THE UNIVERSITY *of* EDINBURGH

Understanding Data Visualization

The need for Subitization and Interactive Dashboards in the Human Resource Departments

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Introduction

Imagine sitting in an hour-long presentation that contains no graphics but just texts. It will be very challenging to remember all that was said. It is no news that engineers tend to be tactile learners. These earlier statements ponder the idiom *A picture is worth a thousand words*. Studies have shown that the business world is fast paced, your competitors are right on your tail. To be the best, you must beat the best. How does one attain external glory if decisions are not made quickly to outpace the competition.

This essay will focus on the relevance of the Human Resource departments using subitization and interactive dashboards for quicker decision making. I demonstrate that the use of graphics is detrimental in the HR department because this department provides management with information that head spears essential activities such as planning, controlling, directing, and organizing company activities, recruitment and utilization of workforce.

First, I review some literature discussing the relevance of visualization and subitization in business and its evolution over the years. Studying this literature shows there are still some shortcomings with how data is visualized in some Human Resource departments.

After, I buttress theories that focus on how data in the Human Resource should be presented in a well and easy to grasp graphical manner. I will touch on how data should be subitized and the relevance of making it interactive.

I present an empirical case that encompasses all the theories I speak of throughout the essay.

I conclude by comparing the effectiveness of subitization and an interactive dashboard to the traditional presentation of raw data to management for decision making.

Literature Review

Diagrams have proven to be an essential part of every meeting in every meeting. According to Pollack and Campagnolo, it is hard to imagine a business meeting that does not revolve around a format that includes graphical representations (Pollack and Campagnolo, 2015). They went ahead to say a business report is considered incomplete if there no graphics to accompany the writings. The Human Resource department is no exception to this.

The need for use of visualization in businesses as a modern way of communicating information was touched on by Gartner in an interview. He said when he first entered the business analyst's world, all analyst firms were producing and selling lengthy reports. He quickly realized how long this took executives to read and come up with quicker solutions, not to mention how long it took analysts to put together this document. He quickly introduced the "one pager" solution (interview, G. Gartner). The one pager solution is considered to have paved the way for simplicity in the generation of business reports.

Getting deeper into simplicity, subitization is introduced, which is the ability of humans to make quick, average and confident decisions about small numbers (Pollack and Campagnolo, 2015). It is based on psychological experiments from the late 19th Century where it was shown that a fundamental law of visual counting was that the reaction time necessary to recognize a

small number of entities was dramatically different from those required to identify entities above 7 or 8 (Cattel 1886 in Dehaene 2009).

However, cramping all information into smaller or simple graphical views can lead to the distortion of relevant information.
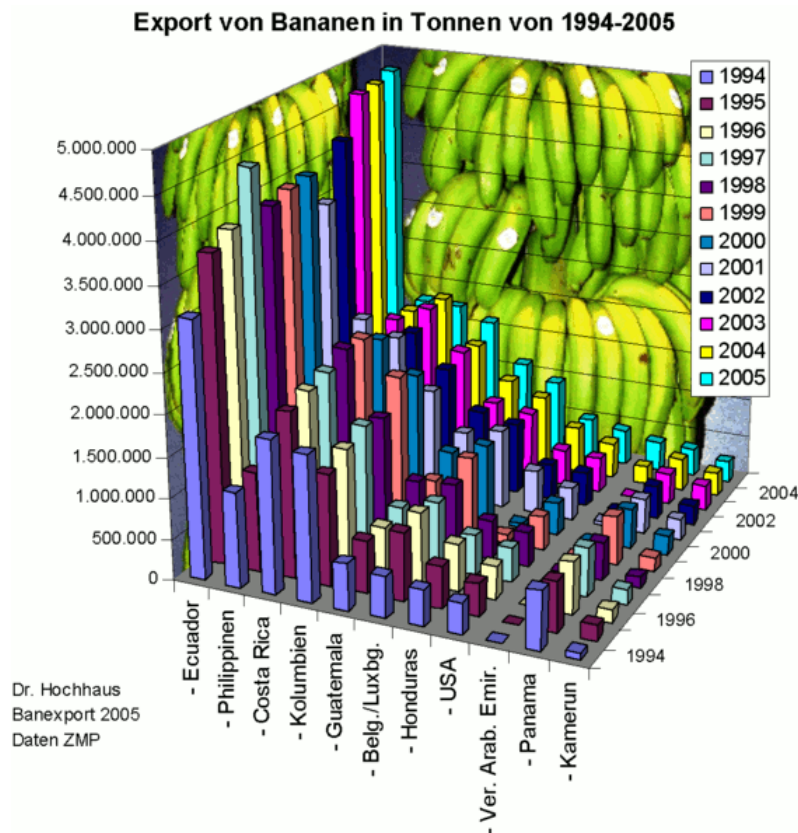

Figure 1: (Hochhaus, 2005)

The figure above by Dr. Hochhaus shows an attempt to display all relevant data in a single graph. Not only is this graph almost impossible to read, but it also has a terrible color scheme. It is very easy to assume cramping information into a whole in the name of simplification is subitization. Gratefully, Pollack and Campagnolo go ahead to juxtapose between subitization and simplification: subitization is not simplification because subitization goes beyond just eliminating details and features for clarity and visual management's sake (Pollack & Campagnolo, 2015).

Theory
The Human resource duties

The human resources department is charged with helping an organization meet its most valuable resource – its employees. Though the department has many tasks ranging from running training sessions for employees to maintaining a safe environment, below focuses on just two duties that would do better with data visualizations.

In her article about the main responsibilities of the Human Resources department, Ruth Mayhew talks about how the success rate of recruiters is measured by the time it takes to fill empty roles (Mayhew, 2015). Mayhew goes ahead to stress how essential this piece of information is to management as it serves as a means of decision making. The

decision to be made here is if the organization should continue with an in-house recruitment team or lease this task out to recruitment agencies.

Mayhew mentions training and development as another critical responsibility of the department. A new employee in an organization needs to be introduced to the necessary tools to spearhead their success and growth. After training comes performance appraisal. A performance appraisal serves to measure how well an employee is developing over the years.

The traditional way of presenting information

Allow me to be very specific here, even though I try to be less subjective. I will start by giving a direct quote by Gartner in an interview:

An average analyst might do...about 330, 350 enquiries a year. So that is 300 conversations. And then face to face like we are doing here, that might be another 150, 200 conversations like that a year. So, 700 face to face conversations at between 20 minutes up to an hour. That is a lot of data in just one area (interview, Gartner analyst, ET).

I may not be talking about analysts here, but I want to draw attention to how tedious tasks can get in departments such as the human resources that do a lot of entries and have a lot of face-to-face conversations.

I work with the biggest pharmaceutical company in Ghana as a systems coordinator, and I interact with the Human Resource department. My time with the organization has drawn my attention to how much data is at their disposal, but visualization is under-utilized. Majority of data is still in hardcopy format sitting on shelves. Whenever information is required, the HR department now rushes to these shelves, skim through before providing the needed information. This traditional way of accessing information takes so much time.

Going back to the two roles mentioned above, the human resource department puts the data in a table. It presents it to management in its raw form for data visualization.

An example is shown below:

Name	Roles filled	Time taken
Derrick Osae	12	6 weeks
Albert Einstein	46	1 year
Mary Young	2	6 day

Presenting information like this leads to a longer time taken by management for decision making.

Subitization and Interactive dashboards

My theory suggests subitization and interactive dashboards will lead to a better presentation of information to management, which will lead to faster and better decision making.

In 2016, Cybulski presented a conceptual framework purposely for geographical data, but I drew so much inspiration from this article as the same knowledge can be applied to an interactive dashboard for the HR department.

- **Layout Composition**: The dashboard should be stable and in order.
- **Title**: In the presence of a title, it should be to the upper part of the layout, to the left or in the center.
- **Legend**: should be on the left in case of interactive dashboards.
- **Interactivity**: Method of interaction is either internal or external, for instance the user interface of a video player would be external.
- **Interactive tools**: Zoom, pan, play, pause, stop, and time control. May be in the legend, in the temporal legend or base map, or placed under separate buttons.
- **Multimedia**: text, sound, charts, pictures, and movies. Their application is closely connected to the GUI and to interactivity.

(Cybulski, 2016)

These points raised by Cybulski fill the gap that is introduced by simplification and, to some extent, subitization. An interactive dashboard will help compress data into very presentable graphics and expand it when the need arises for exploration.

The above proves the relevance of displaying data using interactive dashboards in the Human Resource department. The decision is not illogical. The technique is not only meant to beautify the appearance of the data but to collapse it into a more presentable way and not throw away any relevant information. Hence, this leads to quicker and better decision making.

Empirical Case
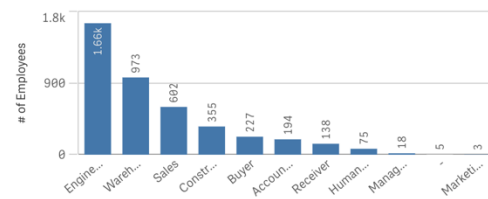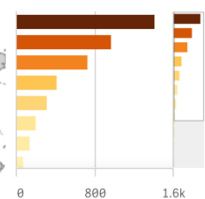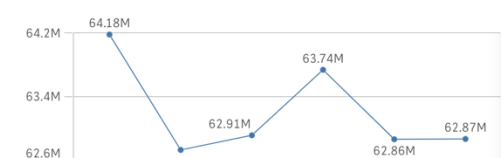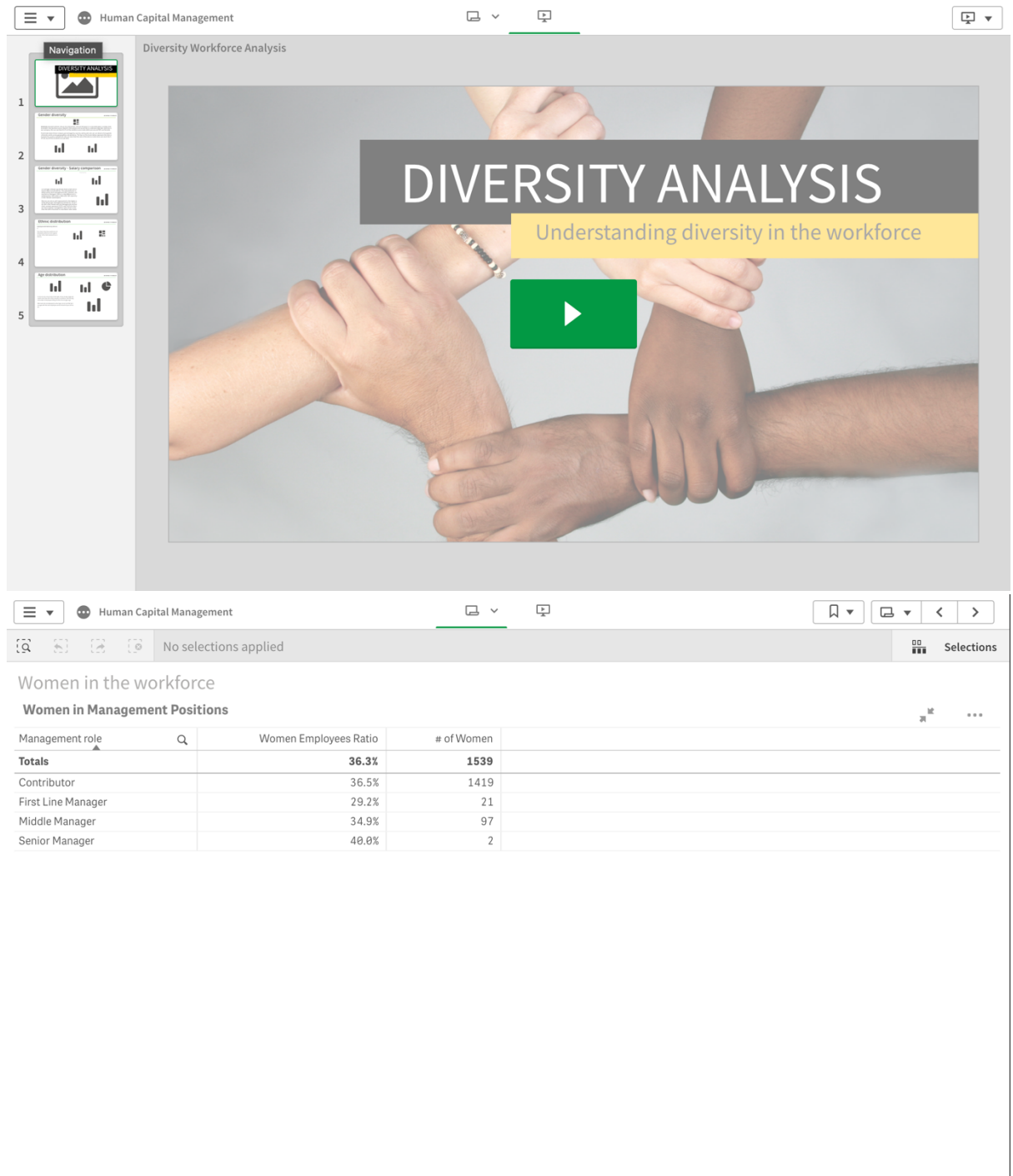
Figure 2: Example in context

The above four screenshots were taken from:

https://www.qlik.com/us/dashboard-examples/hr-dashboard

The above is a website that creates interactive HR dashboards for data-driven decisions. This website is great for my empirical case because it follows the design rules presented by Cybulski.
The first thing you notice is how it presents all the possible data you may be in for. The

presentation of relevant information for quick, average and confident decision-making points back to subitization as presented by Pollack and Campagnolo.

My visualization follows Cybulski's title design idea. The titles are shown above all diagrams and are to the left. This should be the position where most users will expect it to be.

It is seen that the use of multimedia and interactive tools is also apparent in the above visualization. We see a combination of illustrations, text, pictures, and videos. The included multimedia has been equipped with interactive tools such as zoom. Each graph presented on the dashboard has the ability to be zoomed. It can hover over for hidden information. The best part of the interactive tools is the ability to generate tables for each graph. Videos can be paused, played, zoomed and time-controlled.

This being an interactive dashboard, we see that the legend is placed to the left. This is per Cybulski's principles. Users can change the colour of the legend.

It is tough to criticize the visualization above. Still, I went through to see if there was any section for qualitative data and realized there was nothing like that. It would be nicer if there was a section to provide a quick visualization of text. A good example would be word clouds to tell a story about what employees think about salaries.

Conclusion

The Human Resource department is an essential part of every organization because they manage the company's most valuable assets – the employees. The department pass on relevant information to management for decision making. The preparation of data can be cumbersome on the side of HR and very difficult for management to utilize for decision making. I present an empirical case that shows that subitization and interactive dashboards are the best way to deliver information to management for decision-making.

Even though the presented solution appears to be perfect in this timeline, I believe much could be done to improve the experience. Interactive dashboards designed for Human Resources appear to be biased towards quantitative data. There could be sections that visualize qualitative data as well. I know most qualitative data can be expressed as quantitative, but the need for insights may be crucial. An example is "90% of employees are not happy". A qualitative visualization such as a word cloud can assist in giving management a glance at what is making employees not happy.

Reference

Cattel, J. M. 1886. "The time taken up by cerebral operations." *Mind*, 11: pp. 377-392.

Cybulski, P. (2016) "Design rules and practices for animated maps online", *Journal of Spatial Science*, 61:2, 461-471.

Mayhew, R. (2019, January 25). *Six main functions of a Human Resource Department*. Small Business - Chron.com. Retrieved April 3, 2022, from https://smallbusiness.chron.com/six-main-functions-human-resource-department-60693.html

Monmonier, M. (1990). "Strategies for the Visualization of Geographic Time-Series Data", *Cartographica*, 27:1, 30-45.

Pollock, N & Campagnolo, GM (2015). "Subitizing Practices and Market Decisions: The Role of Simple Graphs in Business Valuations", *Making Things Valuable*, 4, Oxford University Press, Oxford, pp. 89- 108.

I. http://wikibon.org/blog/new-gartner-magic-quadrant-signals-an-end-to-traditional-storage-arrays/ Accessed 3rd April
II. https://www.pinterest.com/pin/490962796849725506/ Accessed 3rd April