

Data Visualization in Business Intelligent & Analysis – Analysis of First Positioned Tools According to Gartner’s Magic Quadrant in Ability to Execute

Snezana Savoska¹, Andrijana Bocevska¹

¹ Faculty of information and communication technologies, Partizanska bb,
7000 Bitola, Macedonia
{snezana.savoska, andrijana.bocevska}@fikt.edu.mk

Abstract - Data Visualization tools in Business Intelligent (BI) and Analysis are very effective because they allow gaining of deeper understanding of huge amounts of data stored in databases. For this reasons many market research companies take into consideration usage of Data Visualization tools as part of their BI solutions and analyze their competitive advantage at the market as well as the benefits and disadvantages. In this paper, the Data Visualization tools that are on the top of Gartner and Forrester researches, Tableau and Qlik, are taken into consideration. They are positioned higher on the “Ability to execute” axis and according to researchers’ report, are faster growing sales tools and deserve analyses in details. They are used as Visual Data Analysis (VDA) tools from theoretical and practical side and are analyzed for previous defined Key Performance Indicators in order to gain deeper insights and make a comparison of their ability to execute.

Keywords: Data Visualization tools, Business Intelligence and Analytics, Tableau, Qlik

1. Introduction

The latest researches of Gartner, Forrester and Ovum [1, 2, 3] show that the Visualization tools’ market in Business Intelligence and Analytics (BI&A) grows more and becomes competitive in the area of user friendliness as well as compatibility with the tools that are used for data gathering, storing and manipulating and creating information and knowledge from data [1]. The biggest global companies admit that they had a lot of problems with understanding of their and customers and merchandizers’ demands for analysis [4, 8]. Many efforts were conducted to establish a new form of reporting connected with decreasing time and effort until they started to use Visual Data Analysis tools and gained solutions based on these tools, through principles of self-service [5]. These kind of guidelines show companies how to gain experience that benefits with turning data into another kind of intelligence, called Actionable intelligence, needed for survival of companies in the market and gaining competitive advantage [6].

Although some analysis of usage of Advanced Data Visualization (ADV) from different researches give different ranges according to different criteria [8], the researches show suitability of some Key Performance Indicators (KPI) that are taken into considerations. They mainly argue with the results of researches where the same criteria for evaluation are taken into consideration. The market analysis of Data Visualization Tools (DVT) for BI&A, according to Gartner [1], shows that, if KPI Ability to execute is taken into consideration, the market leaders are Tableau software and Qlik. Microsoft group of tools for BI is closely to them and have the better position if Completeness of Vision is taken in consideration [1,2,3] but the higher progress from 2015 to 2016 exceed the two mentioned DVA tools for BI&A [1, 3].

At most of prestigious World's journals analysis [1, 2, 3, 6, 11], researchers stated that the percentage of usage of these DVT for BI&A for corporate reporting is around 100% for all company's data analysis, especially when financial, marketing and e-commerce key reports are taken into consideration. For these reasons, our opinion is that these tools deserve analysis according to KPI and comparative analysis of their quality according to some practical working experience with them.

In this paper some KPI and Critical success factors (CSF) analysis are made for Tableau and Qlik DVA tools for BI&A. Driven by the need of investigate their performances with the goal of objective assessment of their visualization parameters, we made a comparative analysis, taking into consideration more aspects related to their prerequisites, capabilities, responsiveness, user friendliness, data integration and other attributes.

After the introduction, the second section of the paper is dedicated to studying related works in this area and giving an overview of papers and researches that consider VDA, Data Visualization (DV) for BI&A, ADV. In this session the newest researches in this area are highlighted. The next, third session explains the plans of research and used methodology framework. The forth part summarizes obtained results in comparative table, highlighting advantages and limits of the tools. The final part of the paper draws conclusions and proposes the directions for future research.

2. Related works

Many researches are dedicated of usage of DV in BI&A, firstly because of power they give to decision makers with visual display allowed [10, 12]. The flow of enormous volume of data that can be analyzed for trends identification and predictions, bring additional values for companies. BI&A tools give the opportunity for easy transformation of raw data into valuable information with VDA tools commonly called Visual Business Intelligence Data Visualization [13]. In this way, it is easier to make more sense in data, to present them in the visual form, some hypothesis are tested and some trends are highlighted as well as some insights in data are made [7, 8].

All the benefits brought by Visual Business Intelligence (VBI) contribute to the market demands of staff that possesses VDA knowledge to be enormous increased in the world. This fact produced deficit of staff with VDA skills on the labor market [14]. Also, there is increased market staff demand for managers capable to decide according to VDA for BI&A [15].

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DV is an emerging field that is developed on the base of statistic, mathematics, probability and data representation to gain sense in a huge data sets, stored in data bases [13]. Many authors highlighted that the companies depend more on usage of Decision support systems (DSS) and BI&A tools [16]. Turban [17] and Chaudhuri [8] state that with these concepts, many business processes are improved in many companies. Chen,[14] links BI&A with Big data analytics that becomes increasingly important for the academic community as well as business community in the last decade, that cause an explosion of demands of staffs with advanced analytical knowledge [5,6,14,15,18]. Already, in many Universities are introduced courses with objectives to help in education for VDA, based on principals of usage of concepts “learning-by-doing” and “trial-and-error experimentation” [14].

Aigner&all explore how the interactive visual methods are used in practice in Austria [7]. From the quantitative research conducted through semi-structured interviews with the users of DV for BI&A and usage of cognitive and pre-cognitive methods and theories, concludes that the usage of Visual analysis most depends on corporate culture, the job attractiveness and creativity. Their hypothesis that the most used are static analysis with limited possibility for interaction with BI, increased users' demands for interactivity and the state that interactivity helps to gain more information and knowledge in DV for BI&A are confirmed. The data complexity, possibilities to compare couples scenarios and alternatives and deeply understanding outcomes needed in the processes of decision making, are motivation factors for usage of ADV [7].

Ovum researches see the information as company's wealth [3] and analyze DV in BI&A from different aspects, as Visual point-and-click querying & dashboard development tools, intelligent natural languages similar to Google interface and new self-services tools. They analyze tools according to market position, technology and service assessment, execution and market fit. The gained analysis can be seen on Fig. 1c and 1d [3].

IBM use Visualization of big data to obtain “big picture” of corporate data [6]. Because the human visual system can process 9 Mb information per second, which correspond to 1 million of text letters a second, they think that visual tools have to be integrated in BI&A tools. Only 26% of companies can analyze unstructured data (as sound and video) and only 35% can analyze streaming data. It is important to gain a “Big Picture” of corporate data that can be done with tools for Dashboard creating and creating reports with reporting tools (KPI & Historical data) [6]. Although sometimes tools for data reduction are used before the process of visualization in order to catch essential data attributes (such as segmentation, clustering, linear regression and logarithms), they went further by creating new types of analysis and solutions. Rapidly Adaptive Visualization Engine (RAVE) is created for unstructured data analysis and include libraries that contains novel visualization techniques which are still unknown and under development [6].

The big data analysis is achieved with creation of frame that include ADV tools with previous defining semantic Business definition, data modeling and Data Source Mapping, with Apache Hadoop, eXtreme Data Warehouse and Big Data Analytics with focus of self-service BI tools [5]. Many others studies are made for DV for BI&A in which different tools are used. One of the famous groups of tools for BI is Microsoft tools that enable advanced visual analysis [9, 2]. SAS Visual BI tools also enable

interactive graphs and 3D projections, filtering possibilities for unstructured data analysis [20]. Oracle [21], Tibco [22] and the others, also have impressive tools. Their ability and capabilities for analysis can be seen in worlds' analytical companies business reports, where, despite business achievements and their profits, some technical and users' performances according to different KPI are analyzed [1, 2, 3].

3. Introduction Starting points, research planning and used methodology

We are starting with analysis of Gartner Magic Quadrant data, where Tableau and Qlik are in the higher position of DV tools for BI&A according to Ability to Execute (Figure 1a and b). Although they lag behind tools of SAP, SAS and Microsoft BI if Completeness of Vision is taken into consideration (Figure 1b and 1c), the gained profits and higher position in axis of Visual Discovery and self-service automation (Figure 1d) are these reliable facts that give them competency to be analyzed in details.

As KPI we analyzed: ease of use, connectivity to other data sources, data integration capabilities, needed hardware specification, used BI technologies, OLAP support, Drill-down abilities, insights generation, PowerPivot support, ease to learning, data access models, graphic user interface and available visualization techniques. Also abilities as mapping, trend analysis, prediction, statistic tools, dashboards, publishing and sharing and mobility are also taken into consideration. Practical researches methods are used on same data sets and same hardware. Also, literature reviews as well as comparison of insights in available tutorials are made.

4. Comparative analysis of KPI of Qlik and Tableau

Analysis was made by the authors in the period of January to march 2016 with previous reading of the mentioned and cited literature and other internet resources [23, 24]. We gained the following insights for planned KPI as software performances (Table 1).



Fig.1.a. Magic Quadrant for BI & A according to Gartner; **Fig.1.b.** Forrester Wave BI [1,2]

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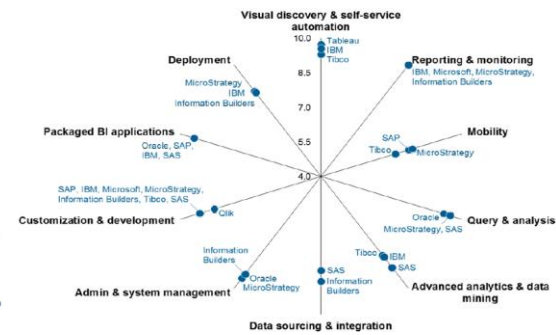
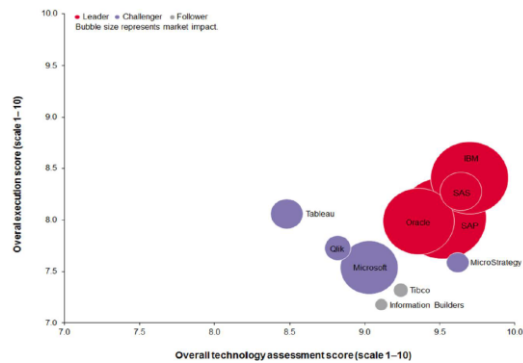


Fig.1.c. Ovum Decision Matrix

Fig.1.d. Market Leaders according to Ovum

Table 1. Results gained from the research of KPI of Qlik and Tableau

KPI/ Properties	Qlik	Tableau
Ease of use	Requires basic scripting; thus, it's beneficial for user to have moderate technical experience.	Intuitive to build dashboards and explore data regardless of technical ability or background.
Connection to multiple data source	Capability to integrate data from a long list of data sources.	Capability to integrate data from a long list of data sources (Tableau list is shorter than that of Qlik)
Data Integration	Built-in ETL tools. ETL is usually done and completed by developers and requires more extensive IT skills as it is more script-driven.	Has native connectors to many common databases and the data integration is done via user interface (wizards) without scripting skills.
Hardware specification	Supports only multiple core processors and requires much more RAM memory. Not support Apple platform	Supports single and multiple core processors.
Used BI technology	In-memory associative technology by means of which can maintain associations among datasets in computer's memory, realized by so-called symbol compression.	Traditional query-based technology that operates from disk, called VizQL™. Tableau's Data Engine-an analytics database that does not require to load data in memory.
OLAP Cube support	Doesn't hold data in cubes or similar OLAP structures, it holds data within a special in-memory structure, faster to access.	Has the best ability to interact with OLAP cubes.
Drill-down capability	May be the best visualization product for interactive drill-down capabilities. Qlik performs calculations on the fly, which means drill-down groups are not limited to a simple hierarchy.	Traditional OLAP tools must pre-calculate aggregations, so their drill-down capabilities are limited to moving up and down a defined hierarchy.

Insight Generation	Associative technology makes it more powerful and it helps to read association between variables easily. This feature helps businesses to understand hidden relation between data points.	Story telling feature helps users to create presentation, using available data points.
PowerPivot support	Currently does not support this functionality.	It is only ADV tool which can use SSAS Cubes and connect to PowerPivot and is much better choice for serious analytical application.
Easy to learn	It has actively engaged community and resources (help manual, books, posted videos) to help users to learn this software in the best possible manner.	It has actively engaged community and resources (help manual, books, posted videos) to help users to learn this software in the best possible manner.
Data access model	The data can be loaded by selecting the Reload button (before that it is necessary script) or using the wizard called Table File.	To import data it is necessary from the menu Data to choose Connect to Data, than select data source type and data file name. Using Go to Worksheets, data will be imported as dimensions and measures.
Graphic user interface (GUI)	Qlik has an associative interface. It is quite easy to find relationships between variables and data fields among tables and charts by means of instantaneous selection filter. Menus have too many tabs that lack a logical structure.	Very intuitive GUI; it groups variables by dimensions and measures. As a result of simple operating interface it has strong capabilities in performing multidimensional analysis.
Visualization techniques	Standard charts (bar chart, line chart, pie chart, area chart, and scatter plot). Provides 3D charts, gauges, faded bar charts which have no real business value.	Standard charts (bar chart, line chart, pie chart, area chart, and scatter plot). Features such as “word clouds” or “bubble maps” are great tools to enhance comprehension. Supports multidimensional analysis.
Mapping	Is not standardly integrated and requires purchasing an additional extension such as GeoQlik.	It is one of the strongest features. It is fully integrated in the software and does not require additional license costs.
Trend lines, Forecasting and Statistics	Include trend analysis and forecasting. It is required to connect with R project using the R Connector. Statistical calculations are performed in R, and completed results are returned to Qlik.	Include trend analysis and forecasting. Includes methods for statistical analysis, built-in the software.
Dashboards	The default settings of the visualizations are not optimal, and it requires quite some time to improve the appearance of dashboard objects. Only selection filters are available.	Dashboards look better than Qlik dashboards with respect to resolution, fonts, colors, text size, margins and other formatting features. Available many types of filters (e.g. sliders, select menu and checkbox)
Publishing and Sharing	Several ways to publish and share dashboard.	Several ways to publish and share your dashboard. One of the most important features where Tableau

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		differentiates from Qlik is "Tableau Public" that allows everyone to share their visualization with the world.
Mobility	Not dependent on device and available on all devices, they can be accessed over internet.	Not dependent on device and available on all devices, they can be accessed over internet.

Conclusion

Data Visualization tools are more integrated in BI&A tools and becoming their part because of the fact that more diverse data has to be analyzed to get “the Big Picture” of the enterprise data. The necessity to analyze variate data, structured as well as unstructured, lead to approaching of Data Visualization tools to interactivity and also, intelligent tools for Advanced Visual Data Analysis to the concept of big data. Therefore these tools are more focused on achieving higher Ability to execute as KPI. Leaders in BI&A Data Visualization tools, according to worlds’ analytic researchers as Gartner, Forrester and Ovum, Tableau and Qlik are analyzed in this paper according to previous defined KPI, for many attributes that contribute to highlighting some practical aspects of usage of the mentioned software tools in the direction of Ability to execute. The research was made in the last two months by the authors with the mentioned methods and the latest version of Tableau and Qlik tools. The results are placed in the Table from which comparative analysis of the tools can be performed.

The paper has no intention to judge about the software quality, rather to explain and highlight their capabilities and suitability through comparative analysis and benefits for the mentioned KPI. The created visualizations with these tools are analyzed too, but they exceed the scope of this paper.

As the future researches, some analysis of tools have to be proposed, but created according to variate criteria according to visualizations gained on the same data sets, with the same visualization techniques but with possibilities of gaining visualization of unstructured data sets.

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