# Addressing Australia's Skill Shortages: The Role of Domestic and International Student Enrollments

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## Introduction:

Australia's competitiveness in the global market is heavily reliant on its talented labor. However, critical areas such as engineering, information technology, health care, education, architecture, management & commerce, and agriculture fields confront severe skill shortages. This project analyzes how educational enrollments address these issues, highlighting the significant contributions of both domestic and international students. The dashboard below provides a comprehensive understanding of enrollment trends and patterns from 2018 to 2022 across all seven states of Australia

There were specifically 2 questions explored in DVP. One was about how domestic and international students enrolled in courses that address skill shortages in Australia and the second was whether the course completion among students correlated with demographic factors such as gender ratios

For this Data Visualization project, the report will explain the findings for the first explored question which is exploring the nature of enrollment by domestic and international students in skill shortage fields. The findings will provide an in-depth analysis of enrollment trends from 2018 to 2022, highlighting state-wise variations and patterns in these fields.

This narration is intended to assist stakeholders in strategic educational planning and career guidance. Understanding these enrollment trends is crucial for creating robust education standards and career guidance for students.

Design Process: 5 Design Sheet

**Brain Storm Sheet Modification:**

Modification to the five-design sheet has been made, since the first draft consisted of minimal set of graphs to visualize in brainstorm phase. Considering the nature of the tabular data which consists of multiple categories with a corresponding single value spider plot, sanky diagrams and lollipop plots has been introduced.

**Modification in sheet 2 and 3:**

Though sheet 3 and 4 graphs showed visualization for different data outcomes the visuals or graphs used in these sheets were similar, hence sheet 3 and 4 have been implemented with different set of visuals.

Sheet 1 Brain Storm:

In the brain storm process considering the fact that the data set consist of multiple categorical data with a single corresponding numeric data, the following has graphs and charts are taken into the account.

1. Bar Plots: Bar plots are chosen to compare enrollment counts across different fields and states, clearly showing trends and differences in categorical data. This aligns with our analysis of domestic and international student preferences and their distribution across skill shortage fields.

2. Pie Charts: Pie charts effectively illustrate the proportions of domestic versus international students in various fields. This helps stakeholders quickly grasp the overall distribution and contribution of each student type to skill shortage areas.

3. Line Graph:

Line graphs are used to depict enrollment trends over time, highlighting fluctuations and impacts such as those caused by COVID-19. This visualization aids in understanding how enrollments have changed from 2018 to 2022, providing a temporal perspective.

4. Spider Plot: Spider charts compare multiple demographic factors, such as enrollment in different fields. This is useful for visualizing how different attributes correlate with each other, supporting the analysis of course completion and gender demographics.

5. Choropleth Map: Choropleth maps display state-wise variations in enrollment patterns, using color to represent the intensity of enrollments. This spatial visualization helps identify geographical trends and disparities in student enrollments across Australia.

6. Sankey Diagram: Sankey diagrams illustrate complex data flows, using line width for magnitude. They handle large datasets well, showing student demography flows between education fields that contributions to skill shortage areas.

7. Heat Maps: Heatmaps show data intensity with color saturation, aiding quick pattern recognition. They are versatile and provide instant visual feedback, revealing enrollment densities and trends across fields and states for a given timeline.

8. Lollipop plot: Lollipop plots emphasize endpoints for precise comparisons, combining bar plot clarity with highlighted data points. They are easy to interpret, ensuring accurate comparisons in enrollment trends.

In the filtering process the scatter plot is excluded has it can be complex for the stake holders to understand.

Categorizing: The data contains enrollment count which is numerical along side citizenship, gender, year, state and education fields has categorical. Based on this the eight filtered plots are categorized as follows

**Sheet 2: Enrollment Trends overview:**

In order for set of visualizations to focus on enrollment distributions we need to focus on state-wise enrollment variations and enrollment trends over time. By employing bar plots, line graph, these visualizations answer the primary questions effectively.

**Layout:**

Line graph: Positioned on top helps to plot the trend of enrollment count between 2018-202.

Bar graph: Positioned below the line graph to show enrollment count with respect to education fields and state.

**Operations:**

Filter for state and education fields.

**Narration style:** This will be an exploratory narration, allowing stakeholders to interact with the data and draw their own conclusions. This style is effective for identifying key trends and insights, supporting strategic planning and decision-making.

**Focus/Zoom:**

- Interactive line graphs showing trends in enrollments and completions over the years at the top half of the sheet.
- Interactive bar charts on the bottom half, showing yearly data segmented by course.

**Operations:**
**Time Slider**: Update Graphs: A slider that allows users to select a range of years, dynamically updating both line and bar charts.
**Click on Course**: Filter Data: Users can click on a course name within the bar chart to see specific trends in the line graphs above.

**Advantages:** Offers a dynamic exploration of temporal data, allowing users to track changes and identify trends across different demographics and courses.

**Disadvantages:** No Information regarding the demographic factors such as gender.

**Sheet 3: Domestic vs. International Enrollment Insights**

**Layout:**
**Spider Plot**: Positioned at the top, this plot compares various education fields for both domestic and international students. The radial layout allows for easy identification of patterns and disparities across multiple categories.
**Lollipop Plot**: Located at the bottom, this plot displays state-wise enrollment counts with the state on the y-axis and enrollment count on the x-axis. A line trend overlay, managed by a year filter, provides a clear view of changes over time.

**Consistency in Design and Interaction**
An orange and green color palette is used to differentiate between domestic and international students, ensuring clarity. labels and legends clearly indicating data categories.

These visual gives clarity on enrollment counts and trends across education fields and states which helps to analyze enrollment distribution and trends, highlighting differences between domestic and international students. By employing spider plots and lollipop plots, these visualizations provide a detailed and comparative view of the data.

**Narration Style:**
The narration style here is analytical, enabling stakeholders to delve into the data and extract meaningful insights.

**Focus/Zoom**

- Spider Plot: Users can hover over each axis to see detailed enrollment counts for specific education fields.
- Lollipop Plot: Hovering over points shows exact enrollment counts and trends over the years, adjustable via the year filter.

**Advantages:** This design is visually comprehensive and facilitates detailed comparative analysis, leveraging effective visual variables and consistent design principles.
**Disadvantages:** The complexity of the spider plot might require users to become accustomed to its radial layout, and the lollipop plot might need precise interaction to adjust the year filter effectively.

**Sheet 4: Enrollment trends with respect to state and gender.**

**Layout:**

**Choropleth Map**: Positioned at the top, this map shows state-wise enrollment data using color gradients to represent different enrollment counts.

**Sankey Diagram**: Located in the middle, this diagram illustrates the flow and distribution of domestic and overseas students, as well as the gender distribution in various education fields.

**Line Graph**: Positioned at the bottom, this graph displays enrollment trends over time with a time slider to filter and view specific years.

**Choice of Visual Variables**

**Choropleth Map**: Use color gradients to represent enrollment counts across states, leveraging spatial recognition for identifying patterns.

**Sankey Diagram:** Uses flow width to represent enrollment magnitudes, highlighting splits and merges in data distribution.

**Line Graph**: Uses position and line trends to represent changes over time, with the time slider allowing dynamic interaction.

We want to look into state-wise and demographic enrollment trends in order to analyze geographical and demographic distribution and trends in enrollment. This can be done by employing choropleth maps, Sankey diagrams, and line graphs, these visualizations provide detailed and comparative views of the data.

**Narrations Style:**

The narration style here is analytical and descriptive, enabling stakeholders to understand the spatial and demographic aspects of enrollment trends.

**Focus/Zoom:**

Choropleth Map: Users can hover over states to see detailed enrollment counts.

Sankey Diagram: Hovering over flows shows exact distribution data for domestic/overseas and gender categories.

Line Graph: Hovering over points shows exact enrollment counts for each year, adjustable via the time slider.

**Advantages:** This design is visually comprehensive and facilitates detailed comparative analysis, leveraging effective visual variables and consistent design principles.

**Disadvantages:** The complexity of the Sankey diagram might require users to become accustomed to its flow layout, and the choropleth map might need precise interaction to understand color gradients effectively.

**Final Design Sheet: Comprehensive Enrollment Trends Visualization**

**Layout:** The layout integrates the best elements from previous designs to create a cohesive, informative visualization

**Choropleth Map**: Positioned at the top, showing state-wise enrollment data with a color gradient representing different enrollment counts.

**Spider Plot**: Located at the bottom left, displaying student enrollment ratios in various education fields, categorized by domestic and international students.

**Line Graph**: Positioned at the bottom right, illustrating enrollment trends over time with a time slider to filter and view specific years.

**Focus/Zoom**

Each visualization component allows for detailed exploration and interaction:

**Choropleth Map**: Users can hover over states to see detailed enrollment counts and click to focus on a particular state.

**Spider Plot**: Provides a comparative view of enrollment ratios in different education fields, highlighting patterns and anomalies.

**Line Graph**: Shows enrollment trends over time, with a time slider for dynamic interaction and detailed year-specific data.

**Operations**

Choropleth Map:

- Hover: Display detailed enrollment data for specific states.
- Click: Focus on a particular state for in-depth analysis.

Spider Plot:

- Hover: Show enrollment ratios for different education fields.
- Click: Highlight specific fields for detailed analysis.

Line Graph:

- Hover: Show enrollment counts for each year.
- Click: Focus on specific years or trends.

Time Slider: Adjust the displayed trend based on selected years.

# Implementation

## 5.1. Technical Implementation:

### Libraries Used:

The project utilizes a range of libraries to achieve dynamic and interactive visualizations. Shiny facilitates the creation of dynamic UI elements and server-side logic, while Leaflet is used to create interactive choropleth maps. Data manipulation and summarization are handled by dplyr, and spatial data integration is managed by sf library. Geographical boundaries data is provided by rnaturalearth and rnaturalearthdata. For generating dynamic HTML content for tooltips and labels, htmltools is employed. Plotly is used to create interactive spider plots and line graphs, and tidyr transforms and reshapes data for visualizations. Finally, RColorBrewer applies color schemes for visual elements, enhancing the overall aesthetic of the dashboard.

**Code Sources:** Layout implementation and design was taken inspiration from the D3 assignment CSS template.

**Difference in design:** The final design sheet consisted of a choropleth map, a bar chart and line graphs with a time slider and male female filter, the final design also lacked in proper layout formatting. Another major issue was the significant variation in enrollment counts across education fields. This disparity resulted in diminished visibility for fields with low enrollment counts when visualized alongside fields with high enrollment counts using a bar plot, and the implementation of gender filters created a complex ambiguity for the data narration part. To address these issues, the 5DS framework was modified to incorporate spider charts, which are more effective in displaying proportions, ratios, and the distribution of enrollments in education fields for domestic and overseas students. Filters were streamlined to focus solely on states, simplifying the insights and avoiding complexity in data interpretation. The layout was also improved by referencing designs from the PE2 and PE3 assignments, enhancing user-friendliness.

### Complexity:

**Integration of latitude and longitude datasets**: The sf and rnaturalearth libraries have been used to plot the state boundaries accurately on the choropleth map which helps mapping enrollment data geographically**.**

**Reactive Values and Inputs**: The state selection and time range inputs are captured using reactive values and input functions. These inputs serve as triggers for updating the visualizations.

**Filtering the Dataset**: When a state is hovered over or selected, the dataset is filtered based on the selected state(s) and the specified time range. This is done using reactive expressions, which ensure that any change in input values (state or time) automatically updates the filtered dataset.

**Dynamic Plot Updates**: The filtered data is then passed to the plotting functions for the spider plot and line graph. These plots are rendered using renderPlotly, which ensures that any changes in the input data immediately reflect in the visualizations.

**Hover and Click Events**: The choropleth map is equipped with hover and click event listeners. When a user hovers over a state, the event triggers a reactive expression that updates the spider plot and line graph with the respective state's enrollment data.

**Synchronized Rendering**: The reactive framework ensures that the state of the inputs (selected states and time range) is consistently monitored. Any change in these inputs triggers a re-execution of the reactive expressions, leading to an updated and synchronized rendering of all interconnected graphs.

**User Interaction Management:** The interactive elements, such as tooltips and legends, are managed to provide a seamless user experience. For instance, hovering over a state shows a tooltip with enrollment details, and the spider plot and line graph update to show the corresponding data.
This approach ensures a dynamic and interactive visualization where the user can explore different data aspects seamlessly.

# 5.2 Interactive Narrative Visualization Implementation:

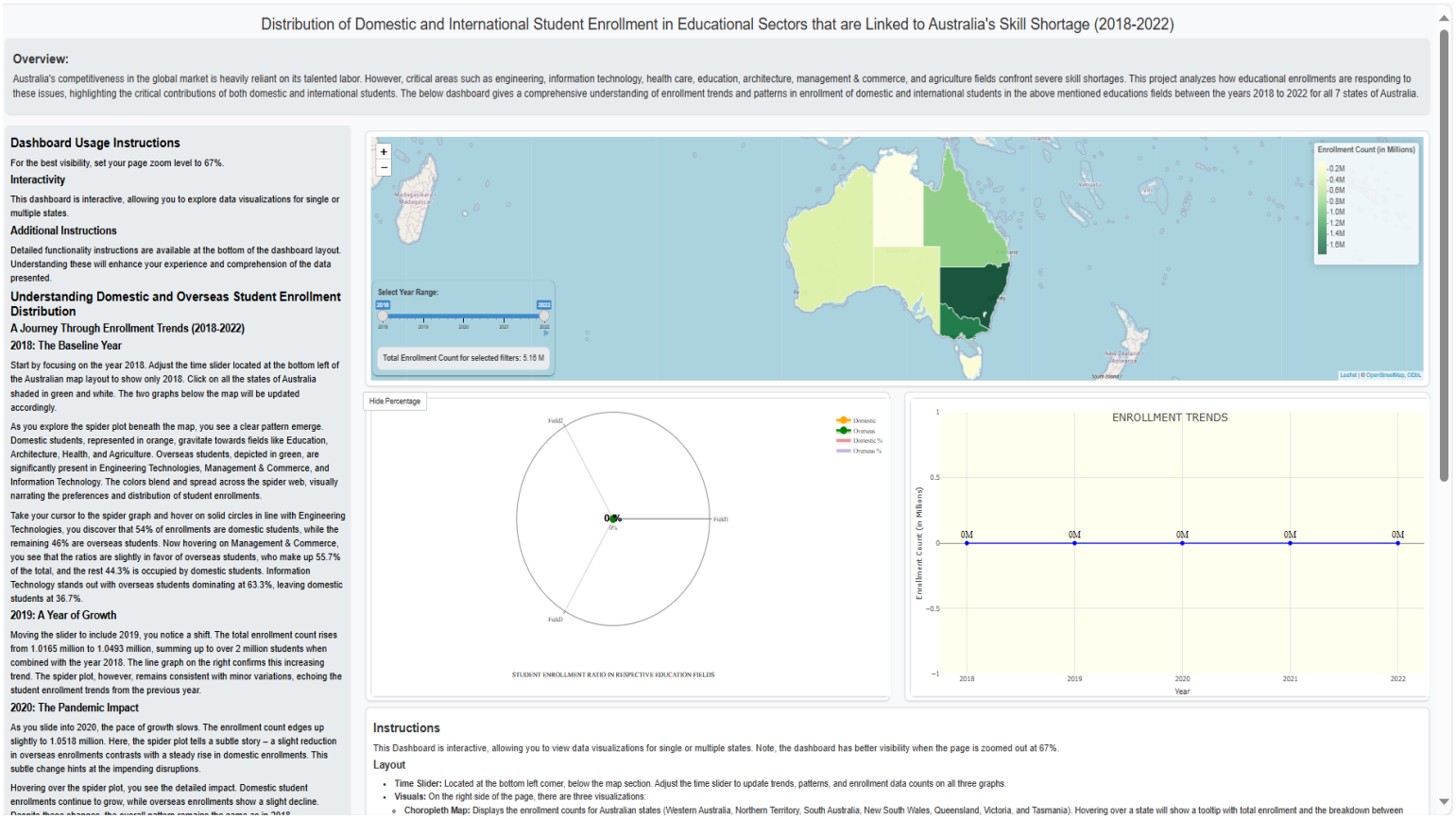



Fig 5.2.1: Initial Dashboard view with no active filters selected.

With reference to the fig 5.2.1 below are its layout details

1. Choropleth Map

- Location: Top of the dashboard.
- A choropleth map indicating student enrollment counts across different Australian states.
- Legends on the right side of the map show the enrollment count range.
- When a state is selected, detailed enrollment data (total, domestic, and international) is displayed within the state's boundaries.

2. Time Slider and Status Board

- Location: Bottom left of the map.
- A time slider allows users to select a range of years, dynamically updating the data displayed on the dashboard.
- Below the time slider, a status board displays the total enrollment count for the selected filters, including both domestic and international enrollments, in millions.

3. Spider Plot

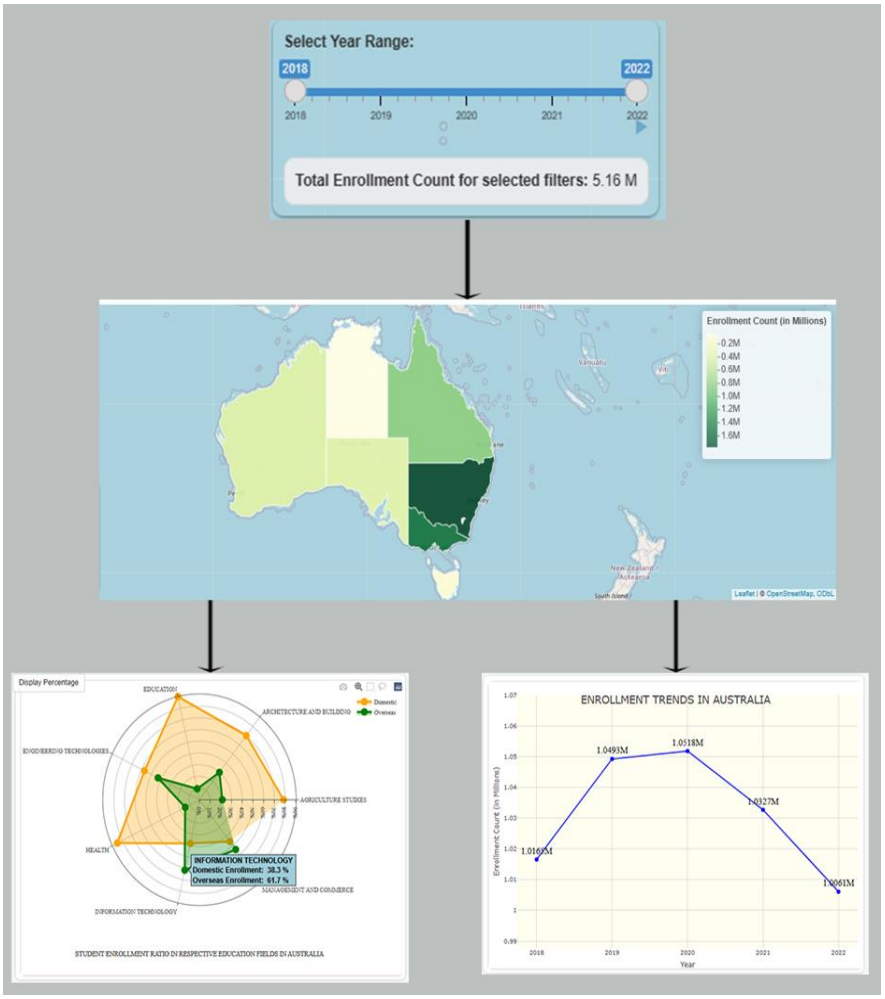
- Location: Bottom left section below the map.
- A spider plot illustrating student enrollment ratios across various education fields.
- Legends to toggle between domestic and international enrollments.
- A "Display Percentage" button located on the top left of the spider plot layout to toggle the visibility of percentage labels on the plot.
- Tooltips providing detailed enrollment ratios for respective education fields on hover.

3. Line Graph

- Location: Bottom right section below the map.
- A line graph showing enrollment trends over the selected years.
- Displays total enrollment counts for each year in millions.
- Highlights significant trends and changes in enrollment over time.

In fig 5.2.1, the dashboard integrates a detailed narrative on the left with an interactive visualization on the right, guiding users through data insights. The instructions explain how to use the time slider to filter data by year, updating the choropleth map, spider plot, and line graph. Users can see how enrollment patterns change over time and across states. The spider plot reveals enrollment ratios in various fields, while the line graph shows trends. This combination of narrative and interactivity allows users to follow step-by-step instructions, making data exploration intuitive and insights clear, highlighting how domestic and international enrollments respond to skill shortages.

## Understanding the filter flow feature:




At Top Level: The time slider controls all elements, updating the enrollment count, choropleth map, spider chart, and line graph based on the selected year range.

Middle Level: The choropleth map filters data dynamically. Hovering over or clicking on states displays detailed enrollment figures and updates the spider plot and line graph accordingly.

Bottom Level: The spider plot shows enrollment ratios by field, and the line graph displays trends over time, both reflecting changes from the map and time slider.

Fig 5.2.2: Filter control hierarchy within the dashboard layout

Fig 5.2.2 explain how the filters in the dashboard enhance the narrative by allowing users to explore and understand enrollment trends dynamically. The time slider at the top adjusts the year range, instantly updating the total enrollment count, the choropleth map, the spider chart, and the line graph. This temporal control helps users observe changes and patterns over different years.

The choropleth map serves as an interactive geographical filter. Hovering over or selecting states reveals detailed enrollment data, which updates the spider plot and line graph below. The spider plot visualizes enrollment ratios across various educational fields, while the line graph depicts enrollment trends over time. These interconnected filters and visualizations enable a comprehensive exploration of how domestic and international student enrollments evolve, highlighting critical insights into Australia's educational landscape and addressing skill shortages effectively.

## Narrating data insights for the audience:

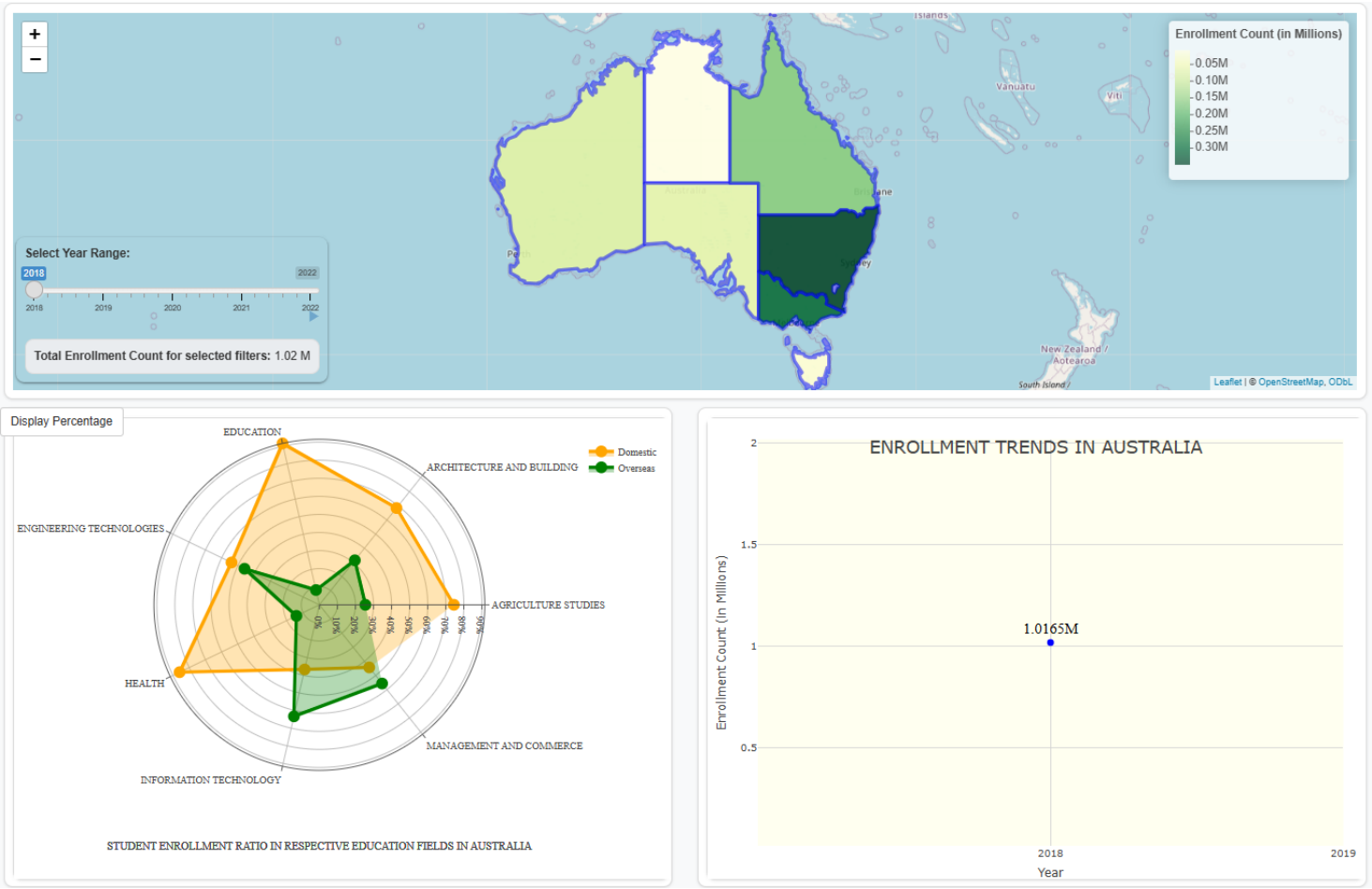
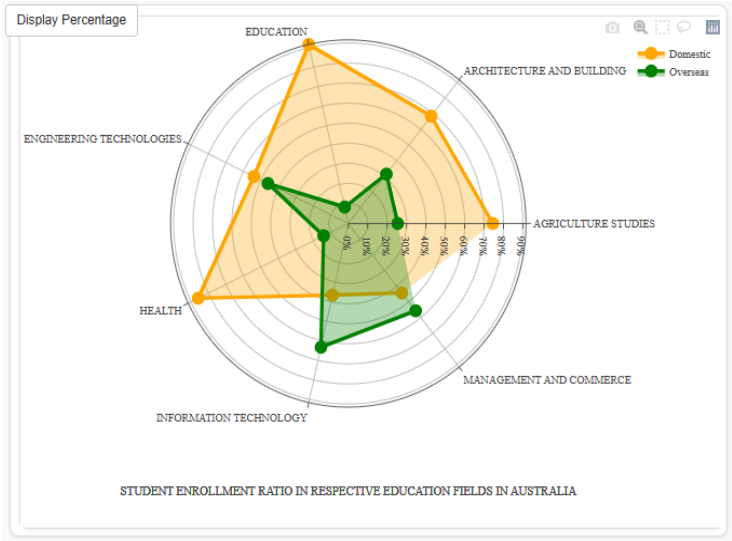



Fig 5.2.3: Showing student enrollment ratio and trends for the year 2018.

**Narration with respective visualization:** Start by focusing on the year 2018. Adjust the time slider located at the bottom left of the Australian map layout to show only 2018. Click on all the states of Australia shaded in green and white. The two graphs below the map will be updated accordingly.




As you explore the spider plot (fig 5.2.4) beneath the map, you see a clear pattern emerge. Domestic students, represented in orange, gravitate towards fields like Education, Architecture, Health, and Agriculture. Overseas students, depicted in green, are significantly present in Engineering Technologies, Management & Commerce, and Information Technology. The colors blend and spread across the spider web, visually narrating the preferences and distribution of student enrollments.

Fig 5.2.4: Student enrollment ratio for the year 2018

Take your cursor to the spider graph (fig 5.2.4) and hover on solid circles in line with Engineering Technologies, you discover that 54% of enrollments are domestic students, while the remaining 46% are overseas students. Now hovering on Management & Commerce, you see that the ratios are slightly in favor of overseas students, who make up 55.7% of the total, and the rest 44.3% is occupied by domestic students. Information Technology stands out with overseas students dominating at 63.3%, leaving domestic students at 36.7%.

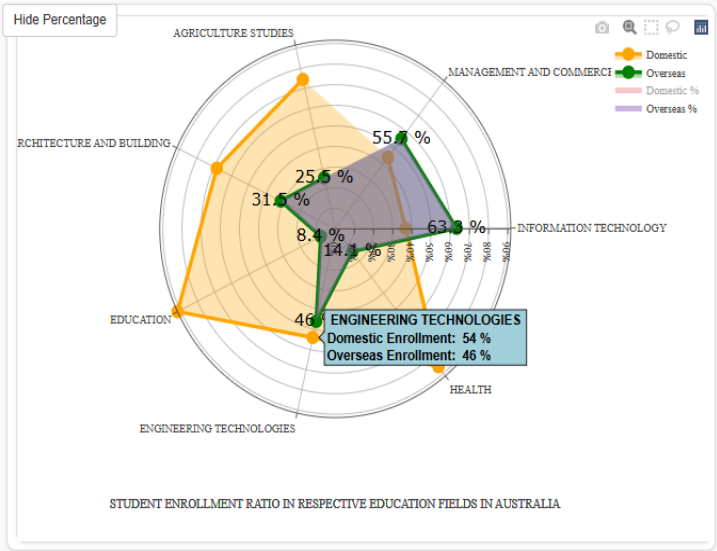



Fig 5.2.4: Student enrollment ratio with percentage filters for the year 2018

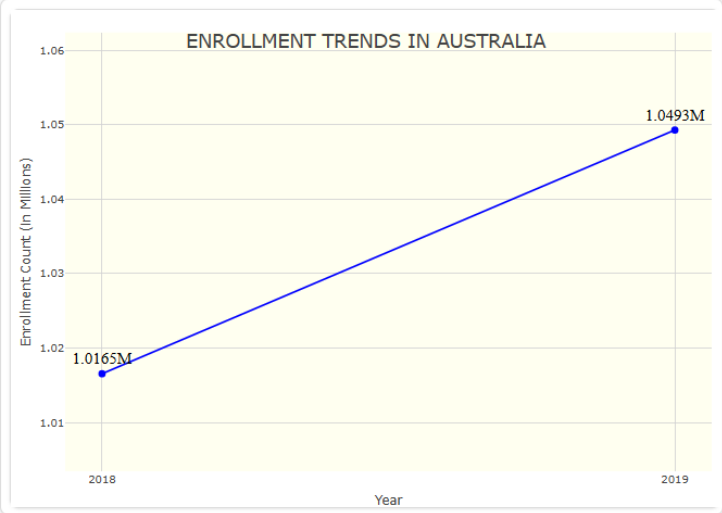



Fig 5.2.5: Student enrollment trend 2018-2019

## 2019: A Year of Growth

Moving the slider to include 2019, you notice a shift(fig5.2.5). The total enrollment count rises from 1.0165 million to 1.0493 million, summing up to over 2 million students when combined with the year 2018. The line graph on the right confirms this increasing trend. The spider plot, however, remains consistent with minor variations, echoing the student enrollment trends from the previous year.

## 2020: The Pandemic Impact

As you slide into 2020 (fig 5.2.6), the pace of growth slows. The enrollment count edges up slightly to 1.0518 million. Here, the spider plot tells a subtle story – a slight reduction in overseas enrollments contrasts with a steady rise in domestic enrollments. This subtle change hints at the impending disruptions.

Hovering over the spider plot, you see the detailed impact. Domestic student enrollments continue to grow, while overseas enrollments show a slight decline. Despite these changes, the overall pattern remains the same as in 2018. (Fig 5.2.5)

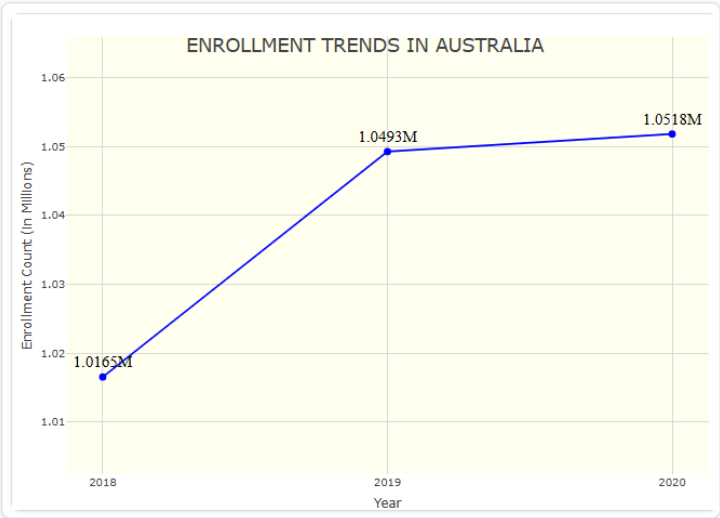



Fig 5.2.6: Student enrollment trend 2018-2020

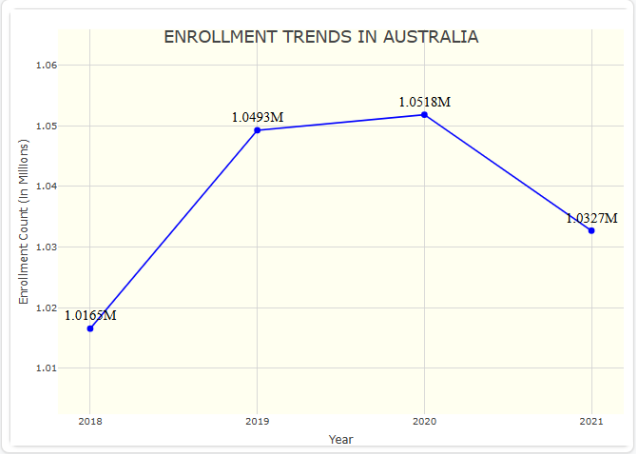



Fig 5.2.7: Student enrollment trend 2018-2021

## 2021: The Crash

The year 2021 hits hard. Enrollment drops from 1.0518 million to 1.032 million (Fig 5.2.7). The global COVID-19 pandemic casts a long shadow over the educational landscape. Overseas student enrollments decline noticeably, while domestic enrollments manage a modest increase. The spider plot's colors show these changes, reflecting the resilience and adaptability of domestic students amidst the pandemic

Examining the spider plot closely (Fig 5.2.8), you see the effects of the pandemic. Overseas enrollments drop significantly, but domestic enrollments show a slight uptick. The total enrollment from 2018 to 2021 reaches 4.15 million, with domestic students continuing to dominate fields like Agriculture, Health, Architecture, Engineering, and Education, while overseas students maintain a strong presence in IT, Management & Commerce.

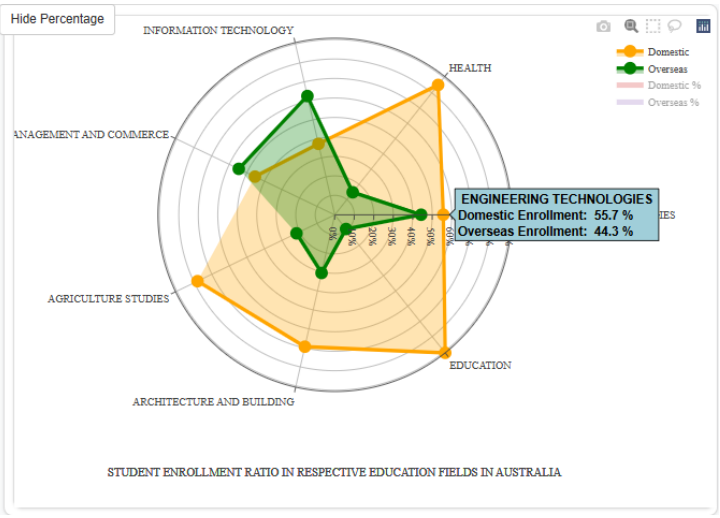



Fig 5.2.8: Student enrollment ratio 2018-2021

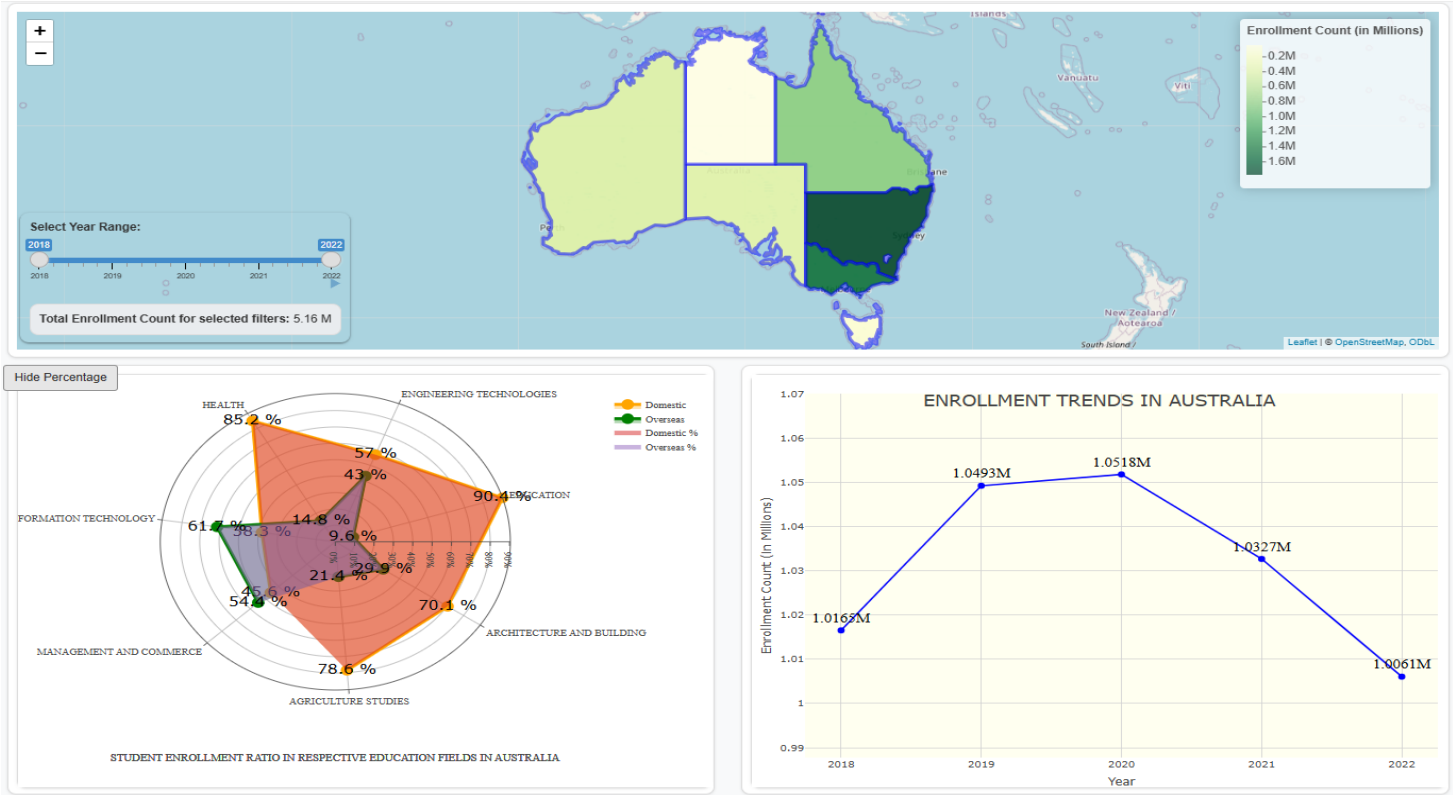



Fig 5.2.9: Student enrollment ratio and enrollment trend dashboard between 2018-2022

**2022: A Continued Decline**

Finally, moving to 2022 (Fig 5.2.9), the narrative becomes clear. The enrollment count dips further to 1.0061 million, the lowest since 2018. The spider plot shows a continued decrease in overseas enrollments and a slight increase in domestic enrollments. Despite the overall drop in numbers, the pattern remains unchanged, domestic students continue to dominate fields like Health, Architecture, Agriculture, and Education, while overseas students prefer IT. Engineering Management & Commerce fields display balanced ratios, with overseas students slightly favoring Management & Commerce, and domestic students leaning towards Engineering. Hovering over the spider plot in 2022, you see the clear trends. Domestic students still prefer fields like Health, while overseas students dominate in IT. Engineering and Management & Commerce show nearly balanced ratios, with a slight edge for domestic students in Engineering and for overseas students in Management & Commerce.

## Using the Implementation:

**Setting Up and Running the Dashboard:**

- Install Required Packages: Ensure all necessary libraries Shiny, leaflet, dplyr, sf, rnaturalearth, rnaturalearthdata, htmltools, plotly, tidyr, RColorBrewer are installed in your R environment.
- Run the Shiny app script in your R environment to start the dashboard.
- Zoom Out: For the best experience, set your browser zoom level to 67% for better clarity.

**Dashboard Layout**

**Instructions and Narration**: Located on the left side of the page, this section provides users with guidance on how to interact with the dashboard and understand the data insights. It includes detailed functionality instructions and narrates the enrollment trends and patterns for the selected years.

**Visuals: The right side of the page contains three visualizations:**

**Time Slider**: Located at the bottom left corner, below the map section. Adjust the time slider to update trends, patterns, and enrollment data counts on all three graphs.

**Choropleth Map:** Displays the enrollment counts for Australian states (Western Australia, Northern Territory, South Australia, New South Wales, Queensland, Victoria, and Tasmania). Hovering over a state will show a tooltip with total enrollment and the breakdown between domestic and overseas students.

**Spider Plot:** Shows the enrollment ratios of domestic vs. overseas students in various education fields that contribute towards skill shortages. You can filter the ratios by selecting the legends (domestic and overseas) located on the top right corner of the map. Additionally, you can rotate the spider plot to match the percentage scale. Hovering over the solid circles of the chart will show tooltips for respective education field enrollment ratios. You can also display the respective percentage ratios on the graph by selecting the 'Display Percentage' button located on the top left corner of the spider chart layout. The percentage display for domestic and overseas can also be filtered by selecting the legends below the main legends.

**Line Graph:** Displays the trend of enrollment for the selected filters over time. Hovering over a solid circle on the chart will show a tooltip with the total enrollment count.

**Features and Interactions Choropleth Map:**

**Selecting States:**

**Single State:** Click on a state to select it. The state's borders will be highlighted in blue. The spider plot and line graph will freeze to show data for the selected state. Hover over the dots in the spider chart to see enrollment ratios and over the line plot to see enrollment counts for specific years. The titles of both graphs will show state names for the selected states on the map.

**Deselecting:** To hover over another state, first deselect the current state by clicking it again. The blue border will disappear, allowing you to hover over any state to see the data.

**Multiple States:** You can select multiple states to view combined data on all visuals. To see enrollment trends for all of Australia, select all states, and the graphs will display the aggregated data. The titles of both graphs will show state names for the selected states on the map.

## Conclusion:

From 2018 to 2022, Australia's enrollment landscape weaves a complex story of growth, resilience, and adaptation. With a total of 5.16 million enrollments, the trends show a peak in 2020, followed by a decline influenced heavily by global events. Domestic students predominantly choose Agriculture, Health, Education, and Architecture, while overseas students are drawn to IT, Engineering, and Management & Commerce.

Enrollment Trends:
The narrative visualization effectively highlights the enrollment trends in various education fields across different Australian states from 2018 to 2022. It demonstrates the distribution of domestic and international student enrollments, providing insights into which states and fields are experiencing growth or decline.

State-wise Analysis:
By allowing users to select and compare multiple states, the dashboard provides a comprehensive understanding of how different regions are contributing to addressing skill shortages.

Learnings:
With this project, I have successfully learned to design a dashboard using 5DS principles and gestalt principles. Learnt to implement HTML and CSS within Shiny, and aggregate data for dynamic visualizations. I can now map explored and aggregated data into visual elements, enhancing clarity and decision-making. This project has improved my skills in data visualization, coding, and applying design principles to create an effective and user-friendly dashboard.

Future work:
One of the features I would prefer to implement is the story mode where users are able to just click panels to understand the trends. I look forward to enhance my project by further exploring enrollment and completion rates for the latest data set.

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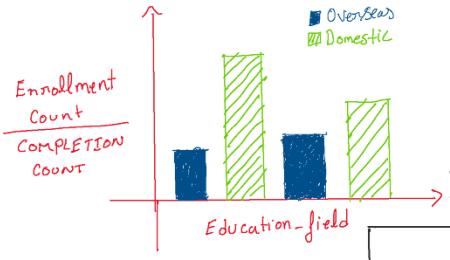
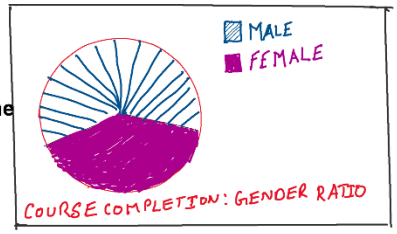
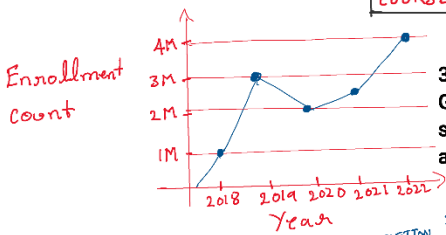
Five Design Sheets
Sachin Shivaramaiah
11/05/2025
Sheet 1
Brain Storm




1.Bar Charts:
Useful for comparing categories like state or course enrollments across education fields

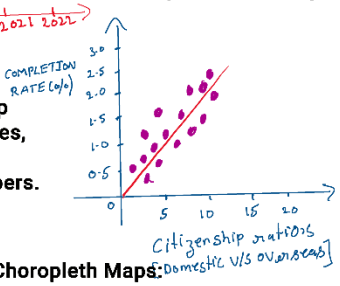
2. Pie Charts:
Used to show the proportional distribution of categories, like the percentage of enrollments by citizenship or gender.

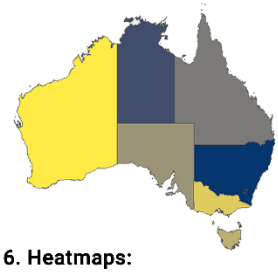



3. Line Graphs:
Great for showing trends over time, such as the change in enrollment and completion across years.

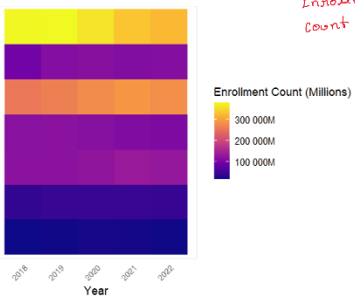
4. Scatter Plots:
Ideal for showing the relationship between two quantitative variables, such as the correlation between enrollment and completion numbers.



5. Choropleth Maps:
Geographic distribution of data, such as enrollment rates by state, can be effectively displayed using this type of map.

6. Heatmaps:
Effective for visualizing the density or intensity of variables, such as enrollment numbers across states and years.




## Filter:

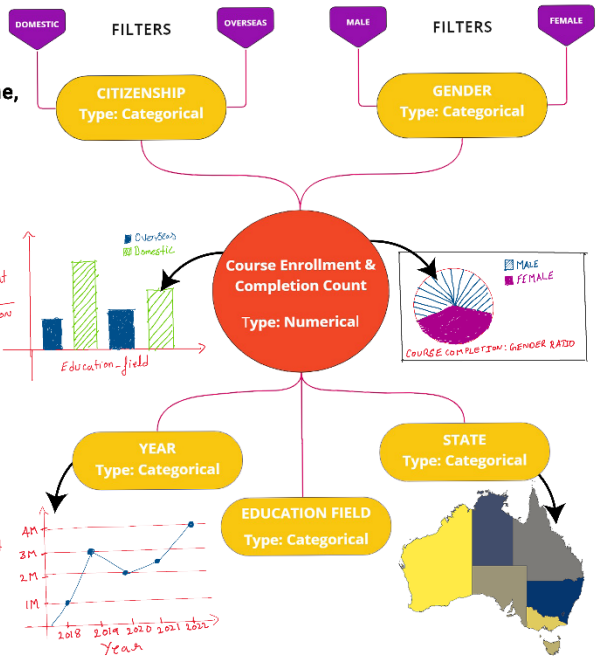
1. Bar Charts:
Useful for comparing categories like state or course enrollments across education fields

2. Pie Charts:
Used to show the proportional distribution of categories, like the percentage of enrollments by citizenship or gender.

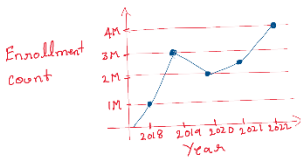
3. Line Graphs:
Great for showing trends over time, such as the change in enrollment and completion across years.

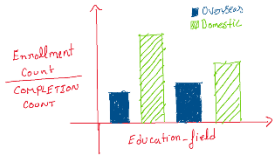
4. Choropleth Maps:
Geographic distribution of data, such as enrollment rates by state, can be effectively displayed using this type of map.

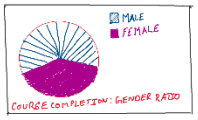
## Categorize:




## COMBINE & REFINE







## QUESTION:

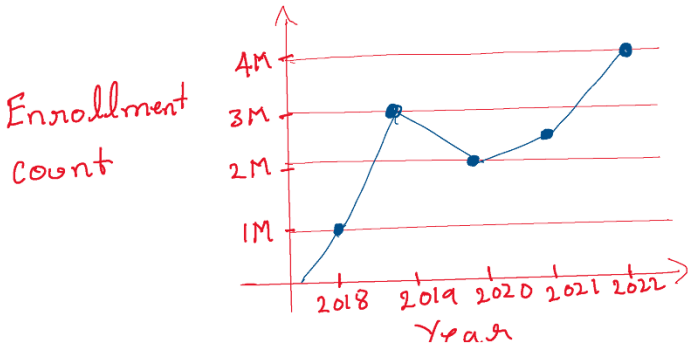
1. Do these visualizations meet the objectives and provide clear insights into the data?

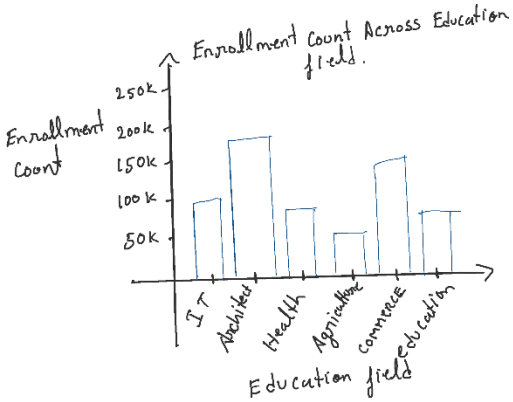
2. Are these designs intuitive and easy to navigate for the target audience?

3. Do they effectively represent both categorical and numerical data in a cohesive manner?

## Layout

**Dynamic Visualization of Yearly Trends in Enrollment and Completion**

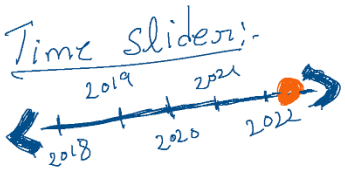



1.Interactive line graphs showing trends in enrollments and completions over the years at the top half of the sheet.
2. Interactive bar charts on the bottom half, showing yearly data segmented by course .

Title: Sachin Shivaramaiah
Auther: 11/05/2025
Date: Sheet 2
Sheet: Alternate Designs
Task:

## Operations




1.Time Slider -> Update Graphs: A slider that allows users to select a range of years, dynamically updating both line and bar charts.
2.Click on Course -> Filter Data: Users can click on a course name within the bar chart to see specific trends in the line graphs above.

## Focus

Emphasis on smooth, animated transitions in line graphs to visualize changes over time.

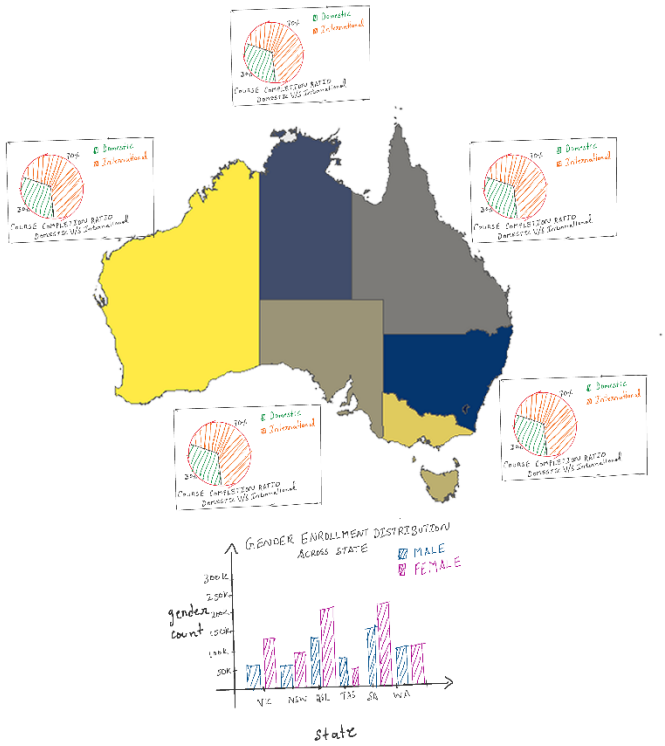
## Discussion

Advantages: Offers a dynamic exploration of temporal data, allowing users to track changes and identify trends across different demographics and courses.

Disadvantages: No Information regarding the demographic factors such as gender

## Layout

### Geographic and Demographic Analysis




1. A Choropleth map displaying enrollment figures by state as the centerpiece.
2. Nested pie charts beside the map, showing the breakdown of enrollments by citizenship within each state.
3. A series of small multiple bar charts under the map displaying completion rates by gender for each state.

Title: Sachin Shivaramaiah
Auther: 11/05/2025
Date: Sheet 3
Sheet: Alternate Designs
Task:

## Operations

1. Click on State in Map -> Update Pie Charts: Clicking a state updates the pie charts to reflect the citizenship distribution for that state.
2. Select Gender -> Highlight Bars: Users can select a gender to highlight in the bar charts, showing completion rates more prominently.

## Focus

1.Highlighting transitions and interactions between the map and the pie charts.
2. Detailed tooltips on hover over map areas and bars providing additional data insights.

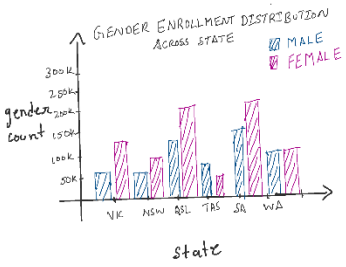
## Discussion

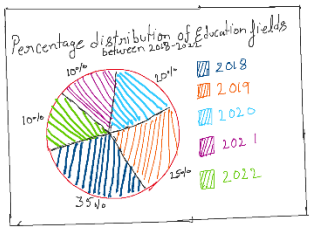
Advantages: Integrates geographic and demographic data in a visually appealing and informative manner. Supports interactive exploration of data across multiple dimensions.

Disadvantages: Complexity due to bulky visualization with multiple graphs

## Layout

### Integrated Dashboard Design




1. A choropleth map at the center showing enrollment rates by state.
2. Bar charts on the side for gender distribution in each selected state.
3. Pie charts below the map showing the percentage distribution of courses for the selected year or state.

Title: Sachin Shivaramaiah
Auther: 11/05/2025
Date: Sheet 4
Sheet: Alternate Designs
Task:

## Operations

**Map Interaction -> Display State Data:** Click on a state in the choropleth map to filter the bar and pie charts to show data from that state.

**Year Selector -> Update Visuals:** Use a slider to select a year which updates all visuals on the dashboard.

## Focus

Detail interaction cues such as hover tooltips on the map showing brief stats, clickable bars in bar charts showing detailed demographics.

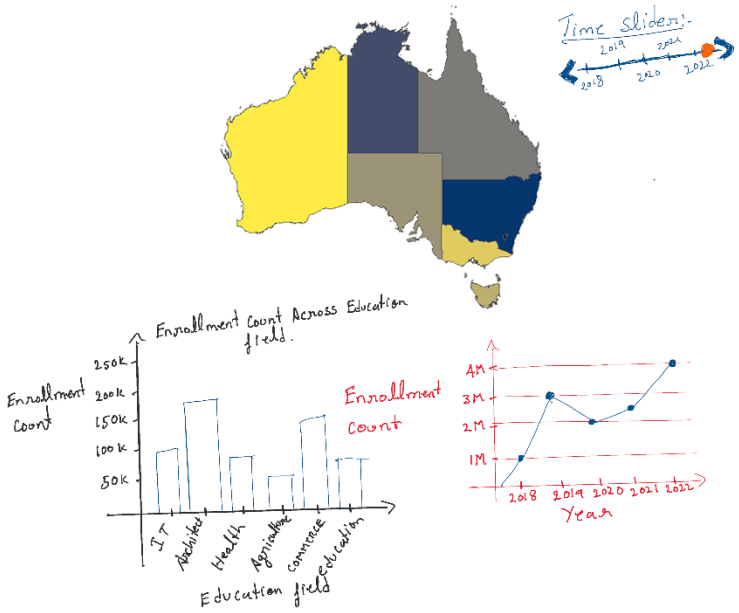
## Discussion

Advantages: Integrated view allows easy comparison across states and student demography.
Interactivity enhances user engagement.

Disadvantages: Requires high user interaction to uncover detailed insights.

## Layout

### Integrated Dashboard Design




From Sheet 4: Use the integrated dashboard design, positioning a choropleth map centrally to display enrollment rates by state.
From Sheet 2: Incorporate interactive line graphs from the top half to show trends over time across different states, enhancing temporal analysis.
From Sheet 3: Employ interactive bar charts from the bottom half to show detailed breakdowns of enrollments by course and gender.

| | |
|---|---|
| Title: | Sachin Shivaramaiah |
| Auther: | 11/05/2025 |
| Date: | Sheet 5 |
| Sheet: | Final Design |
| Task: | |

## Operations

1.Interactive Choropleth Map: Click on a state to filter all other visualizations (line graphs and bar charts) to reflect data from the selected state.

2.Time Slider for Line Graphs: Adjust which years are displayed, dynamically updating the graphs to reflect changes over time.

3.Dynamic Filtering in Bar Charts: Select specific courses or gender categories to isolate and analyze trends within these parameters.

## Focus

Detail windows on hover or click that provide additional data points and insights, such as exact enrollment numbers, completion rates, and demographic breakdowns.

## Discussion