FIT 5147 DATA EXPLORATION AND VISUALIZATION PROJECT REPORT

Job Vacancies in Australia

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1. Introduction

This report is about the data exploration and visualisation of job vacancies in Australia in order to find out tendency of different occupations at different states. The tools used have tableau public and d3.js. Meanwhile, five design-sheet methodology is adopted for the design of final visualisation of job vacancies data.

1.1 Problem Description

The project will research job vacancies over years in Australia on different states for various occupations. The relevant job vacancies data, i.e. Internet Vacancy Index (IVI) data, comes from Australian Government website. It's a count of online job advertisements lodged to three main job boards, SEEK, CareerOne and Australian JobSearch, on a monthly base, which contains a time series of vacancies at kinds of level, including at a national level, at a skilled level, and at an occupational level.

The Australian and New Zealand Standard Classification of Occupations (ANZSCO) and Five Skill Level Classification are used to categorise those data. Overall, the data consists of about 350 occupations for all states.

Through appropriate data wrangling, exploration and visualisation, the following questions should be solved:

- What's the most needed occupation in Australia?
- What's the most or least needed occupation in every major occupation category?
- Which state has the highest demand for different occupations?
- Which skill level is most needed in every state?
- What kind of talents are most needed in different states?
- Which time period has more vacancies?
- What's the trend of the vacancies' changes over time?

1.2 Motivation

Most people need jobs to make a living or enrich their lives. Job has filled a large part of people's lives. We spend most of our time at work, our position at work shows where we are at that moment and where we are heading. It's not just be an approach of earning, but a means to make a difference - for ourselves and the organization. We can constantly discover ourselves, our potential & our limit of taking up more responsibilities in work. Thus, a choice of jobs and job hunt are practical concerns of many people. Besides, the job vacancy of a country can reveal its social-economic development status and social class structure.

As a graduating student, I would like to research on job vacancies in Australia to explore their changes in various aspects and present the result to others who are interested in this area.

2. Data Wrangling

The main data of job vacancies from Department of Employment on Australian Government website has three different Excel files as shown below:

- "IVI DATA_January 2006 onwards" – includes all job vacancies of ANZSCO major group (1-digit codes) and sub-major group (2-digit codes) on different states from January 2006 to February 2017.

- “IVI DATA_detailed occupation – March 2006 onwards” – includes all job vacancies of ANZSCO unit group (4-digit codes) on different states from March 2006 to February 2017.
- “IVI DATA_SkillLevel – January 2006 onward” – includes all job vacancies at different skill levels on different states from January 2006 to February 2017.

For better visualisation in the following sections, there are two more files needed:

- “1220.0 ANZSCO Version 1.2 Structure v3” – includes the description of ANZSCO code based on different groups and corresponding titles.
- “au_state.geojson” – includes geographical data of Australian map.

All the primary data files are shown in Figure 1 with the same sequence.

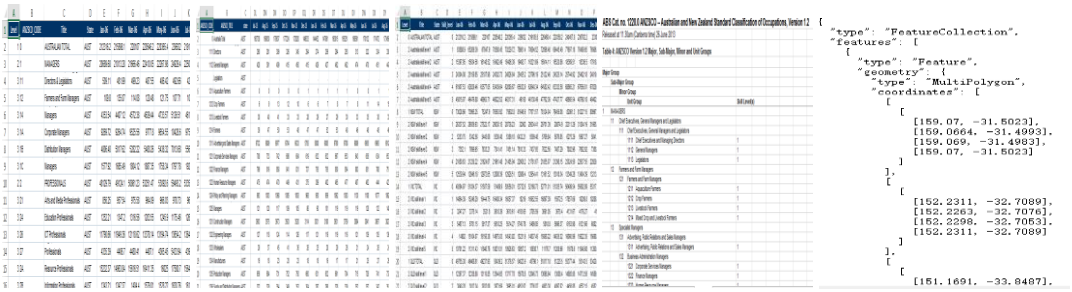


Figure 1. Screenshots of primary data files

In the beginning, some of the data in Excel is not convenient for exploration and visualisation. Thus data wrangling is necessary for refining and using the data. The process has been done in two steps: reformatting data and check for entry errors, which are elaborated below.

2.1 Data Transformation

As the intent of data exploration and data visualisation, there are two different data transformation process respectively.

2.1.1 Transformation For Data Exploration

For data exploration in Tableau Public, the reformatting process is required for those data files. First, open two files, “IVI DATA_January 2006 onwards” and “2-IVI_DATA_SkillLevel - January 2006 onwards”, in Tableau Public and drag their “Seasonally Adjusted” sheet respectively to the data area. Then pivot columns which contain the number of job vacancies to rows. And set the name of “Pivot Field Names” to “Date”. Meanwhile, change this column type to Date and set the name of “Pivot Field Values” to “No. Of Vacancies”.

Moreover, save the description of five skill levels in “Notes” sheet of “2-IVI_DATA_SkillLevel - January 2006 onwards” file as a new file: “SkillLevel_DESC.csv”. Then put it in Tableau Public and join this sheet with previous skill-level table.

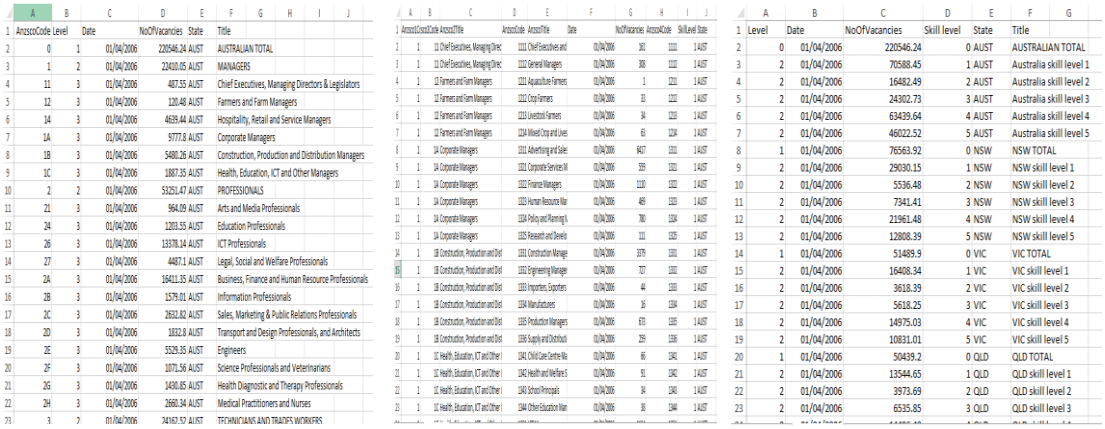
Besides, the same approach is taken to deal with the “4 digit 3 month average” sheet in “IVI DATA_detailed occupation – March 2006 onwards” file. At the same time, reorganise the “Table 4” in “1220.0 ANZSCO Version 1.2 Structure v3” file manually to ensure the dependency relationships between major group (1-digit codes), sub-major group (2-digit codes) and unit group (4-digit codes). The file builds a correct hierarchy of ANZSCO code, including five columns: Anzsco1CODE, Anzsco2CODE, Anzsco2Title, Anzsco4CODE and SKILL_LEVEL. Afterwards, save it as a new csv file – “ANZSCO_DESC.csv”. Then make a union

to combine it and the new detailed occupation sheet using inner joins. The join columns are “AnzscoCode” and “Anzsco4CODE” respectively. Make sure the two columns use the same data type.

For all above, the “No. Of Vacancies” column should use the data type “Number”.

2.1.2 Transformation For Data Visualisation

Data visualisation of job vacancies is implemented using d3.js, which would be described later in this report. To achieve that, one more step need to do after above reformatting process is to export data as individual csv files: “ANZSCO2.csv”, “ANZSCO4.csv” and “SkillLevel.csv”. Finally, open those csv files to delete space and “.” within column names and delete the column “Number of Records” inside them. Currently, the main data after data transformation looks like in Figure 2 below in the same order.



AnzscoCode	Level	Date	NoOfVacancies	State	Title
0	1	01/04/2006	220546.24	AUST	AUSTRALIAN TOTAL
1	2	01/04/2006	22410.05	AUST	MANAGERS
11	3	01/04/2006	487.55	AUST	Chief Executives, Managing Directors & Legislators
12	3	01/04/2006	120.48	AUST	Farmers and Farm Managers
14	3	01/04/2006	4639.44	AUST	Hospitality, Retail and Service Managers
1A	3	01/04/2006	9777.8	AUST	Corporate Managers
1B	3	01/04/2006	5480.26	AUST	Construction, Production and Distribution Managers
1C	3	01/04/2006	1867.35	AUST	Health, Education, ICT and Other Managers
2	2	01/04/2006	51251.47	AUST	PROFESSIONALS
21	3	01/04/2006	964.09	AUST	Arts and Media Professionals
24	3	01/04/2006	1203.35	AUST	Education Professionals
26	3	01/04/2006	13378.14	AUST	ICT Professionals
27	3	01/04/2006	4487.1	AUST	Legal, Social and Welfare Professionals
2A	3	01/04/2006	16411.35	AUST	Business, Finance and Human Resource Professionals
2B	3	01/04/2006	1579.01	AUST	Information Professionals
2C	3	01/04/2006	2632.82	AUST	Sales, Marketing & Public Relations Professionals
2D	3	01/04/2006	1832.8	AUST	Transport and Design Professionals, and Architects
2E	3	01/04/2006	5529.35	AUST	Engineers
2F	3	01/04/2006	1071.56	AUST	Science Professionals and Veterinarians
2G	3	01/04/2006	1430.85	AUST	Health Diagnostic and Therapy Professionals
2H	3	01/04/2006	2660.34	AUST	Medical Practitioners and Nurses
3	2	01/04/2006	74167.57	AUST	TECHNICIANS AND TRADES WORKERS

Anzsco1Code	Anzsco1Title	AnzscoCode	Anzsco2Title	Date	NoOfVacancies	AnzscoCode	SkillLevel	State
1	1 Chief Executives, Managing Direc	1111	Chief Executives and	01/04/2006	161	1111	1	AUST
1	1 Chief Executives, Managing Direc	1112	General Managers	01/04/2006	369	1112	1	AUST
1	12 Farmers and Farm Managers	1211	Aquaculture Farmers	01/04/2006	1	1211	1	AUST
1	12 Farmers and Farm Managers	1212	Crop Farmers	01/04/2006	33	1212	1	AUST
1	12 Farmers and Farm Managers	1213	Livestock Farmers	01/04/2006	34	1213	1	AUST
1	12 Farmers and Farm Managers	1214	Mixed Crop and Live	01/04/2006	63	1214	1	AUST
1	1A Corporate Managers	1311	Advertising and Sale	01/04/2006	6437	1311	1	AUST
1	1A Corporate Managers	1321	Corporate Services M	01/04/2006	559	1321	1	AUST
1	1A Corporate Managers	1322	Finance Managers	01/04/2006	1130	1322	1	AUST
1	1A Corporate Managers	1323	Human Resource Mar	01/04/2006	489	1323	1	AUST
1	1A Corporate Managers	1324	Policy and Planning M	01/04/2006	780	1324	1	AUST
1	1A Corporate Managers	1325	Research and Develo	01/04/2006	111	1325	1	AUST
1	1B Construction, Production and Dist	1331	Construction Manage	01/04/2006	1079	1331	1	AUST
1	1B Construction, Production and Dist	1332	Engineering Manager	01/04/2006	727	1332	1	AUST
1	1B Construction, Production and Dist	1333	Importers, Exporters	01/04/2006	44	1333	1	AUST
1	1B Construction, Production and Dist	1334	Manufacturers	01/04/2006	16	1334	1	AUST
1	1B Construction, Production and Dist	1335	Production Managers	01/04/2006	673	1335	1	AUST
1	1B Construction, Production and Dist	1336	Supply and Distributi	01/04/2006	259	1336	1	AUST
1	1C Health, Education, ICT and Other	1341	Child Care Centre Ma	01/04/2006	65	1341	1	AUST
1	1C Health, Education, ICT and Other	1342	Health and Welfare S	01/04/2006	91	1342	1	AUST
1	1C Health, Education, ICT and Other	1343	School Principals	01/04/2006	34	1343	1	AUST
1	1C Health, Education, ICT and Other	1344	Other Education Man	01/04/2006	38	1344	1	AUST

Level	Date	NoOfVacancies	Skill level	State	Title
0	01/04/2006	220546.24	0	AUST	AUSTRALIAN TOTAL
2	01/04/2006	70588.45	1	AUST	Australia skill level 1
2	01/04/2006	16482.49	2	AUST	Australia skill level 2
2	01/04/2006	24302.73	3	AUST	Australia skill level 3
2	01/04/2006	63439.64	4	AUST	Australia skill level 4
2	01/04/2006	46022.52	5	AUST	Australia skill level 5
1	01/04/2006	76563.92	0	NSW	NSW TOTAL
2	01/04/2006	29030.15	1	NSW	NSW skill level 1
2	01/04/2006	5536.48	2	NSW	NSW skill level 2
2	01/04/2006	7341.41	3	NSW	NSW skill level 3
2	01/04/2006	21961.48	4	NSW	NSW skill level 4
2	01/04/2006	12808.39	5	NSW	NSW skill level 5
1	01/04/2006	51489.9	0	VIC	VIC TOTAL
2	01/04/2006	16408.34	1	VIC	VIC skill level 1
2	01/04/2006	3618.39	2	VIC	VIC skill level 2
2	01/04/2006	5618.25	3	VIC	VIC skill level 3
2	01/04/2006	14975.03	4	VIC	VIC skill level 4
2	01/04/2006	10831.01	5	VIC	VIC skill level 5
1	01/04/2006	50439.2	0	QLD	QLD TOTAL
2	01/04/2006	13544.65	1	QLD	QLD skill level 1
2	01/04/2006	3973.69	2	QLD	QLD skill level 2
2	01/04/2006	6535.85	3	QLD	QLD skill level 3

Figure 2. Screenshots of the main three data files

2.2 Data Checking

After reformatting data, I open those files using Microsoft Excel to check for empty data and invalid data. And compare the hierarchy of ANZSCO code to ANZSCO code used in all data files to make sure their correct correspondences.

Then import the data files in Tableau Public to read in job vacancies data and check for errors. First is to plot state on a map to check whether they are sensible. Figure 3 shows location of every state in different colour on a map. As shown, the all states locate at correct positions on the map according to their geographic locations.

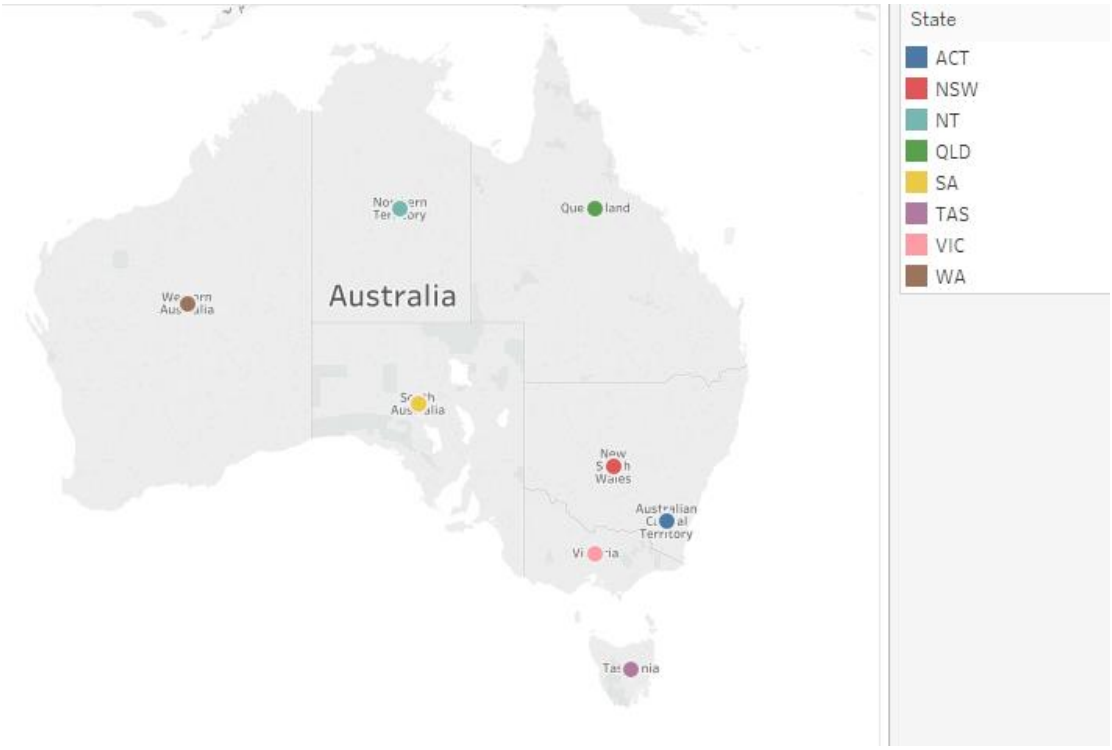


Figure 3. States on a Map

After data checking, there is no obvious error found for those data.

3. Data Exploration & Findings

Data exploration is to explore Internet vacancies data in Australia using Tableau Public so that we can find out tendency of their changes and the key information in the following aspects.

3.1 Occupations

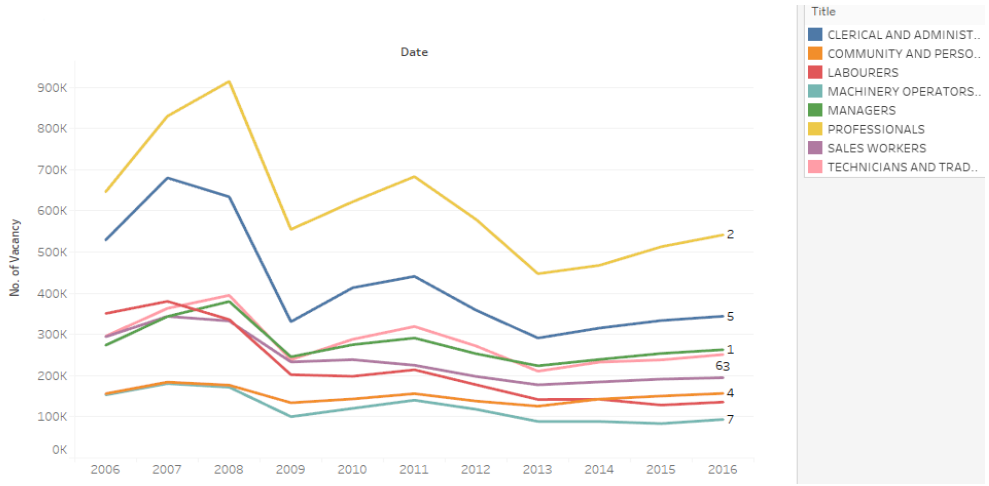


Figure 4. Online vacancies of major groups (Jan 2006 – Dec 2016)

First, at the highest ANZSCO level, i.e. ANZSCO major group, the top two most needed occupations are “2.Professionals” and “5. Clerical and administrative workers”. The least wanted occupation is “7. Machinery operators and drivers” (see Figure 4).

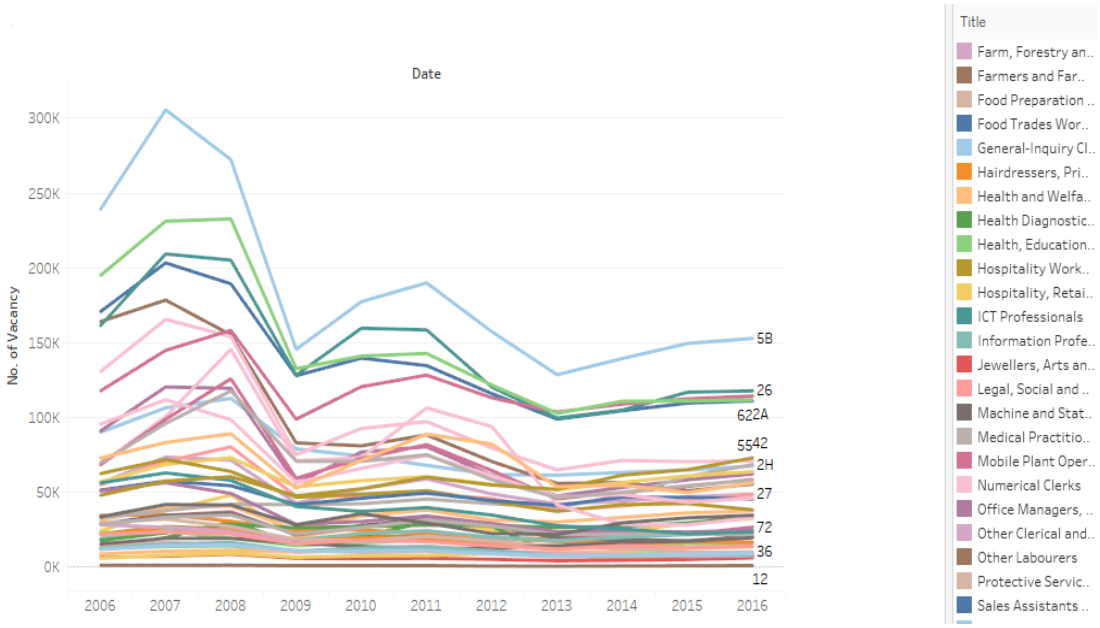


Figure 5. Online vacancies of sub groups (Jan 2006 – Dec 2016)

At second ANZSCO level, which means the sub group using ANZSCO 2-digit code, the most needed occupation is “5B. General-Inquiry Clerks, Call Centre Workers, and Receptionists” (see Figure 5).

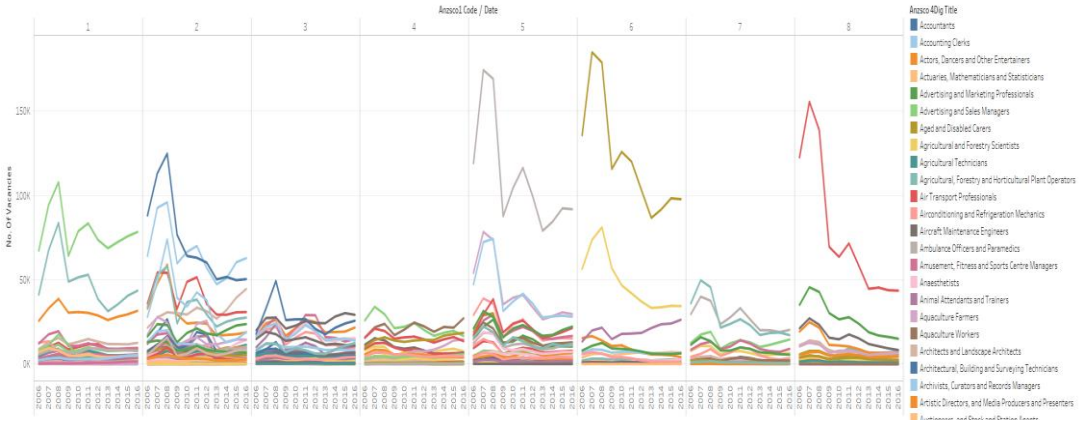


Figure 6. Online vacancies of unit groups (Mar 2006 – Dec 2016)

As shown in Figure 6, at lowest ANZSCO level about unit groups of occupation, the most needed occupations under each category are shown below:

- 1: 1311. Advertising and Sales Managers
- 2: 2211. Accountants
- 3: 3121. Architectural, Building and Surveying Technicians
- 4: 4315. Waiters
- 5: 5311. General Clerks
- 6: 6211. Sales Assistants (General)
- 7: 7331. Truck Drivers
- 8: 8999. Other Miscellaneous Labourers

Overall, “6211.Sales Assistants (General)” is in great demand in Australia from 2006 to 2016.

3.2 Regions

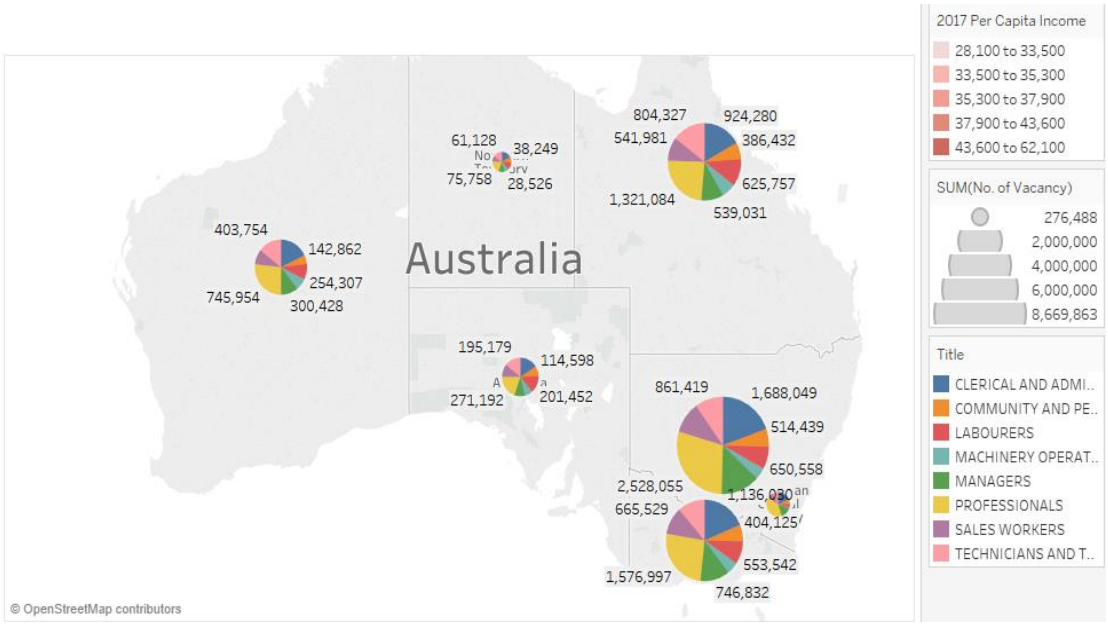


Figure 7. Online vacancies in different states (Jan 2006 – Dec 2016)

As we can see from Figure 7, more job vacancies are concentrated at the eastern Australia. Among all states, the NSW has most vacancies. And the most needed occupation in each state are professionals as well.

3.3 Skill Levels

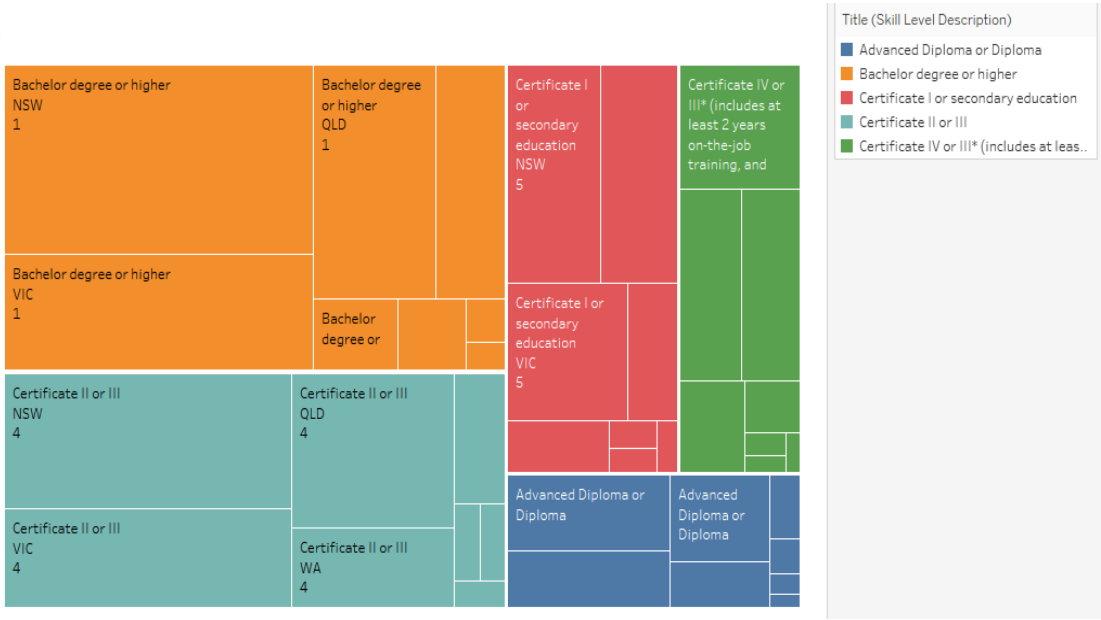


Figure 8. Online vacancies of five skill levels in different regions (Jan 2006 – Feb 2017)

Figure 8 displays the most needed skill level is skill level 1, which means bachelor degree or higher, for the whole Australia. Conversely, skill level 2, i.e. advanced diploma or diploma, is the least needed. Australia mainly needs well-educated talents who has bachelor degree or higher. The similar condition appears in every state.

3.4 Tendency

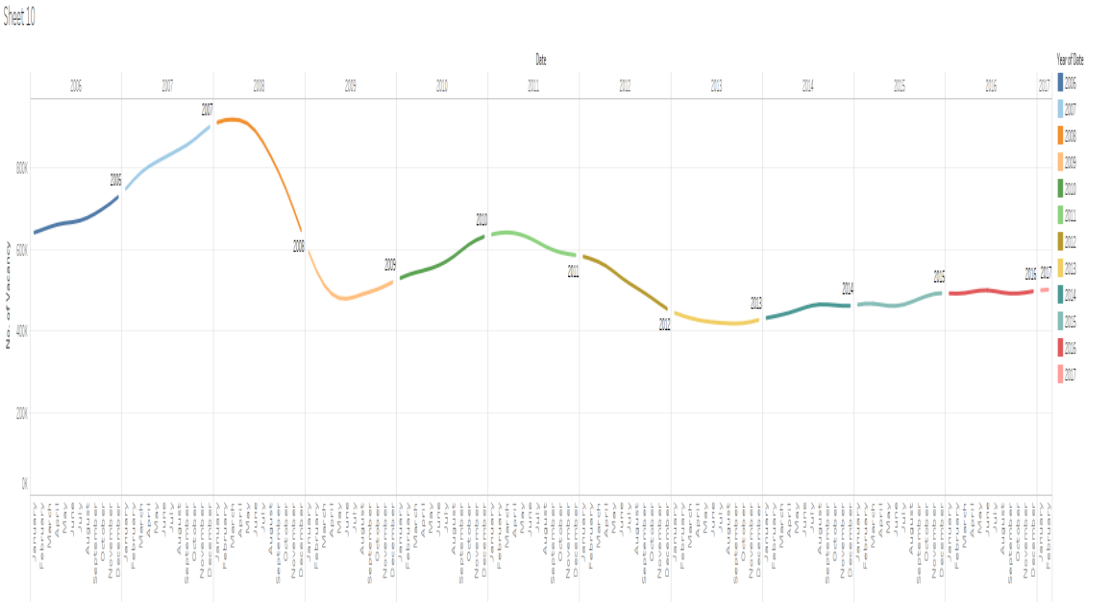


Figure 9. Online vacancies over months and years (Jan 2006 – Feb 2017)

In Figure 9, we can see that the number of job vacancies were growing from 2006 to 2007, then fell. In recent years, the trend of online vacancies is smooth and lightly increase.

4. Narrative Visualisation

A narrative visualisation is developed to present the condition of online job vacancies in Australia on several various aspects. This section would introduce the target audience of the visualisation and the message covered in it.

4.1 Target Audience

The target audience of this narrative visualisation would be people who care about job vacancies in Australia, such as graduating students. Meanwhile, it should be useful for people who are considering the future career selection.

4.2 Message That Visualisation Conveys

The visualisation should convey the condition of job vacancies through several aspects: ANZSCO code, State, No. of Vacancies, Year, Month, Skill level. Thus it could present the job vacancies of every job type at every state in every year among 2006 and 2017. And we can find required skill level for a job type in unit groups. Besides, we can see the percentage of a job type or a skill level for every state or in the whole Australia. It should display both summarised data and details so that we can answer the questions mentions in the beginning.

5. Visualisation Design Process

In order to implement an effective and efficient visualisation, the five design-sheet methodology is used to design how to present the IVI data and convey kinds of message of job vacancies.

5.1 Five Design Sheets

The methodology enables us to create the data visualization through lo-fidelity methods. We can explore different ideas on paper. The first sheet sketch ideas from brainstorming. Then three principal designs are captured in greater detail through sheet 2, 3 and 4. Finally, sheet 5 is the best one chosen from the three ideas to present the design that will be implemented.

5.1.1 Sheet 1

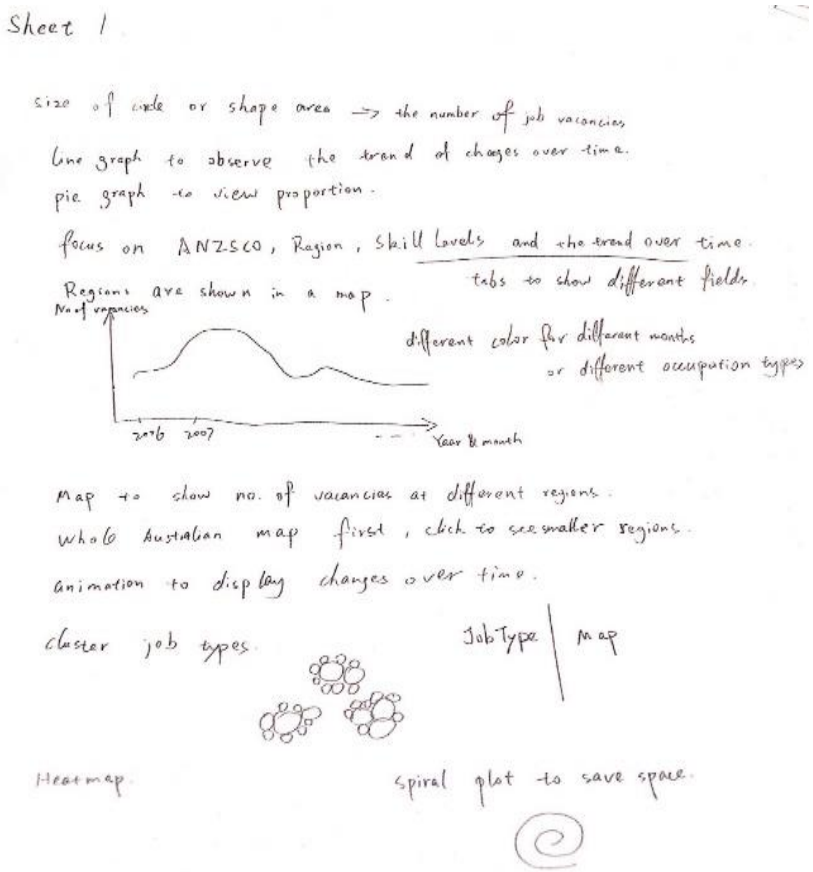


Figure 10. Sheet 1 - Brain storm

As sheet 1 shown above (see Figure 10), there are some ideas about the data visualisation. First, the job types should be displayed at a correct hierarchy. The clustered circles can be used to compare the number of vacancies for different job types. In the other hand, pie graph can be used to observe their proportion. And the different colours represent different major groups only to reduce confusion of too many colours. Additionally, line graph is good to display the tendency of kinds of job vacancies over years. The graph like spiral plot graph can save space to display more details. After that, the Australian map could be good to present job vacancies at every state, which provide a direct impression of geographic location. The interaction can be considered for year or state selections. And the skill levels should be displayed for a job type or a state.

Next, from the brain-storming exercise, three individual design sheets are produced.

5.1.2 Sheet 2/3/4

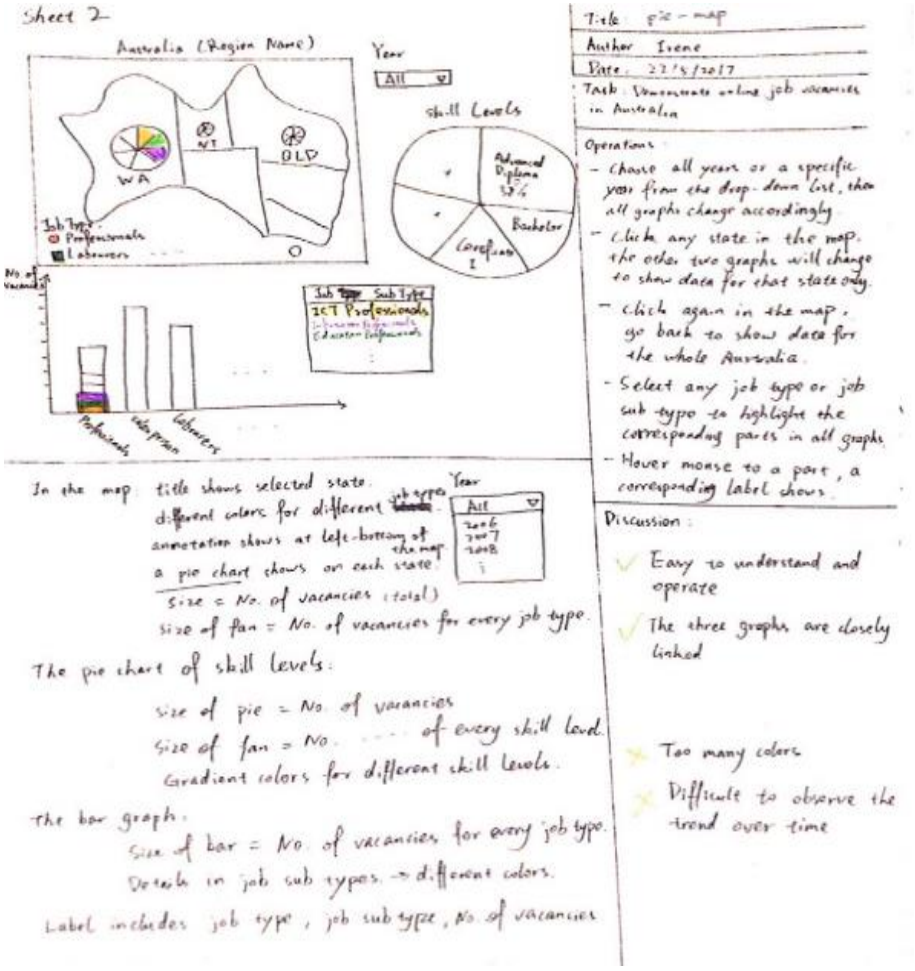


Figure 11. Sheet 2 - Pie-Map

The sheet 2 shows a design that simplify the data visualisation (see Figure 11). It uses an Australian map, a pie chart and a bar chart to present job vacancies. The three graphs appear at the same time. First, the map shows a pie chart at every state storing the job vacancies of various ANZSCO major groups. The skill-level pie chart is constructed for presenting the proportion of different skill levels. Then the bar graph is to display job vacancies of kinds of job types, including major groups and sub-major groups. The sub-major groups of ANZSCO are details inside every bar of major groups.

Moreover, a dropdown list is provided to change the year in which all graphs show job vacancies. Meanwhile, click a state in the map to zoom in it and other two graphs will be changed for the selected state as well. A corresponding label that contains relevant information required with mouse over a state, a fan or a rectangle in those graphs. Besides, choose a job type from the explanation labels to highlight its part in the graph.

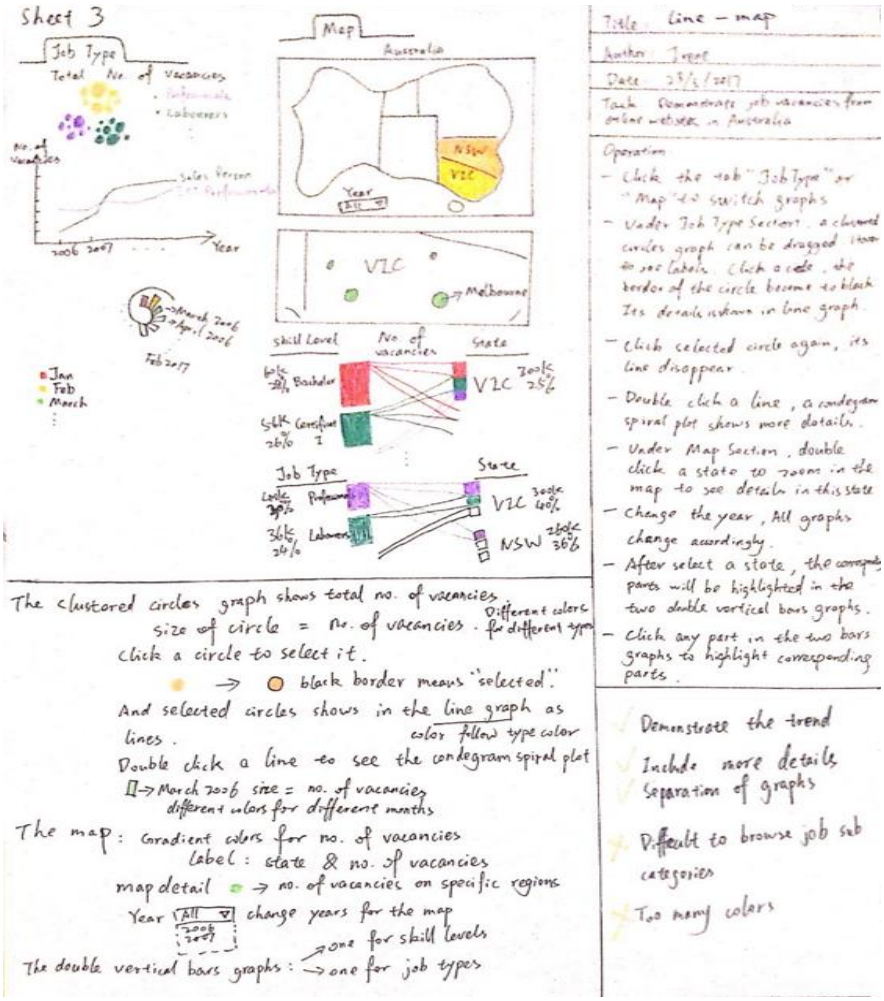


Figure 12. Sheet 3 - Line-Map

In the second design (See Figure 12), it separates all graphs into two sections: Job Type and Map. With “Job Type” tab, a bubble graph emerges first to show job vacancies of all job types. If click a circle, the number of vacancies of this job type changes over time are shown as a line in the line graph. And the selected circle has a black border. The black border and the corresponding line will disappear after click it again. Different colours are used for all sorts of major groups. Then a condegram spiral plot chart appears or changes with double click a line to present all details on every month of every year for only one selected job type at a time. Inside this graph, I use various colours for different months.

Under “Map” section, a map is used with two double vertical bP graphs. The year can be changed using a drop down list for all graphs. The map uses gradient colours to display the number of job vacancies on every state. Click a state to zoom in the map and highlight its corresponding parts in other graphs. The two double vertical-bar graphs: one is for job vacancies of skill levels at states, the other is for job vacancies of major groups at states. Hover a part to see its label in details.

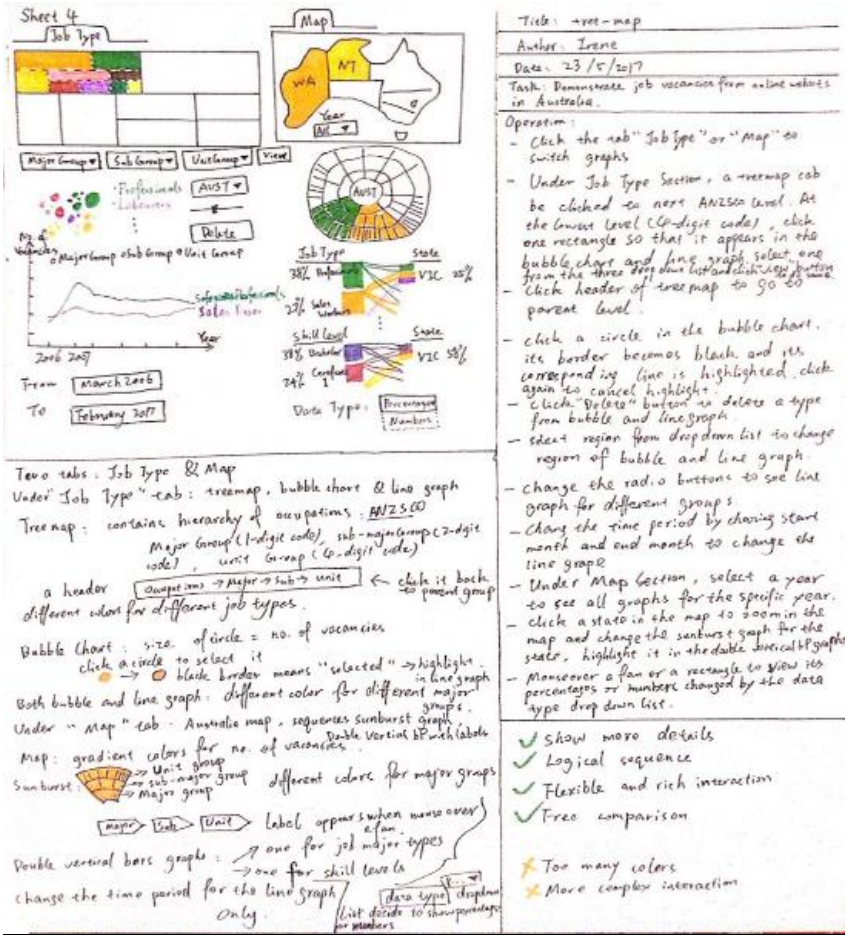


Figure 13. Sheet 4 - Tree-Map

Figure 13 shows another design which is a bit similar with previous one. It uses two tabs as well. In the "Job Type" section, a tree map is displayed with three dropdown lists in the beginning. Click a part of the tree map can go to lower ANZSCO level, and click the header of the tree map to back to higher ANZSCO level. When the tree map shows the lowest ANZSCO level, i.e. unit groups, click one occupation to see it in the bubble chart and the line chart. Another way is select a job type at unit group and then click "View" button to do the same thing. Click a circle in the bubble chart to highlight its line in the line graph, and click it again to cancel the highlight. Meanwhile region of the bubble and line graph can be changes using a dropdown list for the states. A "Delete" button is to delete a job type from the two graphs. Then for the line graph, we can change ANZSCO level of lines through radio buttons and time period by two date picker.

For "Map" tab, there are four graphs appear at a same time: an Australian map, a sunburst graph and two double vertical-bar graphs. The year can be changed for all graphs. Click a state to zoom in the map, and then the sequences sunburst is changed to show for the selected state, with highlights of the state in the two double vertical bP graphs. The two double vertical-bar graphs: one is for job vacancies of skill levels at states, the other is for job vacancies of major groups at states. Hover a part to see its label in details. The data type selection can set the display value of graphs to percentages or numbers except the map.

5.1.3 Sheet 5

According to description of each design in the previous section, we can see that sheet 2 is quite simple which means it's easy to understand and operate. But the information it conveys is limit. It's difficult to observe the trend of job vacancies over time. The sheet 3 is more comprehensive compared to sheet 2. It provides a logic separation of graphs and demonstrates more details. However, the bubble chart may looks a bit messy with too many job types and lack of ANZSCO hierarchy so that it's difficult to find a specific one that we want to see. In contrast to that, sheet 4 shows full details with flexible and rich interactions. In the other hand, it is more graphs and complex interactions mean that make people confused to use in some extent.

Hence, through comparison of the three different ideas, I choose sheet 4 as the final design – sheet 5 (see Figure 14 below). Although it's more complex, more comprehensive information can be given in great details.

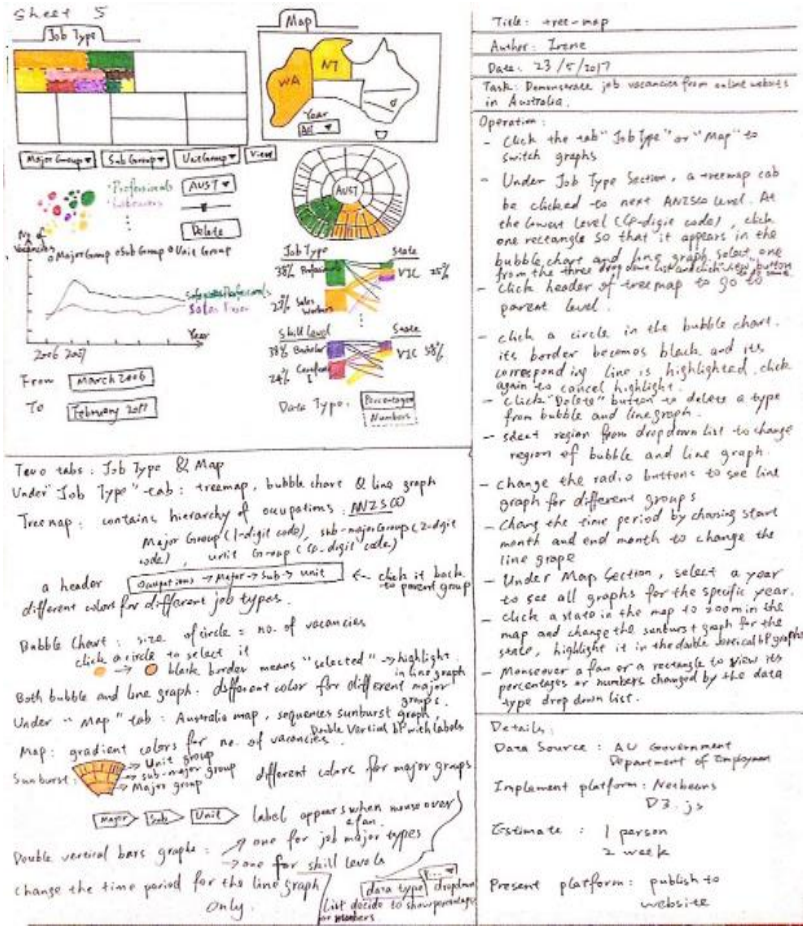


Figure 14. Sheet 5 - Tree-Map

6. Implementation Process

For the intent of implementing the final design of data visualisation, I make use of NetBeans IDE, w3.css, JQuery, d3.js and viz.js. NetBeans is a good tool to build webpages. Then the css file, w3.css, arrange the layout of the webpages and set appearances of elements inside. And JQuery is for the implementation of JavaScript functions. Meanwhile, d3.js is used to visualize data with HTML, SVG, and CSS in the browser. Most graphs is implemented with d3.js. A dynamic, browser based visualization library. In addition, viz.js, a JavaScript library

similar to the original GraphViz, is designed to render graphs specified via the DOT language. Both of d3.js and viz.js handle large amounts of data and enable kinds of interactions with the data to provide powerful and sophisticated visualisations. The viz.js is mainly to manipulate the double vertical-bar graph. And all other graphs are developed through d3.js.

Beside those graphs, the narrative visualisation is created with magazine style to convey more message. The final website would be one-page design that contains four sections: home, introduction, job vacancies (graphs) and references as shown below.

1) Home

Figure 15. Home Section in the Webpage

2) Introduction

Figure 16. Introduction in the Webpage

3) Job Vacancies

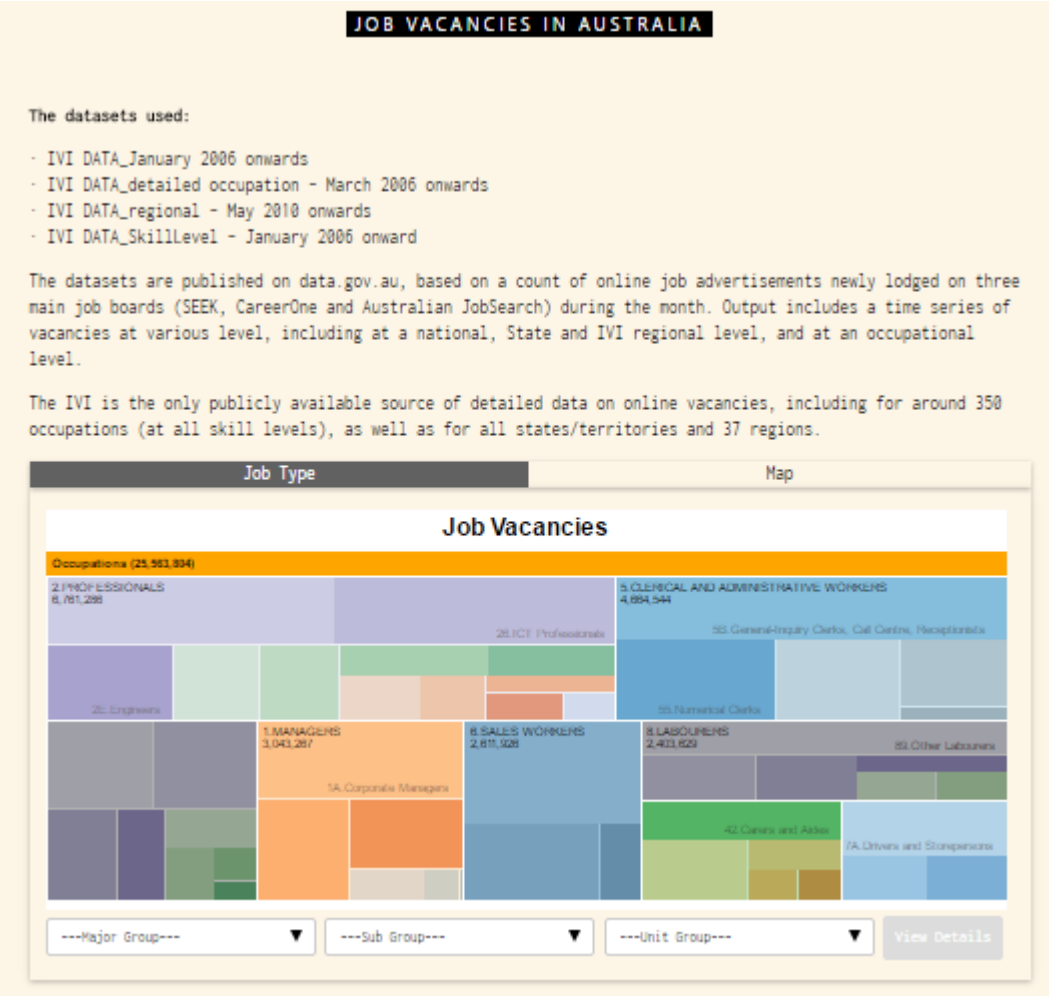


Figure 17. Job Vacancies in the Webpage

4) References

Figure 18. References in the Webpage

7. Instructions For The Narrative Visualisation

To view and explore the narrative visualisation, we'll start from the title and introduction. Then we can interact with graphs within "Job Type" tab or "Map" tab that would be elaborated in the following sections. Then references are provided in the bottom of the webpage.

7.1 Job Type Instructions

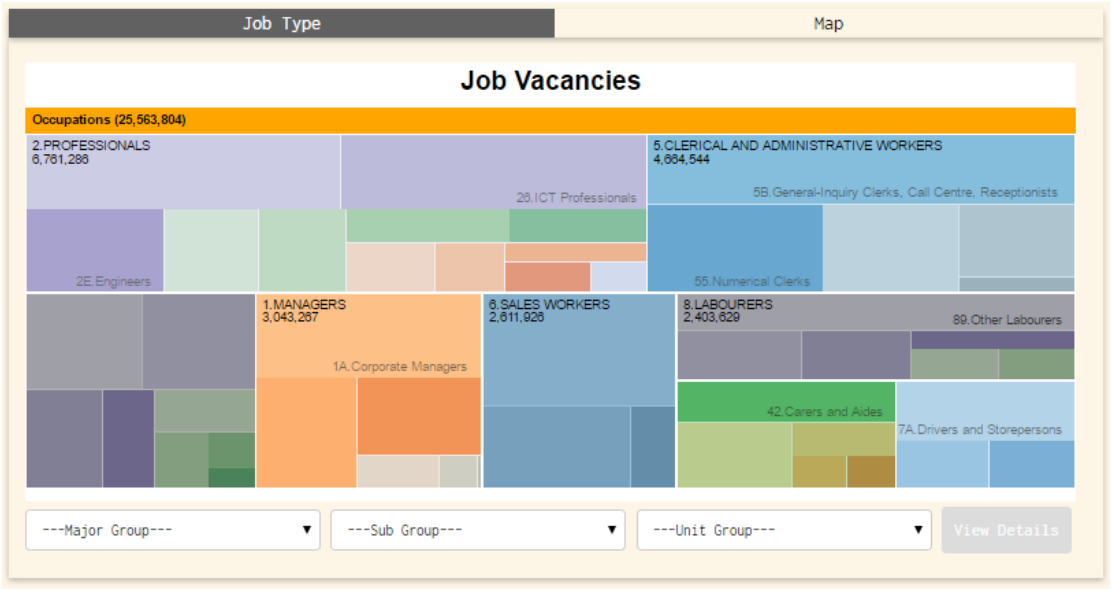


Figure 19. Primary Graph of Job Type

Figure 20. Job Type Selections

A tree map shows first under "Job Type" tab as Figure 19. Click any rectangle in the tree map to the lower level of ANZSCO, and view the sub groups. Correspondingly, click the header of the tree map to back to higher ANZSCO level. If it's the lowest level (see Figure 21), i.e. unit groups, click one to view its details in the following bubble chart and line chart (see Figure 22). Another way to do the same thing is to select a job type from unit group using the three dropdown lists and then click the "View Details" button (see Figure 20).

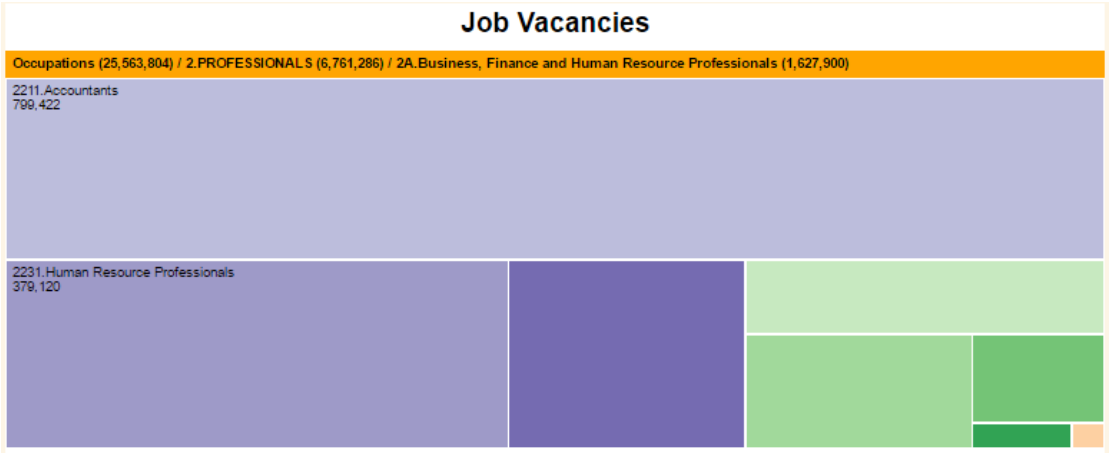


Figure 21. Unit groups in Tree Map

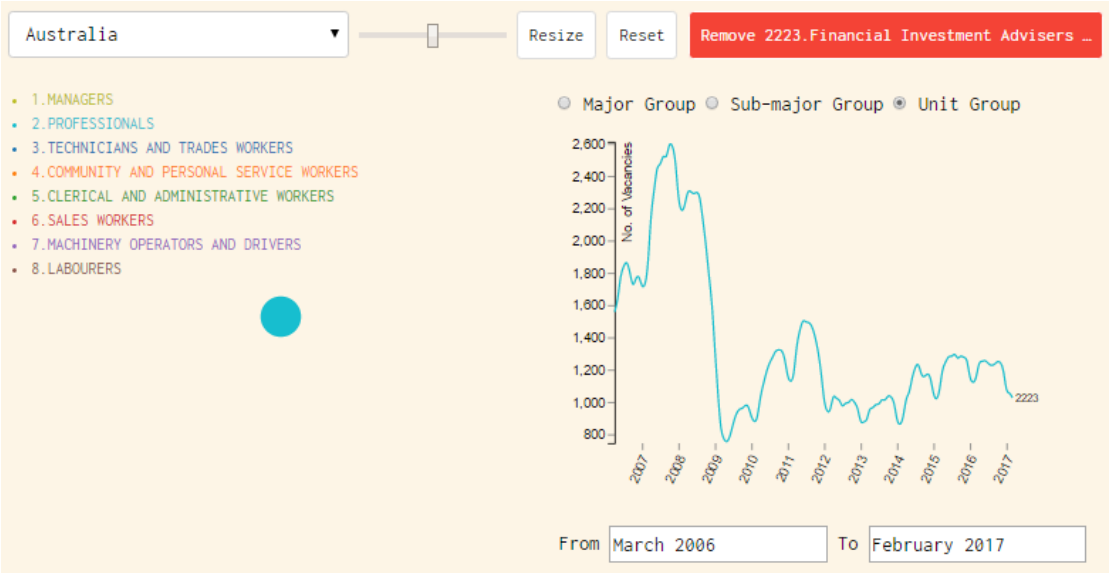


Figure 22. Bubble and Line Graph

As Figure 22 shown, a dropdown list can be used to change state for bubble and line graph. The input range object can adjust the circle size. Two buttons are for reset circle size to default one and clear bubble and line graph respectively. The Remove button is to delete a specific occupation from the two graphs.

And for the line graph, we can change ANZSCO level of lines with radio buttons and time period by two month picker.

In addition, one more operation can do with the graphs is to click a bubble so that its line is highlighted in the line graph (see Figure 23). Click the selected bubble to cancel its highlight.

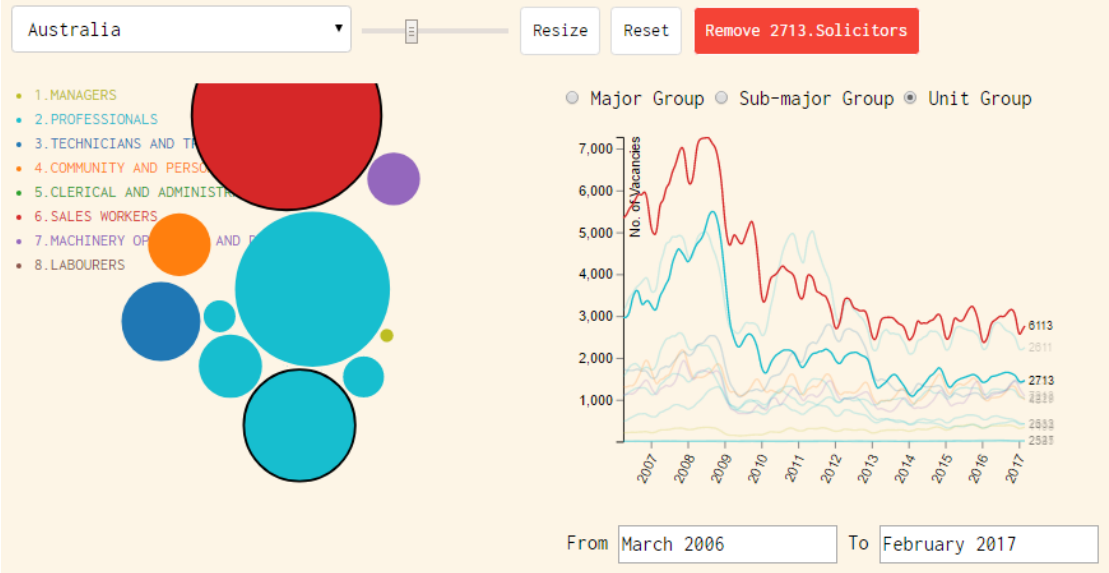


Figure 23. Highlight a Job Type

7.2 Map Instructions

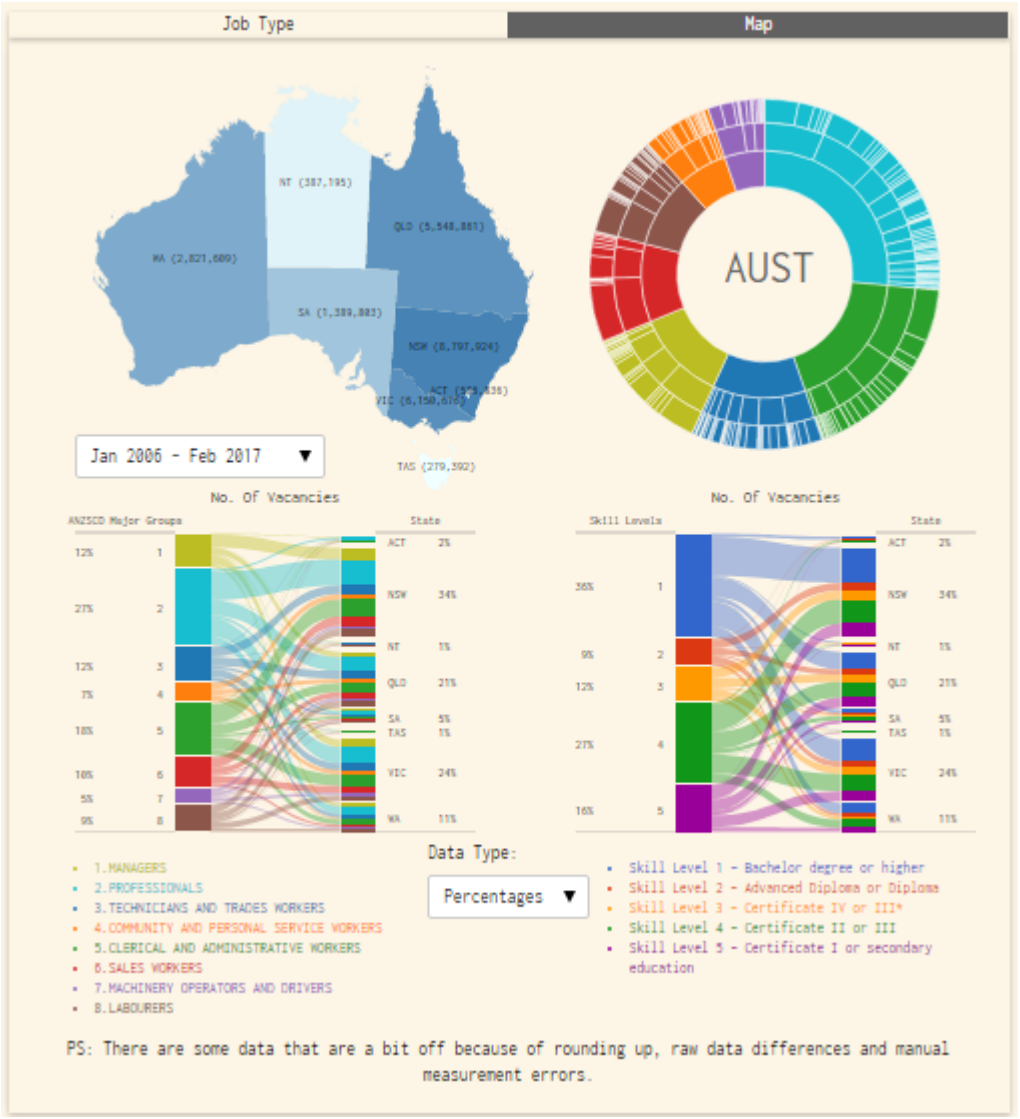


Figure 24. Graphs of Map Section

Under “Map” section, there are four graphs pop up at a same time (see Figure 24). A dropdown list for year selection can change the year in which all graphs display. Then click a state in the Australian map to zoom in the place. Meanwhile, the second sunburst graph shows job vacancies of different job types at the specific state. And the last two graph will highlight bars which belong to the state. Hover a part in a graph to see its label in details. Moreover, a dropdown list for choosing data type can switch displayed value in the last three graphs to percentages or numbers. An example is given in Figure 25.

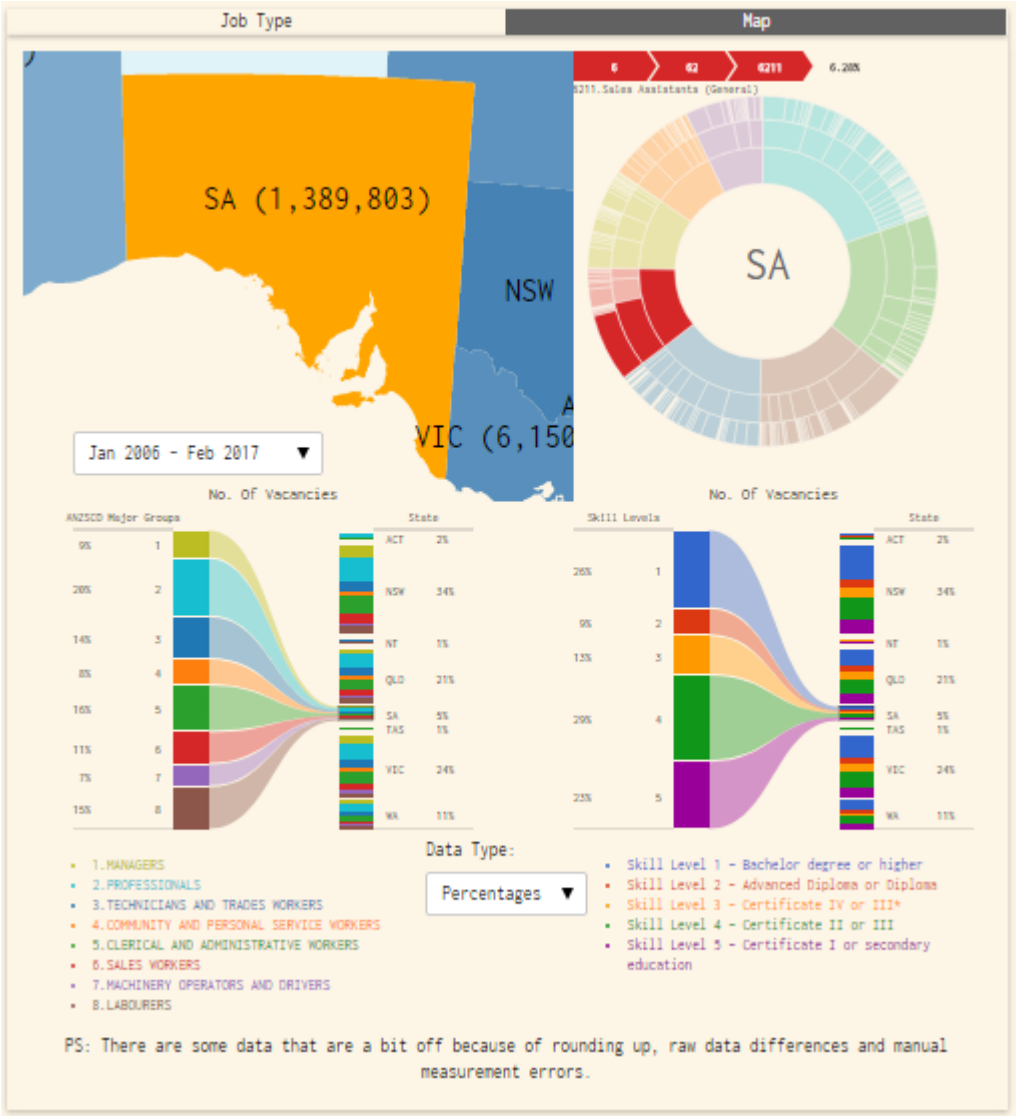


Figure 25. Example of Map Section

8. Conclusion

In order to find job vacancies of different job categories at every state in different years, a narrative visualisation is implemented. Overall, all the required message has been delivered clearly. A rich interaction provides flexible comparison of different occupations and thorough details. In the process, I realised advantages and disadvantages of various diagrams. No such diagram is totally useless. And a narrative visualisation would be good to guide people understanding the data visualisation. In the technical aspect, I learnt more

about d3.js and viz.js. I have a deeper study about how to achieve a good data visualisation. Overall, I feel satisfied with my learning outcomes of data exploration and visualisation. There are many interesting and useful graphs that attract me for continued learning.

9. References

9.1 Data Source

1) Internet Vacancy Index: https://data.gov.au/dataset/internet-vacancy-index
    a. IVI DATA_January 2006 onwards
    b. IVI DATA_detailed occupation – March 2006 onwards
    c. IVI DATA_SkillLevel – January 2006 onward
2) 1220.0 ANZSCO Version 1.2 Structure v3: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1220.02013,%20Version%201.2?OpenDocument
3) au_state.geojson: https://exploratory.io/map

9.2 Code Reference

1) bP Example - Double Vertical bP with labels: http://bl.ocks.org/NPashaP/cd80ab54c52f80c4d84cad0ba9da72c2
2) d3-force-cluster + d3-force-attract I: https://bl.ocks.org/ericsoco/d2d49d95d2f75552ac64f0125440b35e
3) Multiple line graph in v4: https://bl.ocks.org/d3noob/4db972df5d7efc7d611255d1cc6f3c4f
4) Sequences sunburst: https://bl.ocks.org/kerryrodden/7090426
5) Zoom to Bounding Box II - Updated for d3 v4: https://bl.ocks.org/iamkevinv/0a24e9126cd2fa6b283c6f2d774b69a2
6) Zoomable Treemap Template: http://bl.ocks.org/ganeshv/6a8e9ada3ab7f2d88022

9.4 Library Reference

1) d3.js: http://d3js.org/
2) JQuery: http://code.jquery.com/jquery-1.7.2.min.js
3) viz.js: http://vizjs.org/viz.v1.1.0.min.js
4) w3.css: https://www.w3schools.com/