A Demographic Study

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Abstract. The paper presents a demographic study of the world population over the years. We have presented our analysis of 4 major topics using interactive graphs and charts. These topics are Age Distribution, Dependency Ratio, Employment Distribution and Gross Domestic Product. The analysis of these topics are presented for the 10 most populous countries in the world like US, India and China. The datasets we used were fetched from the UN Data website and were enough to show overall and individual statistics.

Keywords: Dependency ratio · Employment · Gross Domestic Product.

1 Introduction

1.1 Topic

It is important to study population to analyze trends, identify causes, project future populations and identify implications of events. Visualization of these data are useful for the immediate detection of anomalies that we might not observe generally. These visualizations also help in the formation of public policies that help shape the world we see around today. Subsequently, analysis of world population over the years help in doing a future trend analysis of businesses so that correct business decisions can be made. Lastly, the simple and cool visualizations help educate the youth about grieving concerns about the society such as overpopulation and gap in labor forces.

1.2 Audience

The audience for this project can be a variety of individuals such as the youth, international business owners and economists. International business owners can study different sectors in the society and how these have changed over the years in order to maximize investment opportunities. Similarly, economists can leverage the data through these visualizations to formulate public policies and identify potential risks. The youth can be tantalized by state of the art visualizations for educational purposes as they are the main harbingers of change in the society.

2 Data

2.1 Collection

The data were collected from the UN Data Website and World Bank website for years 1950 - 2015 and 200+ countries. The first data set [1] that describes age distribution contains data points for both males and females. The second data set [2] that talks about employment by activity has many categories namely, Industry, Services, Agriculture, Hunting, Forestry and Fishing. The last data set [3] entails GDP information for all countries in the given time span.

2.2 Processing

Some basic data processing was performed on the data collected from the above sources using Python NumPy [4] and Pandas [5]. The age distribution data had to be merged for males and females. The Agricultural, Hunting, Forestry and Fishing categories were combined in the employment data set as they talk about similar sectors. The missing values were imputed using mean and duplicate rows were eliminated from all data sets.

3 Approach

3.1 Design

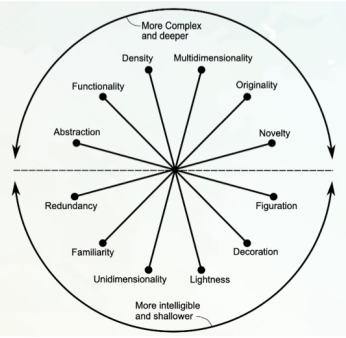

Fig. 1. Visualization Wheel

The design of charts and bars focus on the upper half of Cairo's visualization wheel [6]. The age charts are multi-dimensional and convey various types of

information. The graphs are also not redundant and display novel aspects. Lastly, there is some functionality displayed by the charts using sliders and buttons and are abstract in nature.

Area Chart This chart is better than line chart for our design consideration because it helps us visualize cumulative ideas over the years as compared to individual ones. We have also optionally included vertical lines to show distribution of the dependency ratio, which adds to the multi-dimensionality of the chart. To make the visualization clean and interactive, we have used tooltips to show crucial information. Lastly, smooth transitions have also been added to the chart for better user experience.

Animation Chart The chart animates the same concept of dependency ratio over time by using circles to differentiate between the 3 age groups. This visualization really shows the trend of dependency ratio over the years which might not be fathomable by the previous one.

Grouped Bar Chart and Radial Chart These charts describe the difference between 3 different employment sectors for the selected countries over the years. Grouped bar charts provide an excellent way to visualize different categories and extenuate the difference between them. The radial chart shows this segregation in an even better manner which seems to be more fathomable. The user can hover over the charts to see detailed information using cards and also observe the pertinent bar because of lowered opacity.

World Map The world map shows the change in GDP for many countries over the years with the help of a slider. The map is an excellent way of showing the information in a geological fashion as the audience can easily correlate with the medium. The users can hover on the countries and detailed information regarding the countries will be displayed on the screen.

3.2 Technical Considerations and Development

Several technologies have been used for the completion of this project. D3.js [7] is the main library that was used for creating charts, layouts, animations and transitions. It was used to load the the data sets in csv and json formats as well. Secondly, we used Angular.js [8] for it's MVC architecture and data binding. Additionally, we also used jQuery for DOM applications. Bootstrap [9] was used for styling the HTML elements and also for card layout in the bar charts.

3.3 Evaluation

The development of the website was validated continuously by using the SDLC lifecycle. All the charts and features were monitored by the team members after

the inclusion of each feature. The technology that we used in order to carry out this process was git. The charts were thoroughly tested after each commit by a team member and bugs were fixed on the fly as well.

4 System

The website can be used in most browsers (Safari, Chrome, Mozilla) and can be rendered in all Operating Systems like Mac, Windows, Linux, iOS and Android

5 Related Work

The Department of Economic and Social Affairs of the United Nations [10] provides the international community with timely and accessible population data and analysis of population trends and development outcomes for all countries and areas of the world. The 2017 Revision of World Population Prospects [11] represents the latest global set of demographic estimates and projections prepared by the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

6 Conclusion

The website enables audiences from business, economy and general backgrounds to interact with visual charts that demonstrate valuable information like understanding how age distribution in a country impacts the working population and dependant pressure, knowing how major employment sectors in a country have shaped its economy over time, and visualizing the economic growth with gross domestic product over time. Subsequently, the charts have excellent design considerations such as originality, novelty and multi-dimensionality. Finally, D3, Angular and Bootstrap are robust tools to carry out a successful data visualization project.

References

1. https://population.un.org/wpp/Download/Standard/Population
2. https://data.oecd.org/emp/employment-by-activity.htm
3. https://data.worldbank.org/indicator/ny.gdp.mktp.cd
4. http://www.numpy.org
5. https://pandas.pydata.org
6. Cairo A.: The Functional Art: An introduction to information graphics and visualization
7. https://d3js.org
8. https://angularjs.org
9. https://getbootstrap.com
10. http://www.un.org/en/development/desa/population/publications/pdf/ageing/
11. https://esa.un.org/unpd/wpp/Publications/Files/