SECV3233 - DATA VISUALIZATION

SECTION 01

SEMESTER 1, 2023/2024

LECTURER: Assoc. Prof. Ts. Dr. Farhan bin Mohamed

ASSIGNMENT 1 - Information Visualization

(Power BI Dashboard)

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Part A:

Summary

For this project, I visited Malaysia DOSM Open Data website to search for suitable data set and finally I choose "Quarterly Principal Labour Force Statistic by State" for visualization purpose. Then, I studied the nature of the data and explore the best visualization that could demonstrate the whole data set well. I utilized Power BI as the primary tool for data visualization. I had created a dashboard that provides insight into quarterly principal labour force by state from 2017 to 2023. Through various visualization, I aimed to uncover patterns, trends and relationships within data

For this project, I accessed the Malaysia Department of Statistics (DOSM) Open Data website to find a suitable datasets. After careful consideration, I selected the "Quarterly Principal Labour Force Statistic by State" dataset. The dataset provides information on the labor force across different states in Malaysia on quarterly basis from 2017 to 2023.

To visualize this data effectively, I utilized Power BI as the primary tool for data visualization. Power BI offers a wide range of visualization options and interactivity features, making it ideal for creating insightful dashboard.

After importing the dataset into Power Bi, I conducted exploratory data analysis to understand the nature of the data and identify key insights. I then designed a dashboard that provides a comprehensive overview of the labor force dynamics across states and over time

Throughout the visualization process, my goal was to uncover patterns, trends, and relationships within the data that could potentially inform policy decisions, workforce planning and economic analysis

Overall, my approach involved leveraging Power Bi 's capabilities to create a visually appealing and informative dashboard

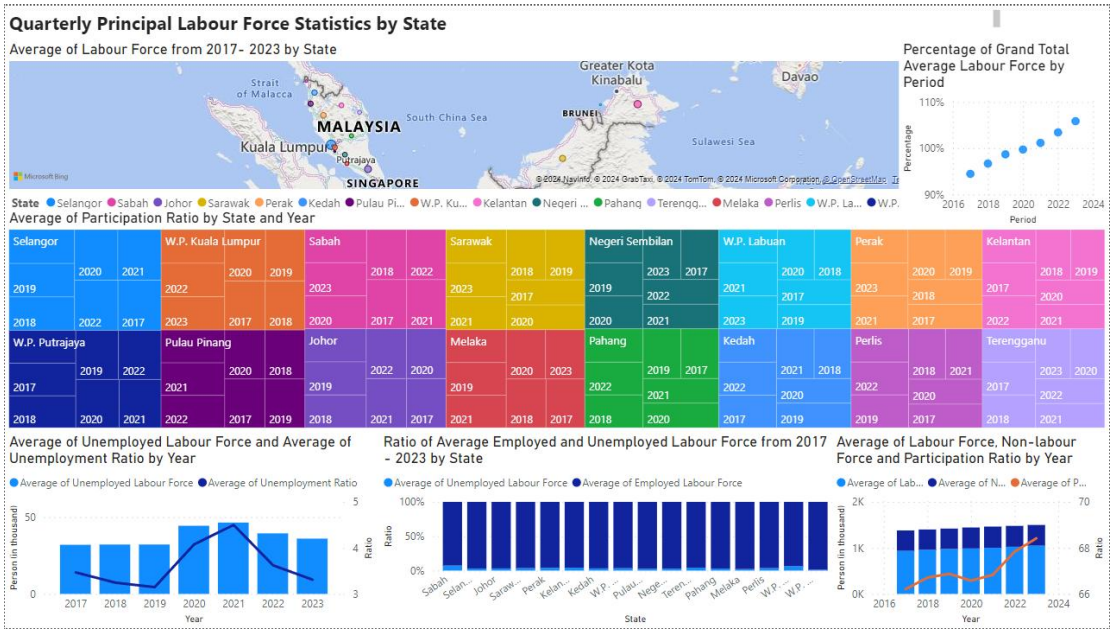
Tools Used:

1. Power BI: Power BI was the primary tool used for data visualization and dashboard creation. Its intuitive interface and powerful features allowed for the creation of interactive and insightful visualizations.
2. Microsoft Excel. Excel was used for validating the visualization to ensure that the visualization demonstrate the correct data through pivot table

Domain Area Description

The domain area of this assignment revolves around labour force statistics, which is a crucial aspect of economic analysis and policy making. Labour force statistic encompasses various metrics related to employment , workforce participation, non-labour force. Analyzing labour force data provides insights into the health of the labour market, trends in employment and unemployment rates, workforce participation proportion, and the overall economic well-being of a country or a state. Understanding labour force dynamics is essential for policymakers, economist, businesses and other stakeholders to make informed decision regarding workforce development, economic policies and social programs

Dashboard



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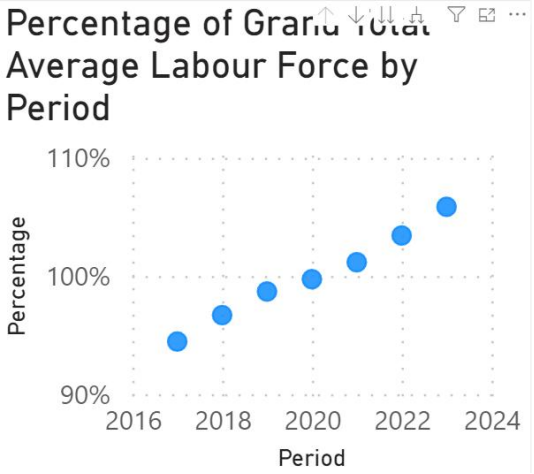
1. Map Visualization: Geographics Distribution of Labour Force

Caption: This map visualization displays the geographic distribution of labour force across states. It provides a spatial understanding of labour force patterns and highlights regions with higher concentrations of labour force.

Insight: Selangor emerges with the highest average labour force, totaling 3656582 persons. In contrast, W.P. Labuan has the lowest average labour force, with only 46429 persons.

2. Scatter Chart:: Percentage of Grand Total Average Labour Force by Period



Caption: This scatter chart displays each period on the x-axis and the corresponding percentage of labor force relative to the grand total average labor force on the y-axis. Each point represents a period, showing how it compares to the average labor force percentage

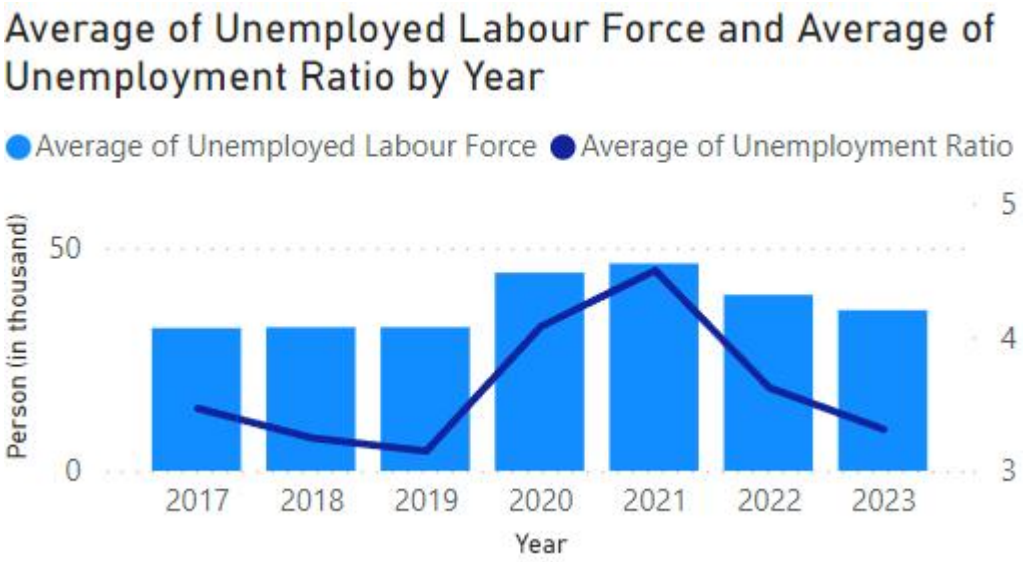
Insight: Over the period, there is a consistent and gradual increase in the percentage of the grand total average labour force. This suggest a steady growth in the overall size of the labour force across the years under consideration. An interesting observation is that after the year 2020, the percentage of the grand total average labour force exceeds 100%. This indicates that the reported labor force figures for the periods post-2020 are higher than the average labour force across all periods

3. Treemap: Average of Participation Ratio by State and Year

Caption: This treemap visualizes the average participation ratio by state and year. Each rectangle represents a state-year combination, with the size indicating the average participation ratio. It offers insight into participation dynamics across state and over time

Insight: The participation ratio, representing the percentage of the working-age population in the labour force, varies significantly across states in different years. Selangor emerges with the highest average participation ratio, indicating a relatively higher proportion of the working-age population engaged in the labor force in this state. Conversely, Terengganu exhibits the lowest average participation ratio, suggesting a lower labour force participation compared to other states.An encouraging trend is observed where half of the states achieve the maximum participation ratio by the year 2023

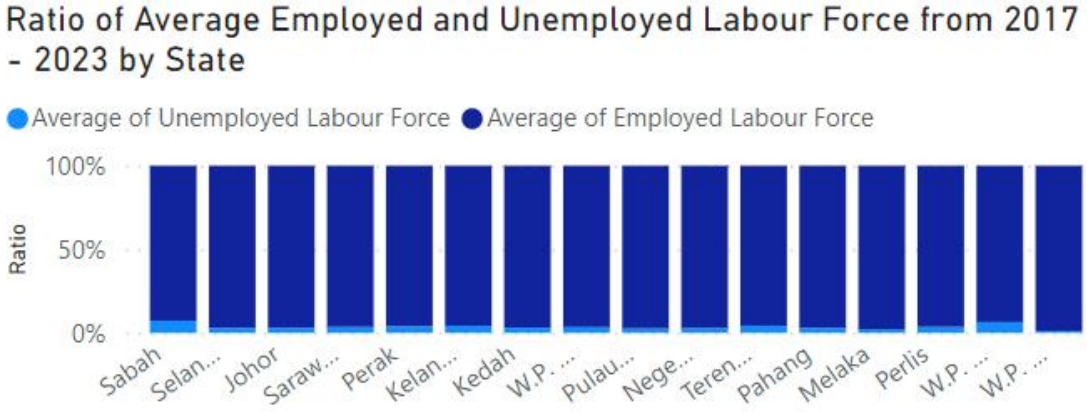
4. Line and Cluster Column Chart: Average of Unemployed Labour Force and Average of Unemployment Ratio by Year



Caption: This visualization presents the average of unemployed labor force as a line chart and the average unemployment ratio as a cluster column chart for each year. It offers insight into both the absolute number of unemployed individuals and the unemployment rate trend over time

Insight: From the visualization, we could know that average of unemployment ratio decreases gradually from 2017 to 2019 although the average of unemployed labour force remains almost the same. However, the average of unemployment ratio and the average of unemployment ratio perform the same trend from 2020 to 2023. In 2020 and 2021, the average of unemployment labour force and the average of unemployment ratio increase drastically followed by a decrease since 2022

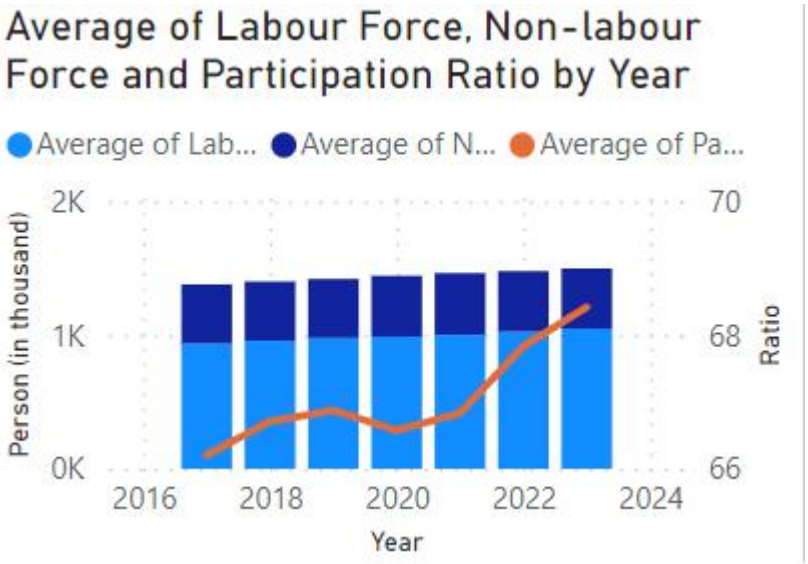
5. 100% Stack Bar Chart: Ratio Average Employed and Unemployed Labour Force from 2017 - 2023 by State



Caption: This visualization depicts the ratio of average employed and unemployed labor force for each state over the years 2017 to 2023. Each bar represents a state, and the segments within each bar show the proportion of employed and unemployed individuals

Insight: All states exhibit similar ratio of average employment and unemployment labour force from 2017 to 2023. This suggest a consistent pattern in the distribution of employment and unemployment across states over the period. The ratio of average employed labour force is consistently larger than the ratio of average unemployed labour force across all states and years. The average unemployment labour force ratio is below 10% for all states, indicating relatively low levels of unemployment on average. Despite the overall low average unemployment ratio, there are variation among states. Sabah achieves the highest unemployment labour force ratio at 7.3%, indicating relatively higher levels of unemployment compared to other states. Conversely, W.P Putrajaya achieves the lowest unemployment force ratio at 1.24%, suggesting a lower incidence of unemployment in this state

6. Line and Stacked Column Chart: Average of Labour Force, Non-labour Force and Participation Ratio by Year



Caption: This visualization presents the average of labour force and non-labour force as a stacked column chart and the average participation ratio as a line chart for each year. It offers insights into the composition of the labor force and the participation dynamics over time

Insight: From 2017 to 2023, the proportion of the average labour force consistently exceeds that of the non-labour force. This suggests that the majority of the working-age population is engaged in the labour force throughout the period. The non-labour force remains relatively stable from 2017 to 2019. However, there is a increase in the non-labour force from 2020 to 2021, followed by a decrease since 2022. In contrast to the non-labor force, the labor force exhibits a gradual increase over the years from 2017 to 2023. The average participation ratio shows a gradual increase from 2017 to 2019, indicating an overall improvement in workforce engagement during this period. However, in 2020, there is dramatic decrease in the participation ratio, although the trend of the average labour force is increasing. The participation ratio rebounds dramatically after 2020, suggesting a rapid recovery in labor market participation

Conclusion

Labour force statistics provide a comprehensive understanding of employment dynamics, workforce participation, and non-labour force characteristics within a population. By analyzing and interpreting labour force data, stakeholders can gain valuable insights into the functioning of the labour market, identify areas of intervention, and formulate strategies to promote economic growth and social well-being

The dashboard provides a comprehensive overview of labour force dynamics, highlighting key trends and pattern across different dimensions such as geographic distribution, participation ratio, employment, and unemployment. Some notable insights include:

- **Geographic Disparities:** Significant variation in labour force force size and participation ratio across states, with Selangor exhibiting the highest average labour force and participation ratio
- **Temporal Trend**s: Gradual increase in labour force size and participation ratio over time, with noticeable fluctuation in unemployment rates, participation rates and non-labour force composition, particularly the period from year 2020 to year 2021
- **Employment Patterns**: Consistent ratios of average employed and unemployed labour force across states, with relatively low average unemployment ratios but variations among states

Overall, the dashboard serves as a valuable tool for stakeholders to monitor and analyze labour force trends, identify areas for intervention, and make informed decisions to promote economic growth and social well-being

Reference

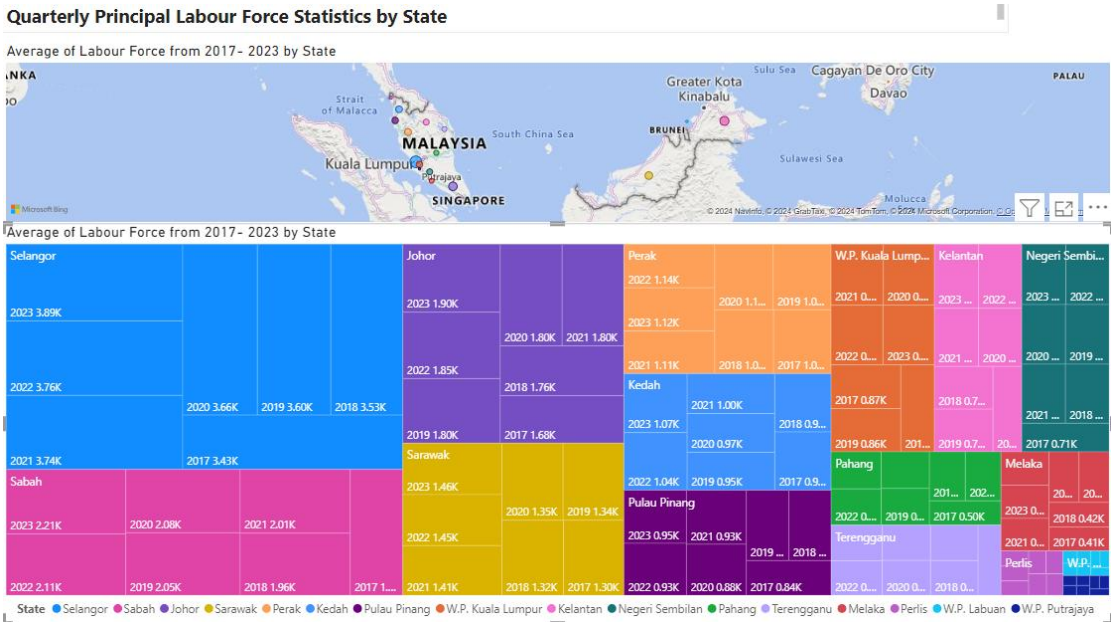
Department of Statistics Malaysia. (n.d.). *Quarterly Principal Labour Force Statistics by State | OpenDOSM*. OpenDOSM. https://open.dosm.gov.my/data-catalogue/lfs_qtr_state

Sinar, E. (2018, June 17). 7 Data Visualization Types You Should be Using More (and How to Start). *Medium*. https://medium.com/@EvanSinar/7-data-visualization-types-you-should-be-using-more-and-how-to-start-4015b5d4adf2

Part B: Comparative Study - Map-based Geo-information visualization vs Treemap for Average Labour Force from 2017- 2023 by State

The study compares the effectiveness of two visualization techniques for representing the average labour force from 2017-2023 by State: Geo-information visualization and Treemap. The data used in this analysis is the average labour force from 2017- 2023 by state that is sourced from the Quarterly Principal Labour Force Statistic by State" dataset that is assessed from Malaysia DOSM Open Data website

Dashboard



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1. Geo-information visualization

Geo-information visualization involves representing data on a geographic map, typically using color-coding or shading to indicate value. In the context of average labour force by state, this technique presents an intuitive spatial understanding of labour force distribution across states. Each state is represented by a circle bubble on the map, with the size and color of the bubble indicating the average labour force for that state. Larger bubbles represent states with higher average labour force, while smaller bubbles represent states with lower average labour force.

Merits

- Information Conveyance

Geo-information visualization effectively conveys the spatial distribution of average labour force, allowing viewers to easily identify regions with higher or lower labour force concentration. We can estimate the amount of average labour force of every state through the respective bubble size. From the visualization, we could know that Selangor exhibits the largest amount of average labour force while W.P. Labuan exhibits the smallest amount of average labour force

- Discovery of Deviation

  It aids in identifying deviation or disparities in labour force distribution across states through the size of the circle bubbles, such as high labour force in populous states like Selangor compared to smaller states like W.P Labuan

- Scale Depiction

  It presents data at macro scale, providing an overview of labour force distribution across states without overwhelming viewers with excessive detail. The map provides an overview of labour force distribution across states, allowing viewers to quickly grasp the spatial patterns and identify regions with higher or lower labour force concentration. The use of circle bubbles to represent each state ‘s average labour force ensures that viewers can easily compare the relative sizes of states without getting bogged down in the details of individual data points. This micro-scale depiction is deal for gaining a broad understanding of labor force dynamics across different regions
  .
- Noise Separation

  By presenting data visually on a map, noise in the data can be minimized, as viewers can focus on the main trends and patterns. The circle bubbles that represent average labour force by state can help separate noise in the data by presenting the information visually. Viewer can focus on the main trends and patterns, such as the overall distribution of labour force across states, without being distracted by minor fluctuations in individual data points. The use of color coding or shading in geo-information visualization can further enhance noise separation by highlighting regions with higher or lower labour force concentration

- Intuitiveness

  Geo-information visualization is intuitive to laypersons. As it leverages familiar geographic representations, making it easy for viewer to comprehend labour force distribution

- Aesthetics

  Geo-information visualization is visually appealing, with color-coded maps offering an aesthetically pleasing representation of labour force distribution

2. Treemap

Treemap visualization represents hierarchical data using nested rectangles, with the size and color of each rectangle indicating different attributes. In the context of average labour force by state, Treep map can display the distribution of labour force across states and years in a hierarchical manner

Merits

- Information Conveyance

  Treemapeffectively convey hierarchical relationships within the data, allowing viewers to discern labour force distribution across states and years

- Discovery of Deviation

  It aids in identifying deviations or disparities in labour force distribution among states and over time, with larger rectangles indicating higher labour force values

- Scale Depiction

  Treemaps, can depict data at different scales, allowing viewers to zoom in or zoom out to explore labour force distribution at various levels of detail. Treemap offers a more hierarchical view of the data, allowing for comparisons at both macro and micro levels. At a macro level, viewers can see the overall distribution of labour force across states and years, similar to geo-information visualization. However, treemaps also allow viewers to drill down into specific states or years to examine labour force dynamics in more detail. This micro-scale depiction enables viewer to explore the data at a more granular level, identifying patterns and outliers that may not be immediately apparent from the macro-level view
  .

- Noise Separation

  Treemap help separate noise in the data by presenting information in a structured and organized manner, making it easier for viewer to identify trends and patterns. Treemap provide a hierarchical view of data, with each rectangle representing a state-year combination and the size of the rectangle indicating the average labour force. While treemap can effectively display large large amount of data in a compact format, they may not be as effective as geo-infomration visualization in separating noise. The hierarchical nature of treemap may make it more challenging for viewers to identify and focus on the main trends and patterns in the data, especially when dealing with geographic data.

- Intuitiveness

  While Treemap may require some learning to comprehend, they are generally intuitive to laypersons, especially when properly labeled and annotated

- Aesthetics

  Treemap can be visually appealing, particularly when well-designed with clear color-coding and hierarchical organization

Conclusion

Both Geo-information visualization and treemap offer effective means of representing average labour force by state from 2017-2023. Geo-information visualization excels in providing a spatial understanding of labour force distribution, while Treemap facilitate the exploration of hierarchical within the data. The choice between the two techniques depends on the specific objectives of the analysis and the preferences of the audience. Geo-information visualization may be more suitable for conveying regional disparities in labour force distribution, while Treemap may be preferred for exploring hierarchical trends and patterns within the data. Ultimately, both techniques contribute to a comprehensive understanding of labour force dynamics and can be valuable tools for decision-making and policy formulation