Design Critique

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Introduction:

The visualization that will be critiqued is the Job Market Tracker by Andrew van Dam and Renee Lighter of the Wall Street Journal. It visualizes unemployment in the United States in the period before and after the crisis. It does this by showing two pairs of graphs that work together. The first pair consists of a stacked graph and a bar chart. The second pair is made up of a tile chart and a line graph.

In this critique we will analyze the graphs based on several aspects. First it will be determined what the problem domain and goals of the visualization are. Then it will be judged if the visualization shows graphical integrity based on Tufte's graphical integrity principles. Secondly the visualization's design will be critiqued by taking Tufte's and William's design principles into account. Then the visualization's visual encodings will be looked at. It will be stated if these visual encodings and their respective characteristics are appropriate. Then the aesthetics of the visualization will be analyzed. Finally, it will be determined if the visualization has met its goals.

Problem Domain and Goals:

The problem domain is the global financial crisis and the unemployment that occurred as a consequence. A drill-down story visualization structure is used because it presents a general theme and shows several instances of that theme. In this case the general theme is unemployment during the crisis. The different instances are showing unemployment for specific groups and placing it in a historic context. By doing this, the user is given the opportunity to review additional details and backstories (Segel & Heer 8).

In the first pair of graphs they specify the unemployment by sector. By doing this it can be determined which sectors were hit hard by the crisis and which sectors were affected in a less intense manner. Maybe, even more interestingly, some sectors even profited from the crisis. In the stacked graph each sector represents a square, and each color represents how it is affected. In the bar chart, the size and the color of the bar represents how it is affected.

In the second pair of graphs the overall unemployment is first shown in a historic context. In the tile chart, each tile represents a year and its color shows how it is affected. In the line graph unemployment is represented by the line. They do this so it can be concluded whether the crisis caused an amount of unemployment that is significant compared to times when the economy is going well. In the line chart they also highlight in which periods recessions take place. This means the creators want you to compare the latest financial crisis to other crises. Finally, the creators want to show how the crisis affected unemployment for different groups of people. Overall unemployment can be compared to specific groups based on gender, ethnicity, age and education level. By doing this Van Dam and Lighter created filter tools, specifying the view of the user (Heer & Schneiderman, 2012).

Graphical Integrity:

Based on Tufte's principles most points in the visualization have graphical integrity. There are also some points that can be improved.

The scaling and labeling of the axes is mostly done correctly. In the tile chart and line graph the labeling is done perfectly. Both the x- and y-axes are labeled clearly and the y-axis of the line chart starts at zero. What could be improved in these charts is choosing a different starting point than 1945. This is directly after the second world war and it distorts the data. Right after the war, there

were lots of phenomena in the economy and society in general that were extraordinary. Europe's economies, important trading partners of the United States, were devastated during the war and developed quickly in the years thereafter. Also the population of the United States grew rapidly just after the second world war. These are just two examples of positive effects coming from a unique event that distort the data because they make the first period of the data look relatively better, compared to the periods later on. Furthermore, it would have been clearer if the bars that contain a negative value would go the opposite direction of the bars that contain a positive value. Now the difference is given with colors.

Design principles:

The design of the of the visualization will be analyzed using Tufte's and William's design principles. These are actually fairly similar.

First we will look at contrast and layer information. The contrast between the colors are clear in all graphs. We can clearly distinguish the squares in the stacked graph, the bars in the bar chart, the tiles in the tile chart and the line in the line graph. The only aspect the designers have not thought about is that their color selection is unfavorable for color blind people. Symptoms of the most common form of color blindness, Deuternanopia, are that people can't distinguish colors with green and red values. These are exactly the main colors of the visualization. The only graph where layer information is applicable, is in the line graph. The layer that shows the recessions is the furthest back, followed by the layer that contains the dotted line that is drawn at the 6 and 12 percent value. The line showing the unemployment is the final layer on the graph. It is easy to tell the difference between the three layers, so the creators of the graph have done well on this.

The next criteria is repetition. Van Dam and Lighter have done this well. They let the same theme, unemployment during the financial crisis, reoccur several times. The difference is that it is in a different context each time. Furthermore, they make use of the same color scheme throughout three of the four graphs, which is good.

Alignment is also done well. The titles of all graphs are nicely outlined right above each other. The first pair of graphs, the stacked graph and the bar chart, are not aligned right above each other. It would have been better if they were, since the charts work together. The bottom two graphs are outlined right above each other and this is important. This is so because they work together constantly. Where you are located on the tile chart with your mouse is also the point that is highlighted in the line graph and vice versa.

Finally, proximity and data density are handled well in the tile, line and bar chart. In the tile chart, the tiles are placed very close to each other. Therefore, it is easy to scroll over them while viewing the percentages of unemployment in the tool tip. In the bar chart, the bars are placed close above each other, which makes it easy to compare their values. The only improvement they could have made was putting the stacked graph and bar chart closer to each other. Since the two charts work together interactively, it would have been nice to be able to view them both fully without having to scroll up and down the page.

The final point related to design principles is Tufte's principle of minimizing chart junk. Van Dam and Lighter have done a good job when it comes to this, however they could have left the dotted lines out at 6 and 12 percent (or 8% and 16% when you filter on education). It is unclear why they put the dotted lines there because it does not seem to make anything clearer. Furthermore, the 6 and 12 percent values seem to be chosen completely arbitrarily.

Visual encodings

As in every visualization, visual encodings are used. In the unemployment tracker they are position, color and size.

In the stacked graph, position and color are important. Position because the position of the squares shows the value of the amount of unemployment and the point in time. In that sense, it makes use of the fact that there is order in the visual variable position (Carpendale 6). Color is important because it also shows the value. This is so because you can also order data points based on color. Moreover, the creators have used the fact that you can be selective through color (Carpendale 12). When the user hovers on one of the squares in the graph, all the other squares of the same sector in different years turn black. Therefore, the user can easily spot a trend over time in the stacked graph for a specific sector. Heer and Schneiderman refer to this process as sorting (1).

In the bar chart, color and size are used. They are both used for the same reason, to show the growth of unemployment in a specific sector at a specific time. Furthermore, it won't come as a surprise that the creators decided to use a bar chart for this visualization. This is so because graphical perception experiments found that spatial position, which is used in bar charts, allows users to come to the most accurate decoding of numerical data. It is in that sense better than visual variables such as angle, one-dimensional length, two-dimensional area, three-dimensional volume, and color saturation (Heer et al. 60).

In the tile chart, again position and color are used. Position to show at what point in time this amount of unemployment took place and color to show what the level of unemployment was.

In the line graph position and color are used once again. Here position, just like in the stacked graph, is used to determine the value of the level of unemployment and to determine the point in time. Color is used to distinguish the different lines.

Perception

The visualization makes great use of top-down and bottom-up processing (Ware, 8-12). When the visualization is first looked at, the user engages in bottom-up processing. This is especially the case in the tile and line graph. When the user first looks at it, he or she takes in the level of unemployment over the years. Once he or she has processed that, the user switches to top-down processing. This is so because the user actively starts using the filters and tries to find unemployment levels for the group that he or she has interest in. Also the user may try to find which group has the highest and lowest unemployment.

Aesthetics

The chart is very nice to look at. It makes use of vivid colors and beautiful fonts.

Furthermore, it is playful due to the many filters and perspectives you can use to look at the data. For example, you can filter on sector, education level, age and gender to name a few. This makes it playful and fun to use. It's also playful due to the transitions in the stacked graph when you re-order it. The slow and bouncy transition is fun to look at.

Goal achieved?

The goal of the visualization was to show how the crisis affected unemployment in specific sectors and groups of people. Furthermore, it wants to put the amount of unemployment in a historical context.

The visualization succeeded in both because the stacked and bar chart clearly show how the visualization affected certain sectors. In the tile chart and the line graph, overall unemployment was shown over a long period of time. Also you could see how the unemployment level developed for specific groups of people. It is clear that the visualization achieved its goals, however there are some things that could have been done differently.

In the stacked graph, you can barely judge the exact value of a square without using the tooltip. Let's take the period of may 2010 as an example. Here, federal government services rise with 14.48%, however it is portrayed exactly the same way as mining & logging in that period which only rises 1.46%.

In the bar chart both color and size are used to show the value of a bar. The use of color therefore seems to be unnecessary. As mentioned before, it would seem more logical to give all the bars the same color and let the bars with negative values go the opposite way of the bars with a positive value.

In the tile graph it would be interesting if you could compare two filters. At the moment you can do this in the line graph, since multiple lines are shown there. The difference between the unemployment of two groups would however become more clear if you can also compare them directly in the tile chart. You could do this by representing one group with half a tile and the other group that is selected with the other half of the tile.

In the line graph it would be great if other economic indicators could be shown. For example, it would be interesting if the development of GDP could be portrayed as a line. Considering that the audience of this visualization are people who read the Wall Street Journal, it is likely that the audience has knowledge of economics and finance. It is expected that those people would appreciate more economic indicators so that they can place unemployment in an even broader context.

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