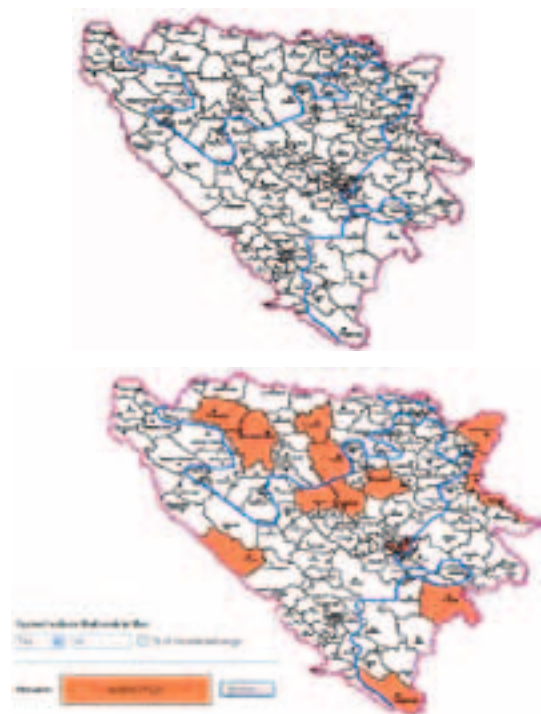
Fig. 4 Application of the Digital Embroidery Method

Below are the examples of the business reports the Author of the paper has created for the Telekomunikacije RS, for the purpose of making regular business analyses and reports, which may be considered to be the information tables.

Fig. 5 Information tables in use in the Telekomunikacije RS

Conclusion

With application of purposely created information tables, important information in various spheres of contemporary business operations may be monitored. The information tables have been, for quite a long time, reality in the developed business world and their functional and design-wise improvement has been underway to a high extent. Therefore, the fact that they are scarcely applied in our practice is surprising. There are no technological impediments for that. It is true that there are no ready-made solutions, since every information table is separately created for particular purpose. However, this may not represent an impediment for national companies to accept and apply in practice this very powerful tool of contemporary business operations.

Authorship statement
Author(s) confirms that the above named article is an original work, did not previously published or is currently under consideration for any other publication.

Conflicts of interest
We declare that we have no conflicts of interest.

References

[1] Department of Economic and Social Affairs of the United Nations Secretariat (2004). World population to 2300, United Nations, New York, 8-9

[2] Few, S. (2006) Information Dashboard Design: The Effective Visual Communication of Data, First Edition, O'Reilly Media, IncSebastopol, CA, 2006, 6-9

[3] Gejts, B. and Hemingway C. (2001) Poslovanje brzinom misli. IK Prometej Novi Sad (in serbian)

[4] Harris, R. Information Graphics: A Comprehensive Illustrated Reference. Oxford Univ Pr Publication Date: January 6, 2000, 3

[5] http://www.dashboardzone.com/bmc-dashboard-monitor-everything-through -dashboards (Accessed: August 2012)

[6] http://www.dashboardinsight.com/dashboards/screenshots/pureshare-operations -dashboard.aspx, 5 (Accessed: August 2012)

[7] Meilach, D. Dynamics of Presentation Graphics. Irwin Professional Pub Computer; 2 edition (February 1990), 2

[8] Michael Alexander, M. and Walkenbach, J. Excel Dashboards and Reports. Wiley Publishing, Inc., Indianapolis, Indiana, Published: September 7, 2010, 12

[9] Smailović, N. Kompjuterska informaciona grafika u predstavljanju Bosne i Hercegovine na putu pridruživanja Evropskoj uniji. PhD Thesis. Banjaluka, Univerzitet Apeiron 2008.