

AUS Men & Women Job Trends

FIT5147 Narrative Visualisation Project



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Lab Number : 12

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INTRODUCTION

The aim of the formation of this narrative visualisation is to have an analytical study on how men and women are employed in Australia and how it has changed over the years. When it comes to employment of women and men, it is found that women like to be employed in service more than men and this is true since 1990. And, men on the other hand are more towards industry and service. Agriculture is going to have lesser job openings in the future as we can see a consistent drop in employment.

One thing to surely look at is Australia's Labor Force Participation which has fluctuated due to unemployment and employment factors. The participation of men and women in labor was something interesting to study. Women participation in the labor force is increasing at a good rate compared to men which is falling consistently. Men participation was highest of all times in 1990 while women's highest was in 2016. Women are taking up jobs in Australia and are more independent financially than they ever were. Furthermore, the visualisation can also convey information on how unemployment and education at various levels affect men and women.

The intended audience of this visualisation application is of a large spectrum. It ranges from anyone interested in knowing Australian Economy to Behavioral Economists. Even economic students can utilise this application to study and reflect on how the economy is affected by various variables in Australia.

DESIGN

The following text discusses the 5 design sheets in detail.

SHEET 1

The 1st sheet deals with the main motive of the application and the research questions it is built on. The brain storming section provides different types of chart ideas to be implemented in the application.

The visualisations are categorised on the bases of the following :

1. Gender
2. Employment Sector
3. Labor Force Participation
4. Unemployment with Education

Brainstorming:

1. Which education sector to focus on?
2. What type of plot is good for what visualisation?
3. 3D graphs to show change in unemployment.
4. Bar charts to show various employment for each gender.
5. Bubble chart to show change in labor force participation.
6. Line plot with some prediction for coming years.
7. Comparison of labor force participation with employment and unemployment with education and sector respectively.
8. Implementing an animation in one of the graphs for application sophistication and better visualisation.

Research Questions:

1. What is the unemployment percentage of men and women with various levels of education from the last 27 years?
2. How has labor force participation of men and women changed since 1990?
3. Where do women and men prefer to be employed?

SHEET 2

Sheet 2 deals with the 2nd research question. The layout is of the following charts:

- 3D graph: The 3D graph has 3 axes which are Advanced Education Unemployment Percentage, Intermediate Education Unemployment Percentage and Years.

Alternative Design:

A 2D line plot with selection of education level as select input. The same can be seen in the Appendix sheet 2.

Operations:

- Users can rotate the 3D graph.
- Users can select the education level in the 2D line plot.(Alternative design)

Focus:

- The change in percentage unemployment in male and female for different education levels.
- Women have quite an interesting trend in unemployment with education compared to men.

Evaluation:

Pros - Provides many interactions on the 3D plot. The user can rotate , zoom in/out on the graph. The user can also isolate and focus on one or many variables.

Cons - Requires users to play with the graph for better information gain.

SHEET 3

Sheet 3 deals with the 3rd question of the research questions. The layout is of the following charts:

- 3D graph: The 3D graph has 3 axes which are Employment Sector, Employment Percentage, and Years.
- Bar graph: The bar graph has 2 axes which are Employment Percentage and Year. The bar graph represents the percentage for male and female for the selected Employment Sector.

Alternative Design:

A 2D line plot with selection of Employment sector and gender as a select inputs. The same can be seen in the Appendix sheet 3.

Operations:

- Users can rotate the 3D graph. Users can also select a gender and isolate a particular sector on the 3D graph.
- Users can select the Employment sector for the Bar graph.
- Users can select the Employment sector and Gender in the 2D line plot.(Alternative design)

Focus:

- The most important thing to focus on is to compare men and women employment change from the bar graph. In the service sector women work more compared to men.

Evaluation:

Pros -Easy and interactive.

Cons - Requires user to play with the graph for better information gain

SHEET 4

The 4th sheet deals with the 1st research question. The layout is of the following charts:

- Animated line plot: The animated graph has 2 axes which are Year and Labor force participation rate. The line plots provide information of males and females of Australia .
- Dual graph 1: The dual graph is of a line plot for labor force participation and a bar graph for employment in a selected employment sector with a selected gender from the select input option.
- Dual graph 2 : The dual graph is of a line plot for labor force participation and a bar graph for unemployment with education for a specific gender. The same can be clearly seen in Appendix sheet4.

Alternative Design :

- A 2D line plot with one select input for gender. The same can be seen in the Appendix sheet 4.

Focus:

- Things to focus on is the effect on labor force participation by unemployment with various levels of education and employment sector.

Operations:

- User can select play and slide the year panel for the animation.
- In the chart2, the user can select the industry and gender from select input.
- In chart3, the user can select the gender.
- On graph interactions can help in isolating the variables.

Evaluation:

Pros: Provides a detailed study on labor force participation. Isolation by plotly provides sophistication to the application.

Cons: No disadvantages.

SHEET 5

The last sheet is of the FDS provides the final layout of the application. The application has 2 tabs. The 1st tab provides charts from sheet 2 and sheet 3. The 2nd tab provides charts from sheet 4.

The application is made in R Studio using Shiny. The time needed to built the application is about 49 to 70 hours of coding.

Focus:

- Male and female working and employment trends in Australia.
- How do men and women contribute to labor force participation?
- Study reveals that for men and women education and employment sector act differently towards labor force participation.

Evaluation:

Pros: The final visualisation gives many interesting ways to interact with the user.

Cons: The application has lots of charts to gain information from. It can become overwhelming for the user.

IMPLEMENTATION

The interactive visualization is built on R using various packages. Shiny, ShinyDashboard, dplyr, ggplot2 and Plotly are the 4 libraries on which the application stands on.

Shiny and Shiny dashboard library implementation was due to the need of various charts inside the application which had to be segregated on the bases of topics. With the help of the shiny dashboard, I was able to provide a side panel on the left of the application screen for easy tab navigation.

The 2 tabs in the application are made on Unemployment with Education & Employment Sectors and Labor Force Participation. The 1st tab provides general trends on Unemployment and Employment by Education and Sector respectively. The 2nd tab provides a detailed visualization on how men and women Labor Force participation change with various levels of Education and Employment Sector.

Shiny's select input dropdown menu was used for getting input from the user for various charts. The 2nd chart on Tab 1, provides an option for the user to change the employment Sector of the corresponding graph and charts on Tab 2, provides option of gender and employment sector as an input form the user.

Plotly and ggplot2 packages played a huge role in application building. Each of the charts in the application utilizes plotly along with ggplot2. The main reason to use plotly was its ability to provide graph interaction so that the user can play around with the graph and explore visually.

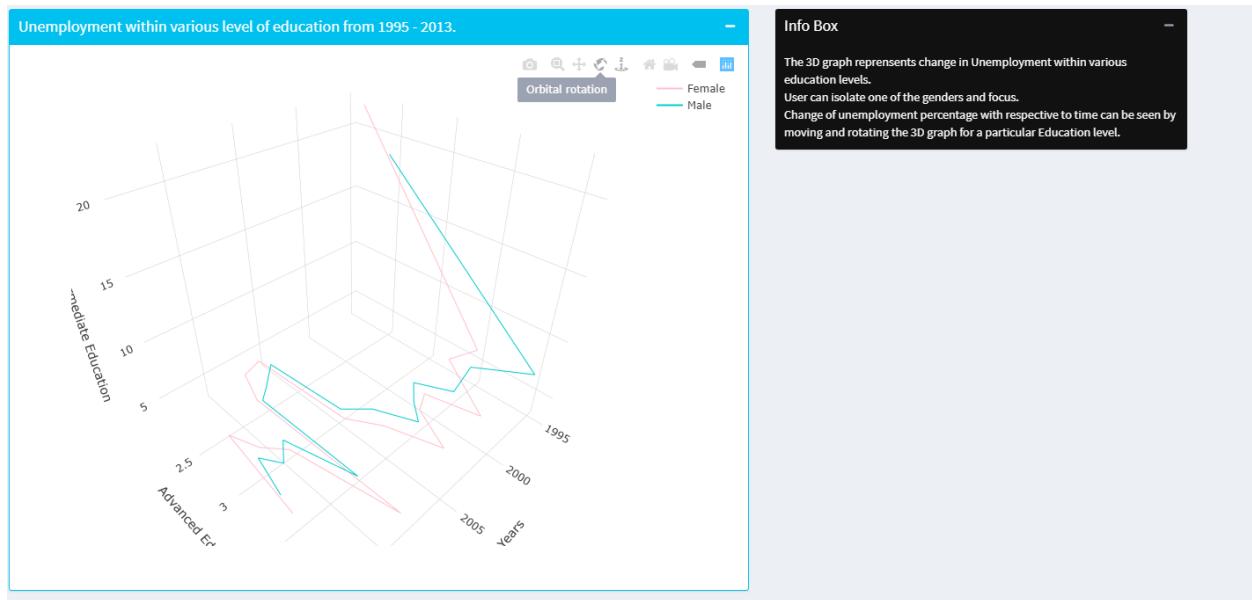
Animation of line graphs on Tab 2, 3D plots on Tab 1 , Bar graphs on Tab 1- 2 and Dual Graphs on Tab 2 all have the ability of on graph interaction with the user. The ability to allow image download and comparison on hover is something which really maximised the capabilities of the application by using Plotly.

USER GUIDE

Tab 1 : Unemployment with Education & Employment Sectors

As the user opens the application the 1st thing he/she sees is the side panel of the Shiny Dashboard. The 1st thing on the side panel is the introduction of the application following the Menu Item of the tabs on the application. This menu allows the user to navigate between the tabs. By default the user is on Tab 1 which is named “Unemployment with Education & Employment Sectors”.

The 1st chart that the user encounters is a 3D graph named “Unemployment within various levels of education from 1995 - 2013.” This graph has 3 axes which are Intermediate Education (in %), Advanced Education (in %) and Year. The black “Info Box” on the right of the graph gives the user some details of the chart in view and it’s interaction capabilities.



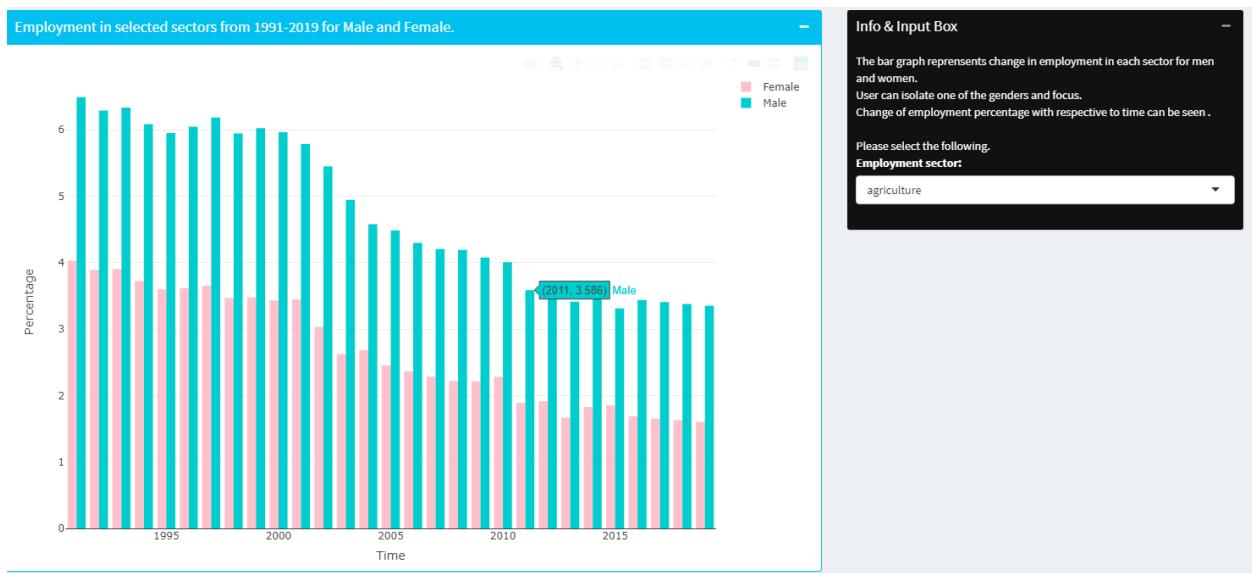
Following are the interactions provided by the chart and how it can be used by the user are :

- Top right corner of the graph provides various options for the user to have an interactive experience. The camera icon allows the user to download an image of the graph, the zoom icon allows change in the range of axes or zooming in or out of the image, the navigation icon is to change the position of the graph, the circular arrows allow the user to rotate , the

home icon allows the user to reset the graph to its default view and the hover allows the user to show or hide values while hovering over the graph.

- The user can isolate one or many variables by clicking on the legend of the graph.

The 2st chart that the user encounters is a Bar graph named “Employment in selected sectors from 1991-2019 for Male and Female.” This graph has 2 axes which are Percentage Employment and Year. The black “Info & Input Box” on the right of the graph gives the user some details of the chart in view and it’s interaction capabilities. The black box provides the option of selecting the specific “Employment Sector”.

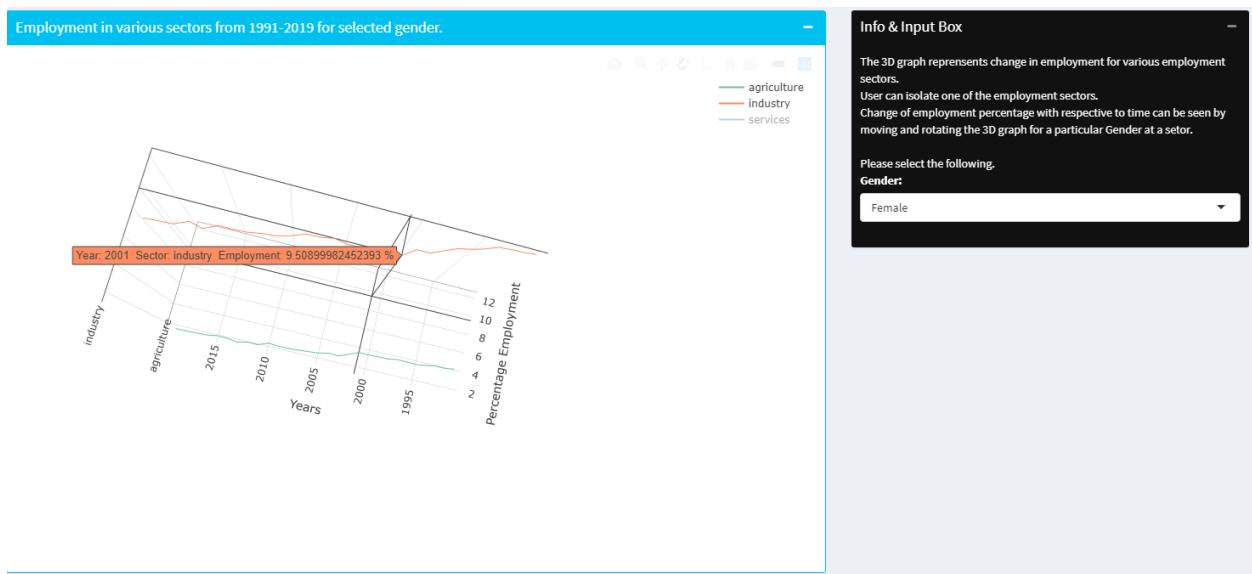


Following are the interactions provided by the chart and how it can be used by the user are :

- Top right corner of the graph provides various options for the user to have an interactive experience. The camera icon allows the user to download an image of the graph, the zoom icon allows change in the range of axes or zooming in or out of the image, the navigation icon is to change the position of the graph, the circular arrows allow the user to rotate , the home icon allows the user to reset the graph to its default view and the hover allows the user to show or hide values while hovering over the graph.

- The user can isolate one or many variables by clicking on the legend of the graph.

The 3rd chart that the user encounters is a 3D graph named “Employment in various sectors from 1991-2019 for selected gender.” This graph has 3 axes which are Employment Sector, Percentage Employment and Year. The black “Info & Input Box” on the right of the graph gives the user some details of the chart in view and its interaction capabilities. The black box provides the option of selecting the specific “Gender”.



Following are the interactions provided by the chart and how it can be used by the user are :

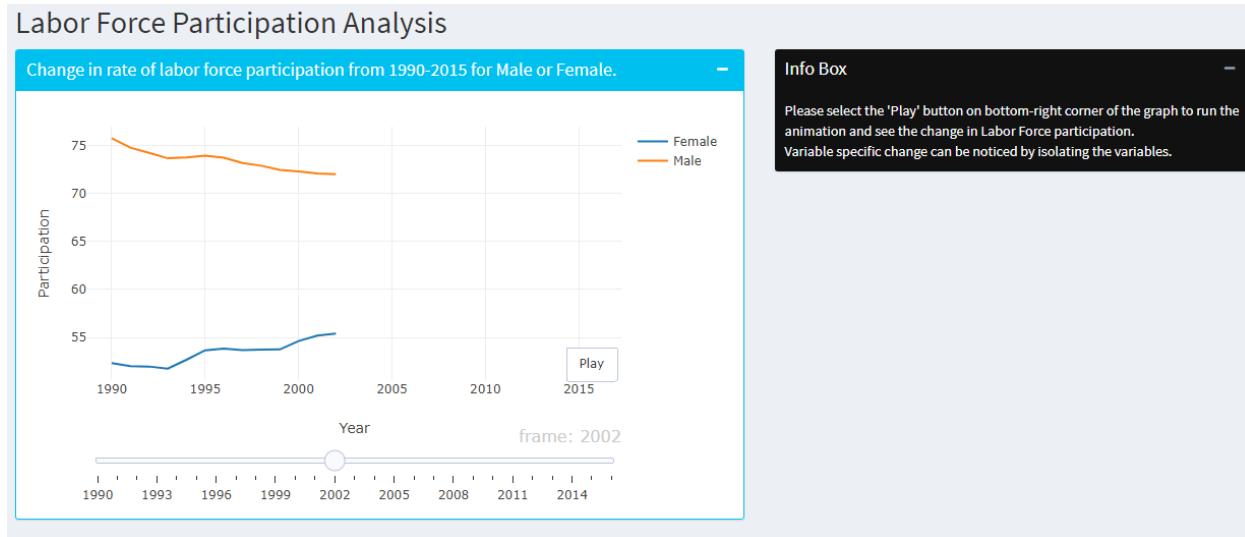
- Top right corner of the graph provides various options for the user to have an interactive experience. The camera icon allows the user to download an image of the graph, the zoom icon allows change in the range of axes or zooming in or out of the image, the navigation icon is to change the position of the graph, the circular arrows allow the user to rotate , the home icon allows the user to reset the graph to its default view and the hover allows the user to show or hide values while hovering over the graph.

- The user can isolate one or many variables by clicking on the legend of the graph.

Tab 2 : Labor Force Participation

The Menu Item on the side panel informs the user to navigate to the 2nd Tab named as “Labor Force Participation”.

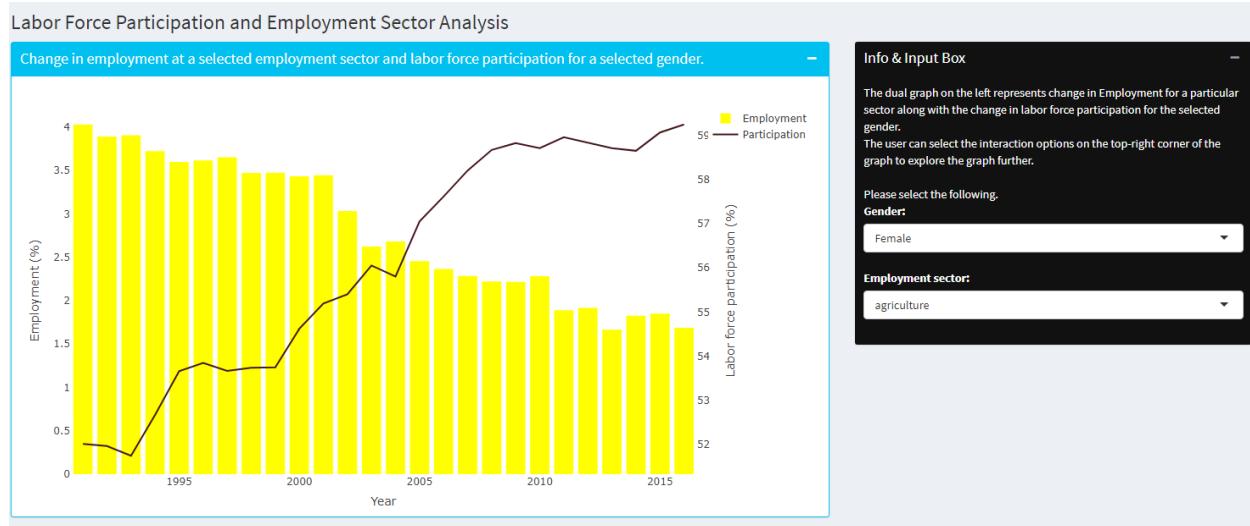
The 1st chart on this tab is named “Change in rate of labor force participation from 1990-2015 for Male or Female.”. This is an animated graph which allows the user to see the change continuously by clicking the “Play” button on the bottom-right corner of the graph. The slider at the bottom of the graph allows the user to set the range of the x-axis.



The black info box on the right informs the user what needs to be done for an interactive experience. Following are the interactions provided by the chart and how it can be used by the user are :

- Top right corner of the graph provides various options for the user to have an interactive experience. The camera icon allows the user to download an image of the graph, the zoom icon allows change in the range of axes or zooming in or out of the image, the navigation icon is to change the position of the graph, the circular arrows allow the user to rotate , the home icon allows the user to reset the graph to its default view and the hover allows the user to show or hide values while hovering over the graph.
- The user can isolate one or many variables by clicking on the legend of the graph.

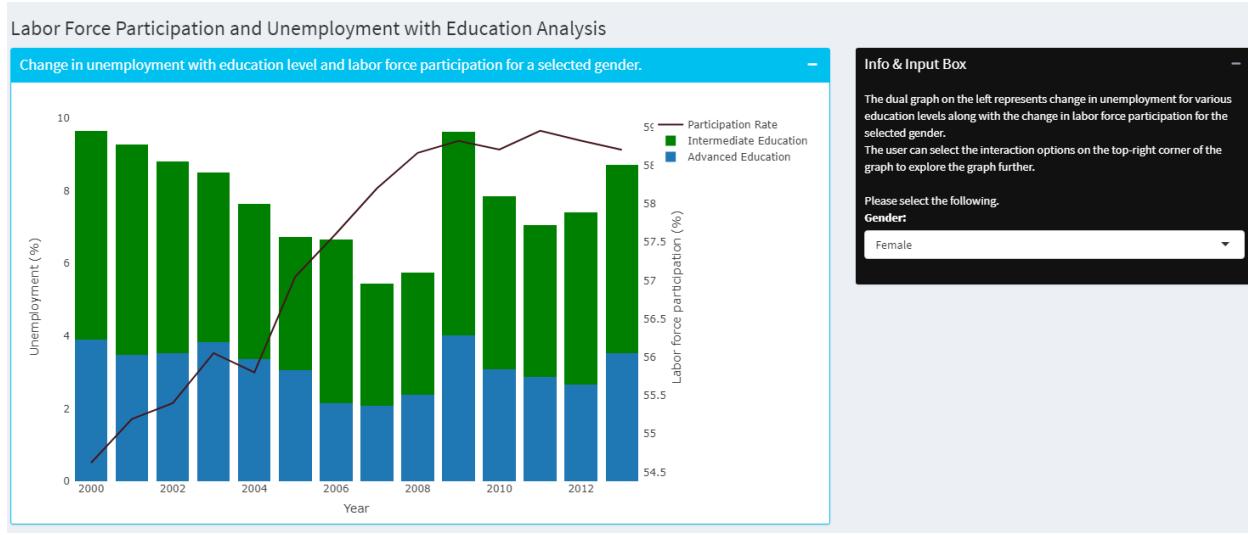
The 2nd chart that the user encounters is a Dual graph named “Change in employment at a selected employment sector and labor force participation for a selected gender.”. This graph has 3 axes which are Employment Sector, Percentage Employment, Year and Labor force participation on the right on the y axis.. The black “Info & Input Box” on the right of the graph gives the user some details of the chart in view and it’s interaction capabilities. The black box provides the option of selecting the specific “Gender” and “Employment Sector”.



Following are the interactions provided by the chart and how it can be used by the user are :

- Top right corner of the graph provides various options for the user to have an interactive experience. The camera icon allows the user to download an image of the graph, the zoom icon allows change in the range of axes or zooming in or out of the image, the navigation icon is to change the position of the graph, the circular arrows allow the user to rotate , the home icon allows the user to reset the graph to its default view, the hover option allows the user to show or hide values while hovering over the graph and the box/lasso selection allows the user to select the graph content as a box for some specific data points.
- The user can isolate one or many variables by clicking on the legend of the graph.

The 3rd graph on the 2nd Tab is named “Change in unemployment with education level and labor force participation for a selected gender”. This graph has 3 axes which are Unemployment with Education, Year and Labor force participation on the right on the y axis.. The black “Info & Input Box” on the right of the graph gives the user some details of the chart in view and it’s interaction capabilities. The black box provides the option of selecting the specific “Gender”.



Following are the interactions provided by the chart and how it can be used by the user are :

- Top right corner of the graph provides various options for the user to have an interactive experience. The camera icon allows the user to download an image of the graph, the zoom icon allows change in the range of axes or zooming in or out of the image, the navigation icon is to change the position of the graph, the circular arrows allow the user to rotate , the home icon allows the user to reset the graph to its default view, the hover option allows the user to show or hide values while hovering over the graph and the box/lasso selection allows the user to select the graph content as a box for some specific data points.
- The user can isolate one or many variables by clicking on the legend of the graph.

CONCLUSION

Exploring the Job and Gender Statistics of Australia from The World Bank gave me an insight on the working dynamics of women and men of Australia. Men and women individually are a strong workforce of this country. The visualisations answered my questions briefly and precisely.

To my surprise, men with an intermediate education background were more unemployed than women but it was not totally true in advanced education.

Furthermore, men and women of intermediate education background always experience more unemployment compared to highly educated individuals.

When it comes to employment of women and men, it is found that women like to be employed in service more than men and this is true since 1990. And, men on the other hand are more towards industry and service. Agriculture is going to have lesser job openings in the future as we can see a consistent drop in employment.

Finally, the participation of men and women in labor was something interesting to study. Women participation in the labor force is increasing at a good rate compared to men which is falling consistently. Men participation was highest of all times in 1990 while women's highest was in 2016. It is interesting to see that the Labor force participation somehow follows the same trend as Employment in the Agriculture Sector for Men while the same is true for Women in Services Sector . Labor force participation with Unemployment with various levels of education doesn't actually follow a concrete relation for both men and women. As a result we can say women are taking up jobs in Australia and are more independent financially than they ever were.

The formation of this application was a continuous process. The most time consuming aspect of this application was styling and representation of the application interface. I 1st started with plotting all the charts on a single Tab without planning the full design. Implementing dashboards was something which came later with a motive to make the application much more sophisticated. Strategically placing all the charts in order was a slow task as the application had to be a visual storyteller. The 2nd most time consuming process was coming up with a five design sheet. It required a huge amount of time to think and align my thoughts to come up with something relevant and visually appealing at the same time.

BIBLIOGRAPHY

[1]Job Statistics: Tabular data downloaded as CSV file: 167 rows x 31 columns.
Numeric and Text data (<https://databank.worldbank.org/source/jobs>, Country selected: Australia, Series selected: All available (166), Time selected: 1996 - 2016)

[2]Gender Statistics: Tabular data downloaded as CSV file: 571 rows x 64 columns.
Numeric and Text data (<https://databank.worldbank.org/source/gender-statistics>, Country selected: Australia, Series selected: All available (570), Time Selected: 1960 - 2019)

[3]<https://rstudio.github.io/shinydashboard/>

[4]<https://plotly.com/r/>

APPENDIX

MEN WOMEN EMPLOYMENT TRENDS

SHEET 1

Brainstorming Ideas

- 3D graphs to show change in unemployment.
- Bar chart to show various employment for each gender.
- Bubble chart to show change in labor force participation.
- Line plot with some predictions for coming years.
- Comparison of labor force participation with unemployment and employment with education and sectors respectively.

COUNTRIES

JOB IN VARIOUS SECTORS

UNEMPLOYMENT WITH EDUCATION

LABOR FORCE PARTICIPATION

CATEGORY

COUNTRY → **SECTOR**

GENDER

EDUCATION LEVEL

RESEARCH QUESTIONS

1. How has the labor force participation changed in the past 30 years or so?
2. What is the unemployment percentage of men and women with various levels of education from the last 27 yrs.
3. Where do men and women prefer to be employed? What sector is preferred most preferred?

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SHEET-2

TITLE: Interactive UI
of men and women
employment trends

Author: VAIBHAVI
BHARDWAJ

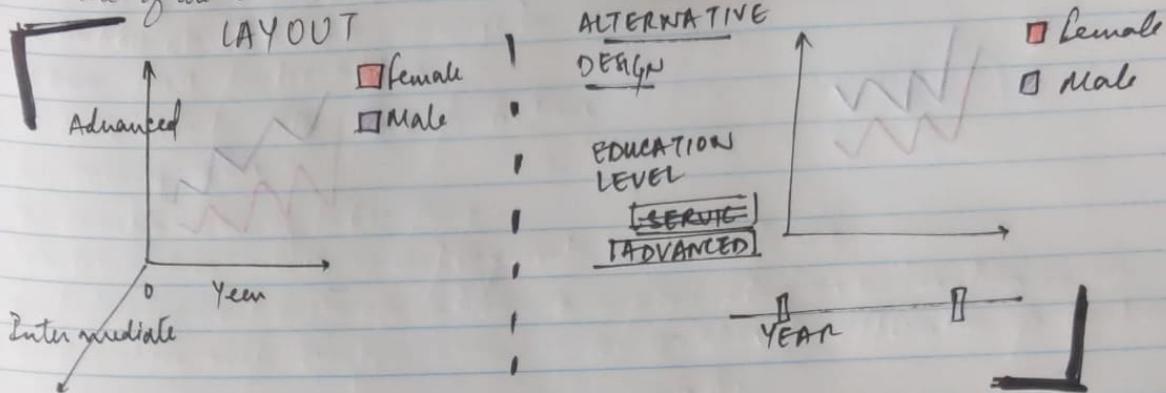
DATE: 07-06-2020

SHEET: 2 OF 10

TASK: To ANSWER RESEARCH
QUESTIONS ON SHEET 1

Operations:

- User can have an on screen graph interactive by zooming, selecting and isolating one of the variables.



Operations:

- User can rotate the graphs in 3D figure.
- User can select the education level in the 3D line plot.

Focus:

The change in percentage unemployment in male and female.

Evaluation:

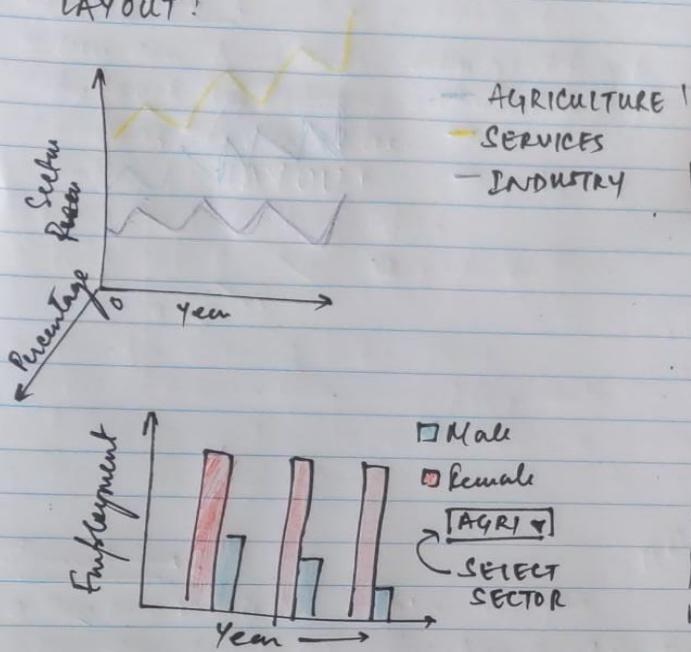
PROS: Provides many interactions on the 3D plot. The user can rotate, zoom on the graph.

The user can also isolate and focus on one variable.

CONS: Requires user to play with the graph for better information gain.

SHEET-3

LAYOUT!



TITLE: Interactive Visualisation
of men and women
employment trend.

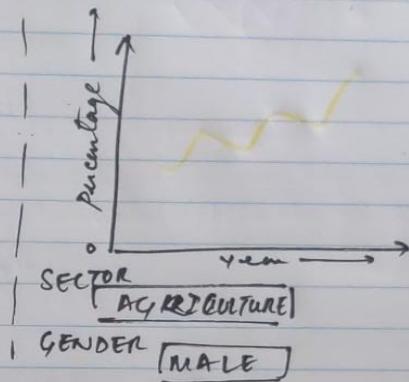
AUTHOR: VAIBHAVI BHARDWAJ

DATE: 07-06-2020

sheet: 3 of 8

task: Where do men and
women prefer to be employed

ALTERNATIVE DESIGN



Operations:-

- User can select a gender and isolate a particular sector on the 3D graph
- The bar graph allows the user to select from the dropdown menu.

Focus:

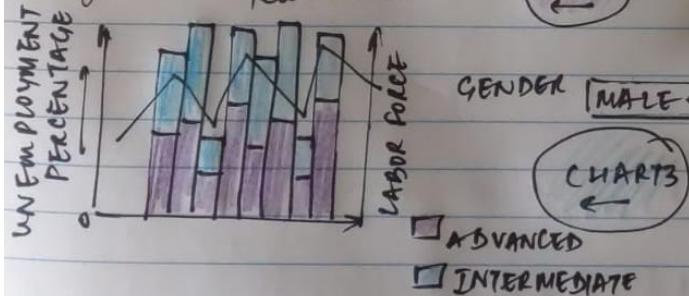
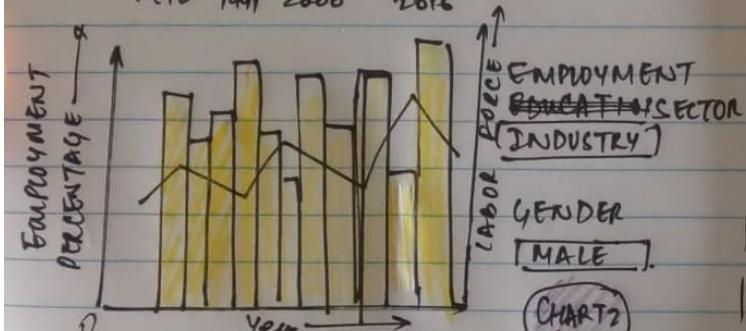
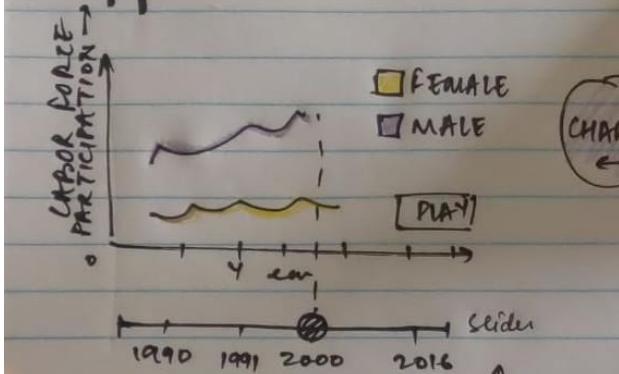
- The most important thing to focus is to compare men and women employment change from the bar graph. In service sector women work more compared to men.

EVALUATION:

PROS: Easy and ~~comp~~ interactive

CONS: Requires user to play around with the graph for better information gain.

15 SHEET - 4



Title : Interaction w/c
for men and women
employment trends.

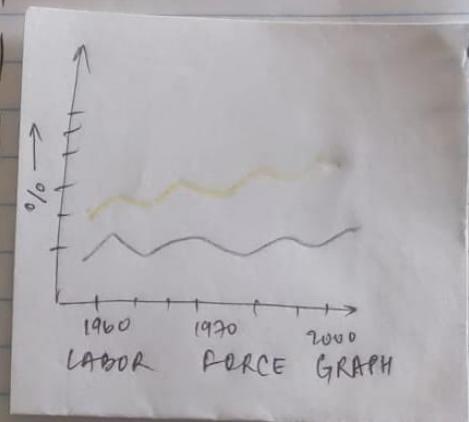
Author : VAIBHAVI
BHARDWAJ

Date : 07-06-2020

Sheet : 4- OF FDS

Task : To give a detailed
study on labor force participation.

ALTERNATIVE DESIGN



GENDER MALE

Focus :

- Things to focus on is the effect on labor force participation by education and sector.

Iterations :

- User can select play and slide the year panel for the animation.
- In chart 2 the user can select the industry and gender from select input.
- In chart 3 the user can select the gender.
- On graph interaction can help in isolating the variables.

EVALUATION:

PROS: Provides a detailed study on labor force participation. Isolation by plotly.

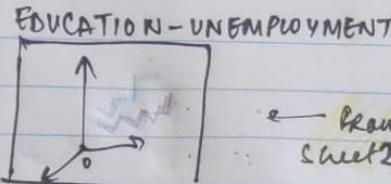
CONS: No cons.

SHEET-5

FINAL DESIGN :-

Introduction

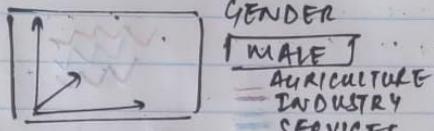
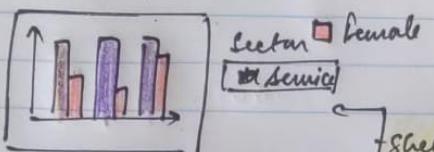
Tab1



Tab1

Tab 2

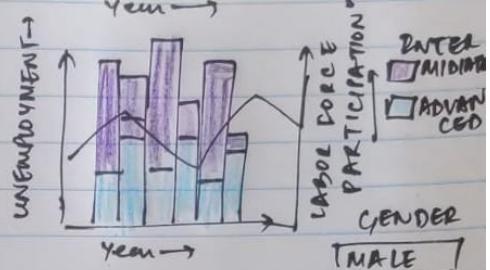
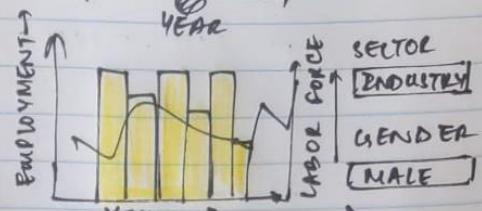
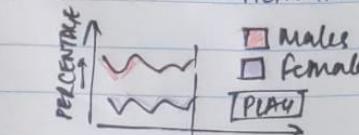
EMPLOYMENT SECTOR



GENDER
[MALE]
AGRICULTURE
INDUSTRY
SERVICES

Tab 2

LABOR FORCE PARTICIPATION



Title : Interactive vis
of men and women
employment trends .

Author : Vaibhavi
Bhardwaj

Date : 07 - 06 - 2020

Sheet : 5 - OF FDS

Task : To finalise the
visualisation application.

Details :-

- Software = R Studio (Shiny)
- Packages used = Plotly, Shiny Dashboard .
- Time needed = 7 days, 7-10 hours per day .

Layouts :-

- Dual Graphs
- 3D Graphs
- Animated Graphs
- Bar Graphs .

Focus :-

- Male and female working and employment in Australia .
- How do men and women contribute to labor force participation .

EVALUATION :-

PROS : Gives many interesting ways to interact with the user .

CONS : Need time to code . Lots of graphs .