Data visualization process through storytelling technique in Business Intelligence

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Abstract

New technologies have allowed corporations to collect, store and manage huge quantities of data, being necessary in their daily management. Hence, business intelligence and data analytics have become an important and rapidly growing area of study that reflects the impact of data-related problems to be solved in business organizations. However, it is difficult to recognized patterns and draw conclusions from large amount of data and also, understand the stories of such information. We propose a methodology based on storytelling technique in order to improve the perception and interpretation of the data with the aim to make the information more memorable for people.

Keywords: Data visualization; storytelling; business intelligence.

1 Introduction

New changes are emerging that will force organizations to work in different ways. Technology has increased, devices have improved the capacity to process, store and generate massive amounts of data, recognizing that value of companies have begun to push the use of information systems for the efficient management of information. Elias [1] argues "Business Intelligence (BI) deals with the collection of processes and software that supports organizations in understanding large business datasets, retrieving and analyzing information and making decisions". Airinei & Homocianu [2] categorized BI technologies into reports, online analytical processing, analytics, data mining, business performance management, benchmarking, text mining, and predictive analytics. At the same time, a huge number of visualization systems have been used to help users view, explore, and analyze information [3]. However, such visualization systems have received little attention in organizations in the way to use them as a visual language in order to make information accessible to more people.

In recent years, there has been an increasing interest in the importance and value of narrative and anecdotal information in the form of stories. According to M. Johnson [4] stories are one of the communication structures of humanity. The value of "storytelling" transcends language and culture, and as we move towards a future of improved connections between people and digital effects, stories continue to represent the most compelling platform for managing imagination, as they can provide interpretation by taking advantage of the results of analysis, trends and scenarios in spreadsheets. Since, analysts work with increasingly large data sets, data visualization has become an incredible important asset during sense-making analysis and to communicate results to other analysts, decision makers or to their audiences. Thus, the importance of storytelling in data visualization would be helpful in order to enhance visual analysis tools providing understandable information to a broader public.

The aim of this paper is to examine and propose a methodology based on storytelling technique in BI in order to provide insights and natural ways of perceiving complex information and makes it more memorable.

2 Related work

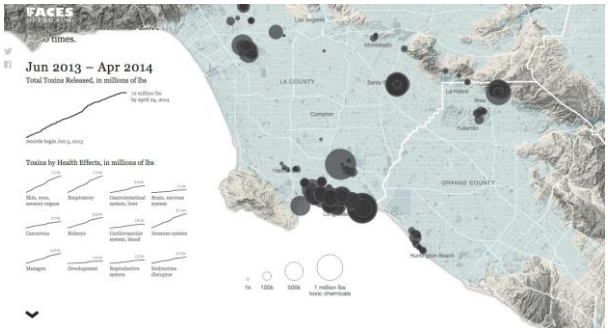

Figure 1. Example visual data story. Face of Fracking is available at http://www.facesoffracking.org/data-visualization/

Kosara and Mackinlay [5] define a story as an ordered sequence of steps, with a clearly defined path through it, they argue that the stories in a structured context can be used not only to support discussion and decision-making, but also in the analysis process. By way of illustration, Heather Craig [6] discusses a web platform Face of Fracking, see Figure 1, about the impacts of fracking in California that uses storytelling technique through data visualization and interactive narrative form that facilitates understanding of the beholder.

Preliminary work on storytelling technique was undertaken by Lee and Reche [7], they propose a process of transforming data into visually shared stories. Although, they do not focus in business related-problems, we believe it is a fast growing

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application area in business that can provide significant competitive advantage to an organization. Thus, we contribute with a data-visualization methodology based on storytelling technique expecting to improve the perception and interpretation of data in business intelligence.

3 Proposed methodology

The process of turning data into a visual story has so far received little attention in business intelligence and analytics. Important stories live in our data; when we observe statistical information such as sales, profit by product, census population in tables or simple charts does not reflects the story behind data, the information is abstract, difficult to understand and communicate results. In order to visualize data effectively derived from an understanding of human perception, we propose to use storytelling technique in data visualization for business intelligence. Storytelling technique regulates the perception and interpretation of the data with the aim to make the information more memorable for people. The objective is to provide a methodology for the creation and presentation of stories from raw data, offering a series of steps that allow people with technology skills use this proposal in dashboards, presentations, web pages, among others. The proposed methodology is shown in Figure 2 and comprises four steps as follows:

1. Explore and gain insight
2. Create story
3. Select Media
4. Understanding

3.1 Explore and gain insight

The context of the organization and the information obtained through the process of business intelligence is analyzed.

3.2 Create story

Creating a story consists in identifying the context and creating a structure in order to get the viewer's attention, create intrigue, know the background and know the characters.

3.2.1 Identify context

At this stage, it is ensured that the audience knows the context in which the story unfolds. It stirs up interest from the viewer, explains general details and introduces the characters.

3.2.2 Make structure

The information is separated into small pieces and a sequence is created to which the point of contrast must be integrated, so that the audience becomes interested, and provide a solution that allows the viewer to explore information and create conclusions based on results.

3.3 Select media

Once the type of audience is identified, implementing the story and setting its navigability and interactivity select a proper media for the presentation.

3.4 Understanding

The user perceives the story, gets value and offers feedback for best practices in the future. The correlation between previous four steps will help us to provide a sequence of steps to tell information through stories and presenting information in an easy and remarkable way.

4 Case study

In this section we describe an example based on guidelines from the proposed methodology. This case study was conducted using information generated by the National Water Commission of México (CONAGUA). The mission of this organization is to preserve national waters and their inherent public goods for their sustainable management and ensuring water security with responsibility for the orders of government and society in general. According to the vision of the 2030 Water Agenda, CONAGUA [8], its requires average annual investments greater than 4.16 billion dollars, turning its vision into a reality. Their principal objectives are focus on measures to increase efficiencies in the use of water in agriculture and public urban supply. Not acting implies growing opportunity costs, which for unmet industrial demand alone would reach orders of magnitude of 124.70 billion dollars per year up to 2030. The growing need to raise awareness about the sustainable use of water resources is noticeable. Therefore, it would be helpful if managers, educators, governments and society in general contribute to achieving the objectives and strategies proposed by the government. In this regard, our proposal as an interactive technological tool could contribute that people understand through visual information

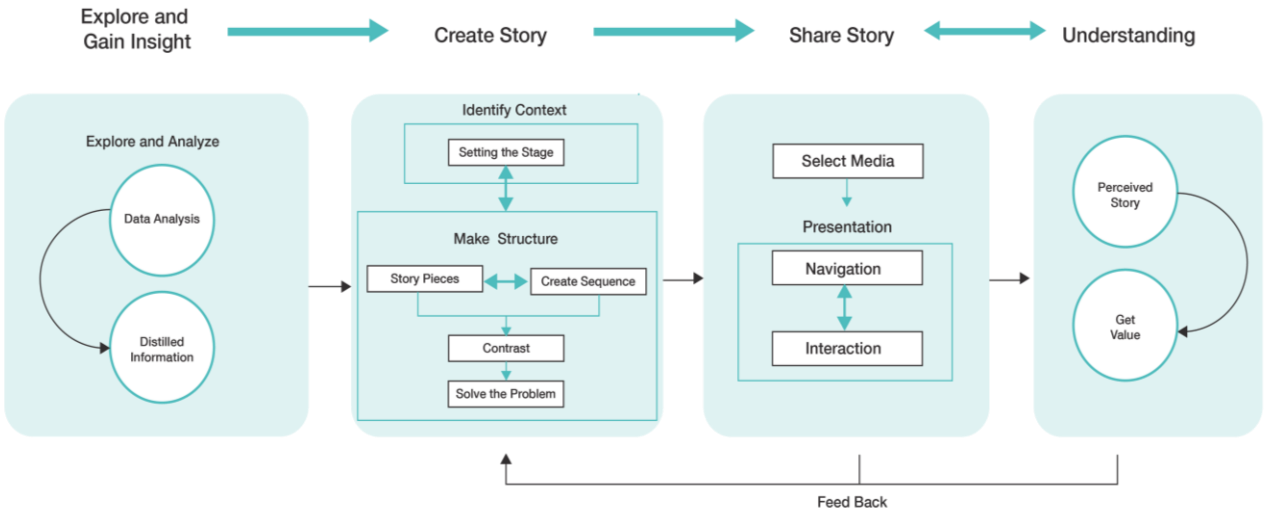

Figure 2. Data visualization process through storytelling technique in Business Intelligence

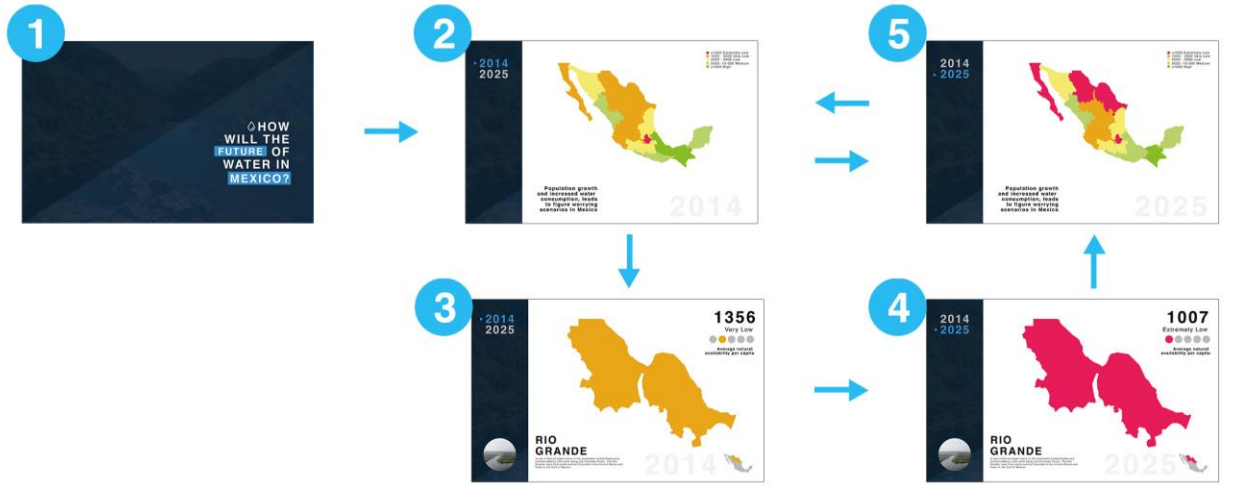

Figure 3. Data visualization process trough storytelling technique using the proposed methodology for CONAGUA organization

about the current hydrological problems and the possible consequences this would have in the near future.

In this case study, we analyzed a possible scenario to 2025 about the water consumption in different regions in Mexico according to CONAGUA and CONAPO (National Population Council) projections.

4.1 Explore and gain insight

Report on future scenarios of the water sector in Mexico average natural availability per capita in 2014 and 2025 of CONAGUA was used to explored and analyze the information as shown in Table 1.

Table 1. Average natural availability per capita in 2014 and 2025

Administrative Region	Average natural availability per capita 2014	Average natural availability per capita 2025
Baja California Peninsula	1317	833
Northwest	3210	2491
North Pacific	6038	5517
Balsas	2703	2403
Sur Pacific	7782	7378
Rio Grande	1356	1007
North Central Basins	1726	1606
Lerna - Santiago - Pacific	1820	1583
North Gulf	4666	4200
Center Gulf	10574	9853
South border	24549	19790
Península de Yucatán	8255	5786
Mexico's Valley and Cutzamala System	188	162
Baja California Peninsula	1317	833
Northwest	3210	2491

4.2 Create story

We started with the question how will the future of water in Mexico? To hook the audience and introduce the context followed by general information.

We use the regions as characters in this story, followed by the history divided into small parts and a logical sequence, see Figure 3, giving the meaning to the history; here the characters are gradually introduced up to the last scene where the contrast is shown and the water problem is revealed.

4.3 Select media

In order to illustrate the use of storytelling technique in data visualization for this case study, we select adobe illustrator to create some transitions, about the water consumption per capita since 2014 through 2025, see Figure 3. The design of the interactive tool it is recommend to use a business intelligence software as Tableau, Qlik View, Pentaho, among others.

4.4 Understanding

Finally user perceives the story, gets value and offers feedback for best practices in the future, see Figure 3.

5 Conclusion

The results of this research support the idea about the importance of data visualization in business intelligence for decision-making. In this way, we propose a methodology based on storytelling technique in BI in order to provide information more remarkable for people to support the decision making process. Thus, we presented a case study to illustrate the use of our proposed methodology. The implementation of the interactive tool based on storytelling technique in a business problem is currently under development. Finally, we expect to assess the model in different scenarios for novice and expert users in order to validate our approach.

6 References

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