UTM UNIVERSITI TEKNOLOGI MALAYSIA | Faculty of Artificial Intelligence

POST MODULE ASSESSMENT (PMA)
SEMESTER 1, SESSION 2024/2025

COURSE CODE	:	**MRTB1143**
COURSE NAME	:	**DATA VISUALIZATION AND INTERACTIVE DESIGN**
YEAR / PROGRAMME	:	**1 / MSC. BUSINESS INTELLIGENCE AND ANALYTICS - ODL**
DURATION	:	**4 WEEKS**
MONTH	:	**JANUARY 2024**

INSTRUCTION TO CANDIDATES
ANSWER **ALL** QUESTIONS IN THE QUESTION PAPER.

(Student are required to write his/her name and lecturer's name on the answer script)

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MATRIC NUMBER	:	**MRT 241040**
YEAR / COURSE	:	**2024/2025-2**
CLASS SECTION	:	**1 / MSC. BUSINESS INTELLIGENCE AND ANALYTICS**
LECTURER'S NAME	:	**TS. DR. SURAYA BINTI YA'ACOB**

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This examination question consists of (7) printed pages only

Part A – Data Visualization Report

Answer 1. Business Understanding

Malaysia's Technical and Vocational Education and Training (TVET) system plays a vital role in preparing a skilled workforce for national development. Between 2021 and 2025, accredited centres doubled from 150 to 300, with many institutions improving quality and expanding training in high-demand sectors like Information Technology, Renewable Energy, and Automation Technology.

Despite this progress, several key issues persist: mismatches between graduate supply and job demand, uneven quality of training centres across states, high dropout rates in certain fields, and regional differences in job opportunities. These challenges limit the effectiveness of the TVET system in supporting industry needs and offering equitable outcomes for all students.

This study aims to identify gaps and opportunities by analyzing integrated data from 2021 to 2025, including centre quality, student performance, job market demand, and salary trends. The goal is to help ministries such as KESUMA (Ministry of Human Resources), KPM (Ministry of Education), and KKDW (Ministry of Rural and Regional Development) make informed, data-driven decisions.

The following objectives and corresponding insights have been identified to help achieve a comprehensive analysis:

Graduate Supply vs. Job Market Demand

This objective aims to understand whether the number of TVET graduates in each field matches the job demand across industries. By identifying shortages and oversupply, this use case helps improve workforce planning and supports more effective program allocation.

- To compare the number of graduates by field with job openings in 2025.
- To identify fields with a significant talent shortage or surplus across Malaysia.
- To analyze whether the most popular fields among students align with job demand and salary prospects.

Centre Quality and Student Performance

This objective aims to evaluate how the quality of accredited TVET centres affects student success. By linking centre ratings to student outcomes, this use case supports decisions on accreditation, funding, and quality improvement.

- To assess the distribution of centre quality ratings (High, Moderate, Low) across 2021, 2023, and 2025.
- To determine if students in Low Quality centres experience higher failure or dropout rates.
- To track whether the quality of centres has improved over time, especially in rural or underserved states.

Student Dropout and Field-Level Performance

This objective focuses on identifying fields and regions with high student attrition. By analyzing dropout and failure patterns, the insights can inform better resource planning and student support strategies.

- To identify TVET fields with the highest dropout or failure rates from 2021 to 2024.
- To compare dropout trends across states, especially between urban and rural areas.
- To analyze how dropout rates relate to centre quality and field-specific challenges.

Career Outcomes and Salary Trends

This objective explores how different TVET fields impact graduate earnings. Understanding salary trends helps guide student enrollment decisions and policy support for high-impact training areas.

- To compare average salaries by field to identify which offer the best financial return.
- To highlight the top three highest-paying TVET fields in 2025.
- To assess whether students are choosing high-paying, in-demand fields or entering oversaturated, lower-paying areas.

Regional Access and Job Opportunities

This objective examines geographic disparities in TVET access and employment. By mapping where students are trained and where jobs are located, this use case helps ensure balanced development and policy support across all regions.

- To visualize student enrollment and graduate numbers by state and region.
- To identify areas with high graduate supply but low job demand, or the reverse.
- To map the location of job opportunities to understand whether students need to relocate for employment.

Use Cases and Business Questions

Use Case 1: Matching Graduate Supply with Job Demand

This use case focuses on identifying gaps between the number of TVET graduates and available job opportunities, helping align training efforts with real market needs.

1. What is the total number of graduates in each TVET field from 2021 to 2024?
2. Which fields have the highest number of job openings in 2025?
3. Where are the mismatches between graduate supply and job demand across fields?

Use Case 2: Assessing Centre Quality Across States

This use case examines how centre accreditation ratings vary by year and region, helping decision-makers identify where quality improvements are needed.

4. What is the distribution of High, Moderate, and Low Quality centres from 2021 to 2025?
5. Which states have the largest concentration of Low Quality centres?
6. How has the number of High Quality centres changed over time?

Use Case 3: Analyzing Student Dropout and Failure Rates

This use case aims to uncover fields and locations with high dropout or failure rates, allowing for targeted support to improve completion.

7. Which TVET fields recorded the highest student failure rates between 2021 and 2024?
8. Where are student dropout rates highest across Malaysian states?
9. What is the relationship between centre quality and dropout rates?

Use Case 4: Understanding Salary Trends by Field

This use case explores salary levels across TVET fields, helping students and ministries prioritize high-impact and financially rewarding programs.

10. What is the average salary for each field based on 2025 job market data?
11. Which TVET fields offer the top three highest-paying career paths?
12. How do salary levels compare between fields with high vs. low job demand?

Use Case 5: Exploring Regional Access and Employment Distribution

This use case investigates how training and job opportunities are spread across Malaysia, supporting balanced regional development.

13. Which states produce the most and least number of TVET graduates?
14. Where are job opportunities most concentrated across the country?
15. How closely does student location match job location, and do students need to migrate for work?

Answer 2. Data Understanding and Preparation

a) Identify the Data Relevant for the Insights Above

To support the five use cases and fifteen business questions outlined in the previous section, the following datasets were identified as relevant and are used in this project. These datasets cover information on accredited centres, student outcomes, job market demand, salary data, and geographic distribution from 2021 to 2025.

1. Accredited Centre Quality Dataset (2021, 2023, 2025)

Purpose:

- Analyze changes in the number and quality (High, Moderate, Low) of accredited TVET centres over time
- Compare centre distribution across states and fields
- Support insights for Use Case 2 and Use Case 3

Relevant Fields: Centre Name, State, Field of Study, Quality Rating, Year

2. TVET Student Performance Dataset (2021–2024)

File name: *TVET_Students_Dataset_With_Failures_English.xlsx*

Purpose:

- Identify failure and dropout rates by field and state
- Compare student outcomes based on centre quality
- Link performance with job market supply
- Supports Use Case 1 and Use Case 3

Relevant Fields: Student Count, Field, State, Year, Dropout %, Failure %, Total Graduates

3. Final TVET Job Market Dataset (2025)

File name: *Final_Adjusted_TVET_Job_Dataset_English.xlsx*

Purpose:

- Analyze job demand by field and state
- Identify top-paying job sectors for TVET graduates
- Support insights for Use Case 1 and Use Case 4

Relevant Fields: Job Title, TVET Field, Required Skills, Number of Vacancies, Average Salary, State

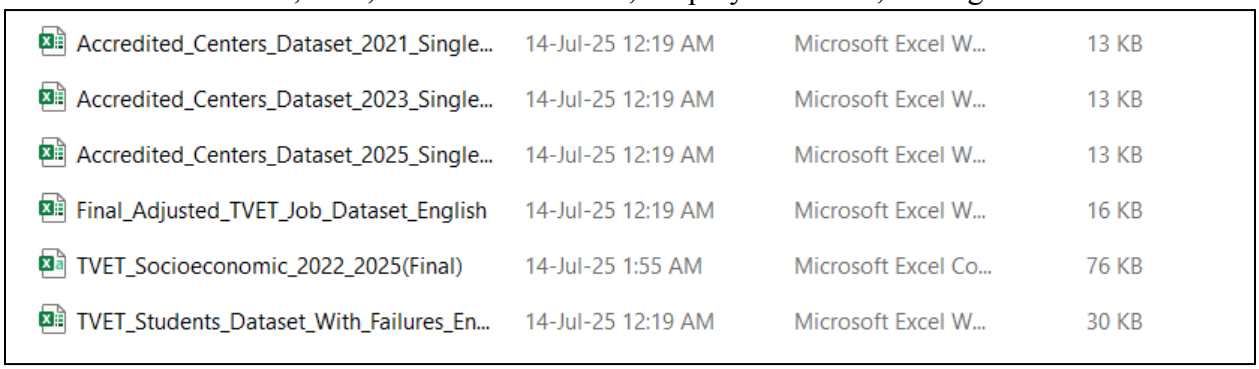
4. TVET Socioeconomic Dataset (2022–2025)

File name: *TVET_Socioeconomic_2022_2025(Final).csv*

Purpose:

- Compare training access and job opportunities across rural and urban states
- Support regional analysis in Use Case 5

Relevant Fields: State, Year, Number of Centres, Employment Rate, Average Household Income



External Data Sources

To support Use Case 5: Regional Access and Employment Distribution, an external dataset titled TVET_Socioeconomic_2022_2025(Final).csv was created specifically for this project. This dataset was constructed by extracting and combining key indicators from four public sources available on the ILO Asia and the Pacific Data Portal: ILO ASIA

Source Files Used

- data-S4doK.csv
- unemployment rate.csv
- Working_Poverty_Rate_By_Age_2022_2025.csv
- malaysia.csv

These datasets contained information on:

- Labour force participation
- Unemployment and NEET rates
- Informal employment
- Working poverty and income share

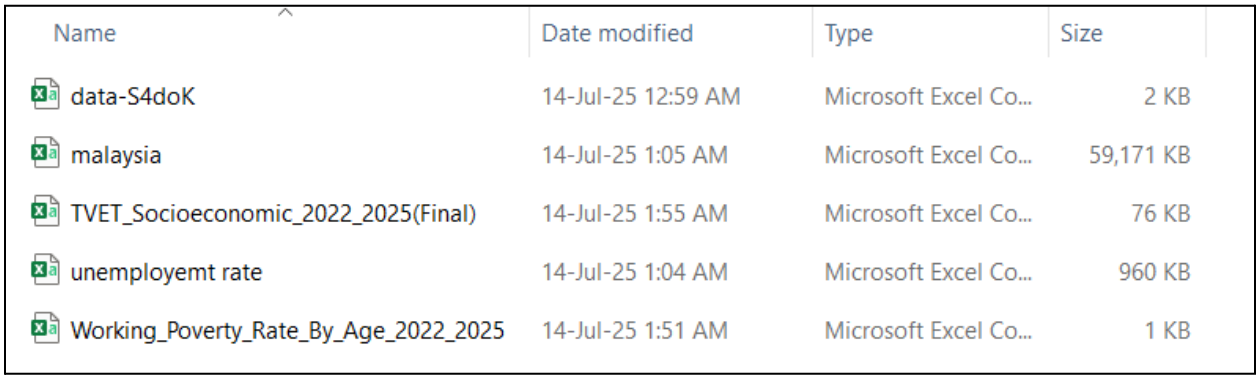
After filtering the columns most relevant to Malaysia's TVET landscape, the datasets were cleaned, trimmed, and merged by year (2022–2025). The result was a consolidated and structured dataset: ***TVET_Socioeconomic_2022_2025(Final).csv***

Purpose and Contribution

This external dataset enriches the internal TVET analysis by:

- Supporting comparisons between graduate supply and job demand by state
- Revealing how socioeconomic conditions influence dropout or failure rates
- Strengthening recommendations with national labor indicators like NEET and poverty
- Helping policymakers target underserved or high-risk regions

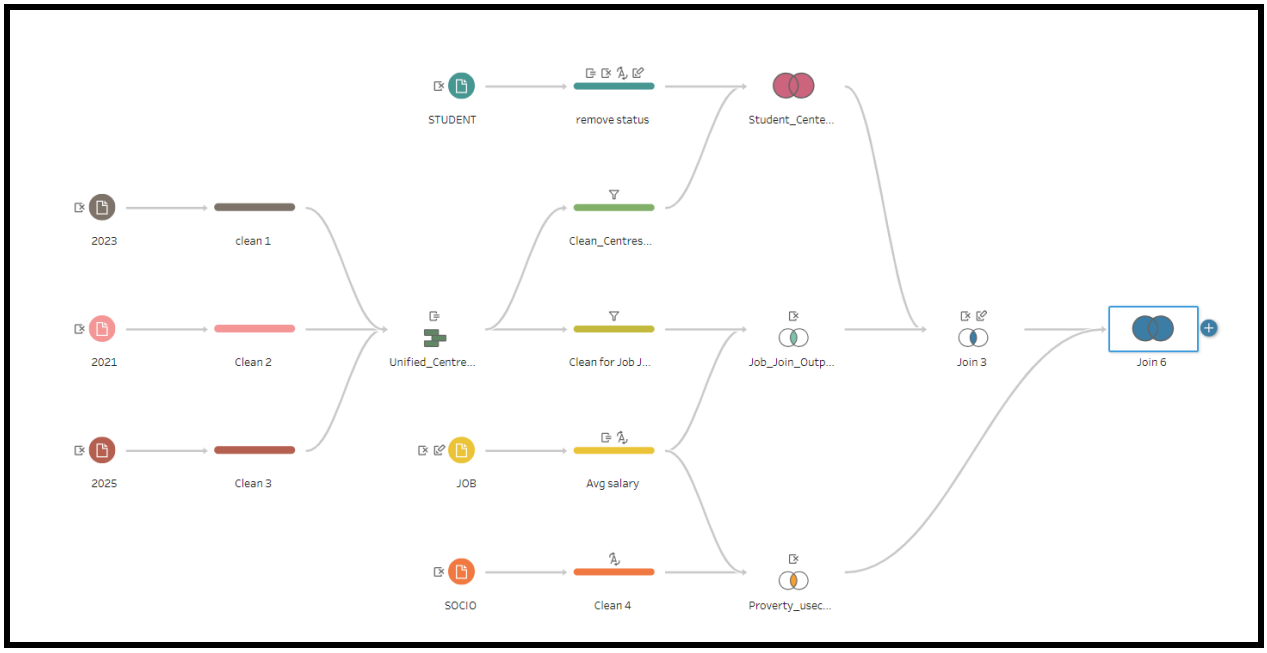
By integrating macroeconomic context into the visualization, this dataset directly supports the core objective of bridging the gap between TVET education and industry needs with data-driven insights.



Name	Date modified	Type	Size
data-S4doK	14-Jul-25 12:59 AM	Microsoft Excel Co...	2 KB
malaysia	14-Jul-25 1:05 AM	Microsoft Excel Co...	59,171 KB
TVET_Socioeconomic_2022_2025(Final)	14-Jul-25 1:55 AM	Microsoft Excel Co...	76 KB
unemployemt rate	14-Jul-25 1:04 AM	Microsoft Excel Co...	960 KB
Working_Poverty_Rate_By_Age_2022_2025	14-Jul-25 1:51 AM	Microsoft Excel Co...	1 KB

(b) Overall Data Flow Description

The overall data flow begins by unioning the Accredited Centers datasets from 2021, 2023, and 2025 to create a unified table with a new “Year” field. This unioned dataset is then joined with the student dataset using a cleaned join key (TVET Field and State). The result is further joined with the job dataset to enrich it with employment and salary details. Lastly, the flow joins with the socioeconomic dataset, which was cleaned and duplicated by states and federal territories, allowing the final dataset to support complete visualizations. All joins are based on common fields like TVET Field, State, and Year.



3. Lower-Level Structure (Worksheets)

a) Pre-attentive Elements

Pre-attentive elements are visual attributes that our brain processes almost instantly, without conscious effort. These include color, shape, orientation, position, and size, which help us identify trends, anomalies, and patterns in data quickly. By leveraging these elements in data visualizations, we improve readability and enhance decision-making. Below, we explore how pre-attentive elements like points, lines, spatial placement, and color are utilized in Tableau with supporting examples and explanation.

Points

Points are used in scatter plots to represent individual data records and can quickly highlight clusters and outliers.

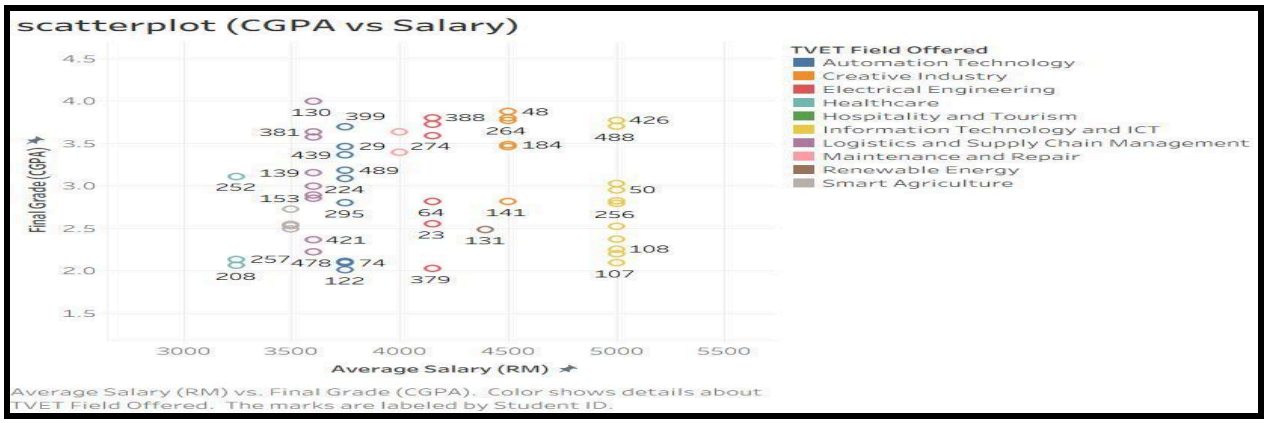


Figure 01: Visualization: Average Salary vs. CGPA Scatter Plot

This scatter plot shows the relationship between students' Final Grade (CGPA) and Average Salary (RM). Each point represents a student, and their location is defined by two quantitative variables—CGPA and salary. The pre-attentive feature used here is position, which allows immediate recognition of distribution, density, and outliers.

Using color for different TVET fields offered makes clusters easily distinguishable. For instance, Smart Agriculture students cluster around higher CGPA and salary ranges. Viewers can quickly draw insights without needing to analyze raw values, which is the power of using position and color as pre-attentive cues.

Line

Line elements represent continuity and movement across time or ordered data categories.

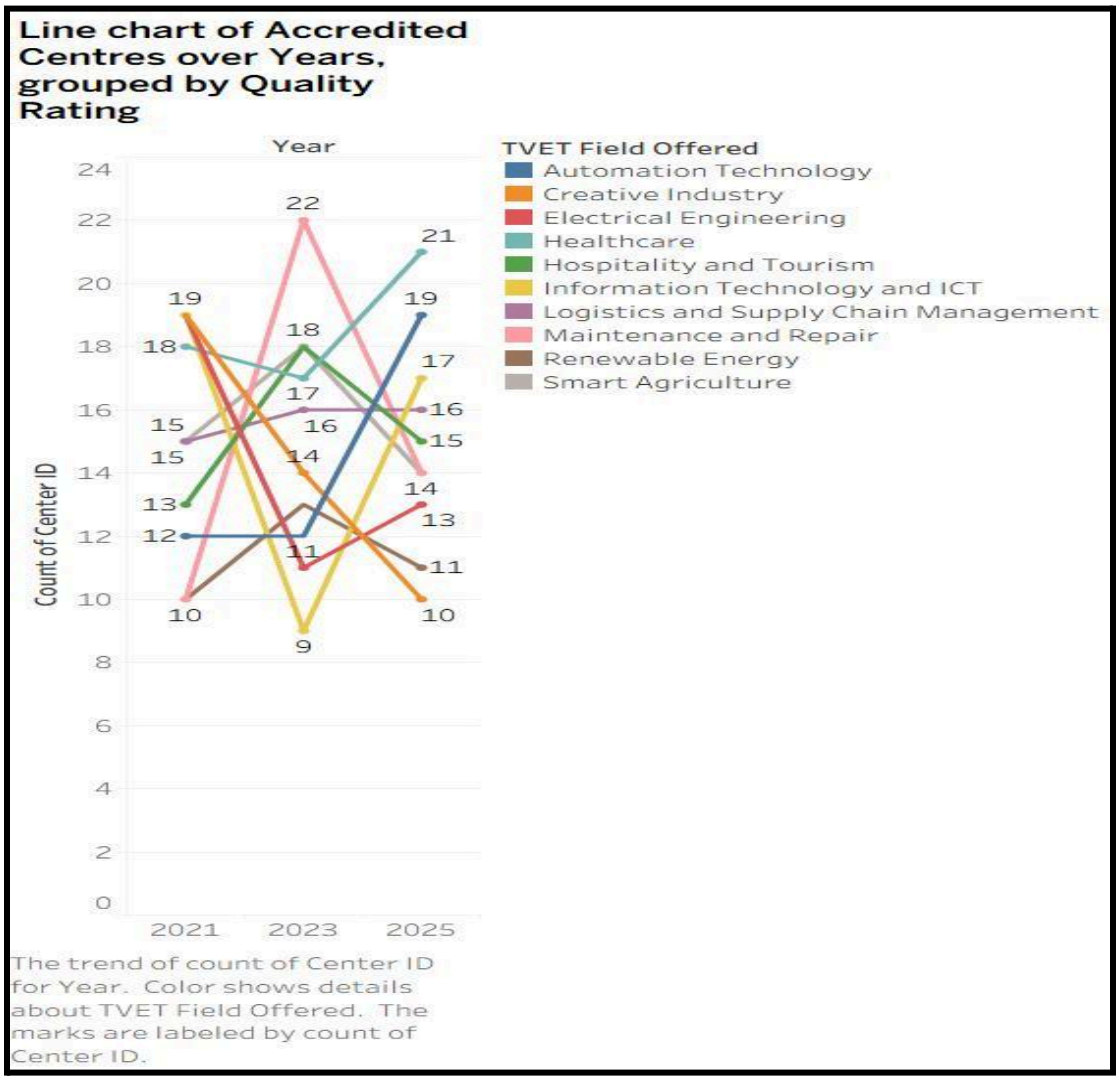


Figure 02: Visualization: Count of Accredited Centers over Years

This line chart visualizes the number of accredited centers by year, broken down by TVET fields. The pre-attentive feature is orientation, where the slopes and trends of the lines are instantly visible.

By using colored lines for each field, the chart allows viewers to easily detect rising or falling trends. For example, the Renewable Energy field shows a consistent increase, while some others fluctuate. This allows faster comparison and highlights fields requiring attention or investment.

Spatial

Spatial placement maps data geographically, utilizing our brain's familiarity with spatial orientation.

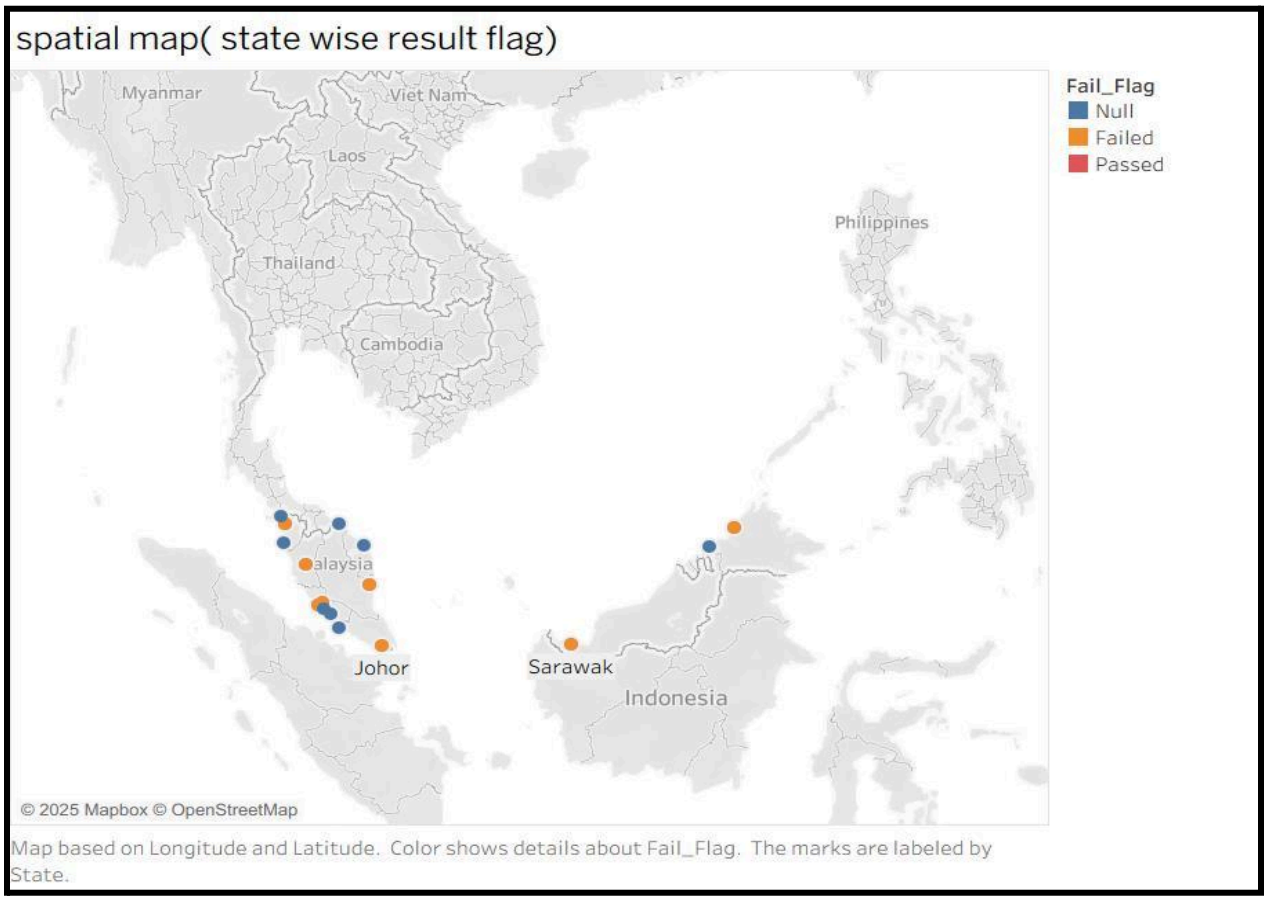


Figure 03: Visualization: State-wise Fail Flag Map

This map shows TVET center outcomes (Pass/Fail) by state in Malaysia, using the pre-attentive feature location. Dots are plotted by longitude and latitude, enabling immediate recognition of regional differences.

States with more orange dots (Fail) become obvious without needing to read legends. For instance, more failures appear in southern states, while central regions perform better. This helps identify geographic gaps at a glance.

Color

Color is a dominant pre-attentive element used to encode categories or intensity.

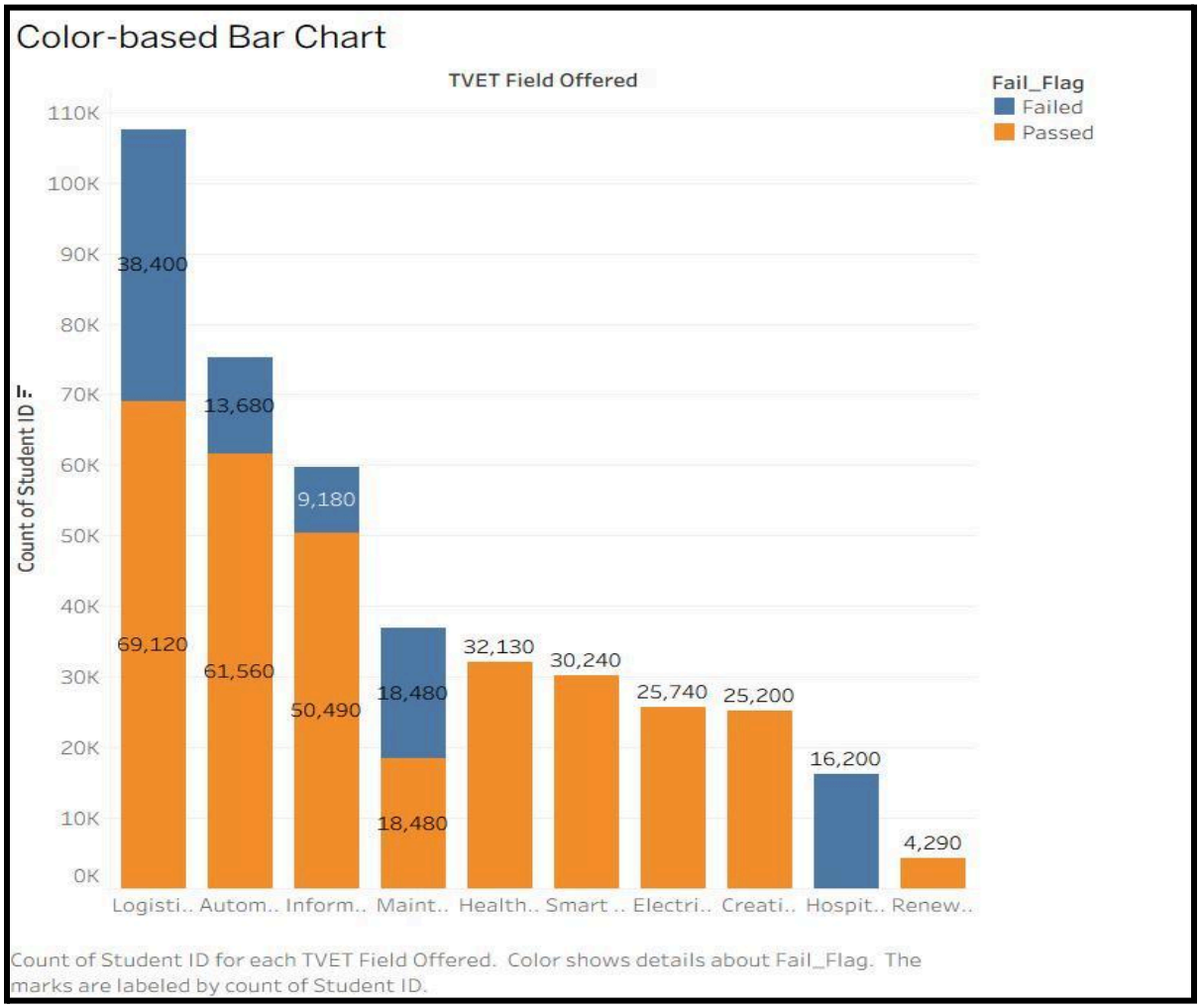


Figure 04: Visualization: Pass vs. Fail by TVET Field (Bar Chart)

This bar chart visualizes student outcomes by TVET fields, where colors distinguish Pass and Fail outcomes. The pre-attentive feature color hue is used to differentiate success vs. failure instantly.Fields like Logistics and Automation Technology show taller bars with large blue segments, indicating high fail rates. This quick visual cue supports faster data interpretation and directs viewer attention where it's most needed.

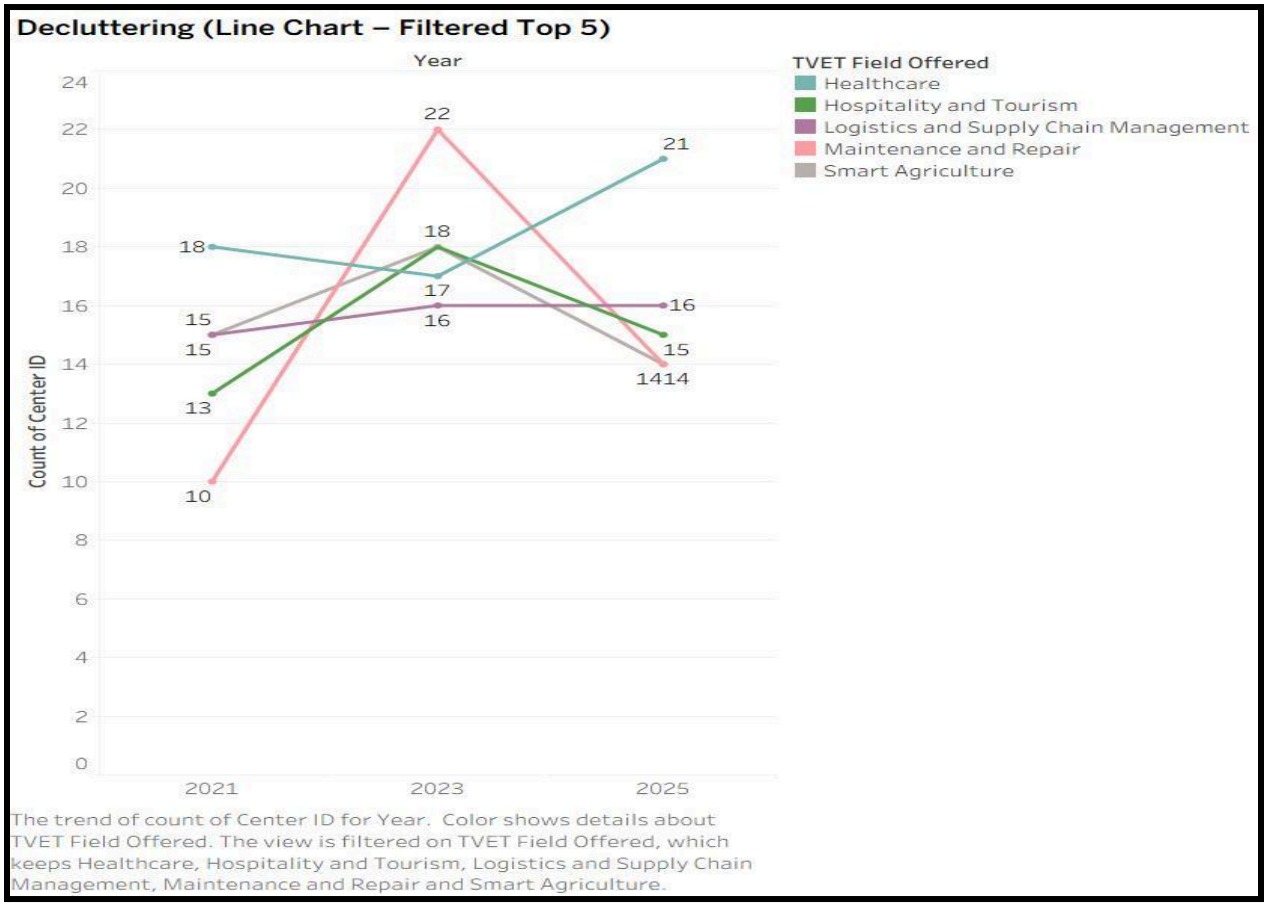
3. (b) Lower-Level Structure (Worksheets)

Analytical Reasoning

Analytical reasoning in data visualization refers to methods used to guide users in discovering insights through comparison, sorting, focus, and filtering. These techniques help simplify complex datasets, highlight gaps, and lead to better decision-making. Below are five core reasoning strategies used in Tableau, with snapshots and explanations.

Decluttering – Line Chart (Top 5 TVET Fields)

Decluttering is a visualization technique used to remove unnecessary data to enhance clarity. In this example, the original line chart included **all TVET fields**, causing visual overlap and making it hard to interpret trends.



To declutter the chart, a Top 5 filter was applied based on the count of Center ID. This filter limited the view to only the five most prominent fields with the highest number of accredited centers across the years.

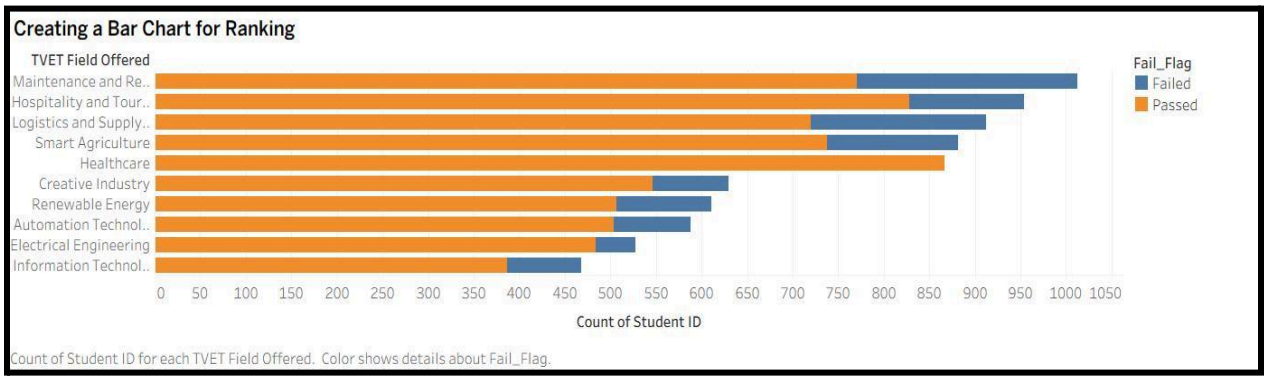
This method reduces cognitive load and allows the viewer to:

- Quickly identify key trends over time

- Focus on the most impactful categories
- Avoid distraction from low-activity fields

The result is a cleaner, more focused chart that supports clearer analytical reasoning for performance comparison.

Ranking – Bar Chart: Pass vs. Fail by TVET Field



Visualization Technique: Horizontal Bar Chart

Ranking is an analytical technique that arranges data in order to quickly compare performance across categories. In this visualization, a horizontal bar chart is used to display the total number of students per TVET field, segmented by Pass vs. Fail outcomes (Fail_Flag).

By sorting the bars in descending order, it becomes easy to identify which TVET fields have the highest or lowest student participation. The length of the bars provides a clear indication of volume, while the color encoding helps differentiate student performance.

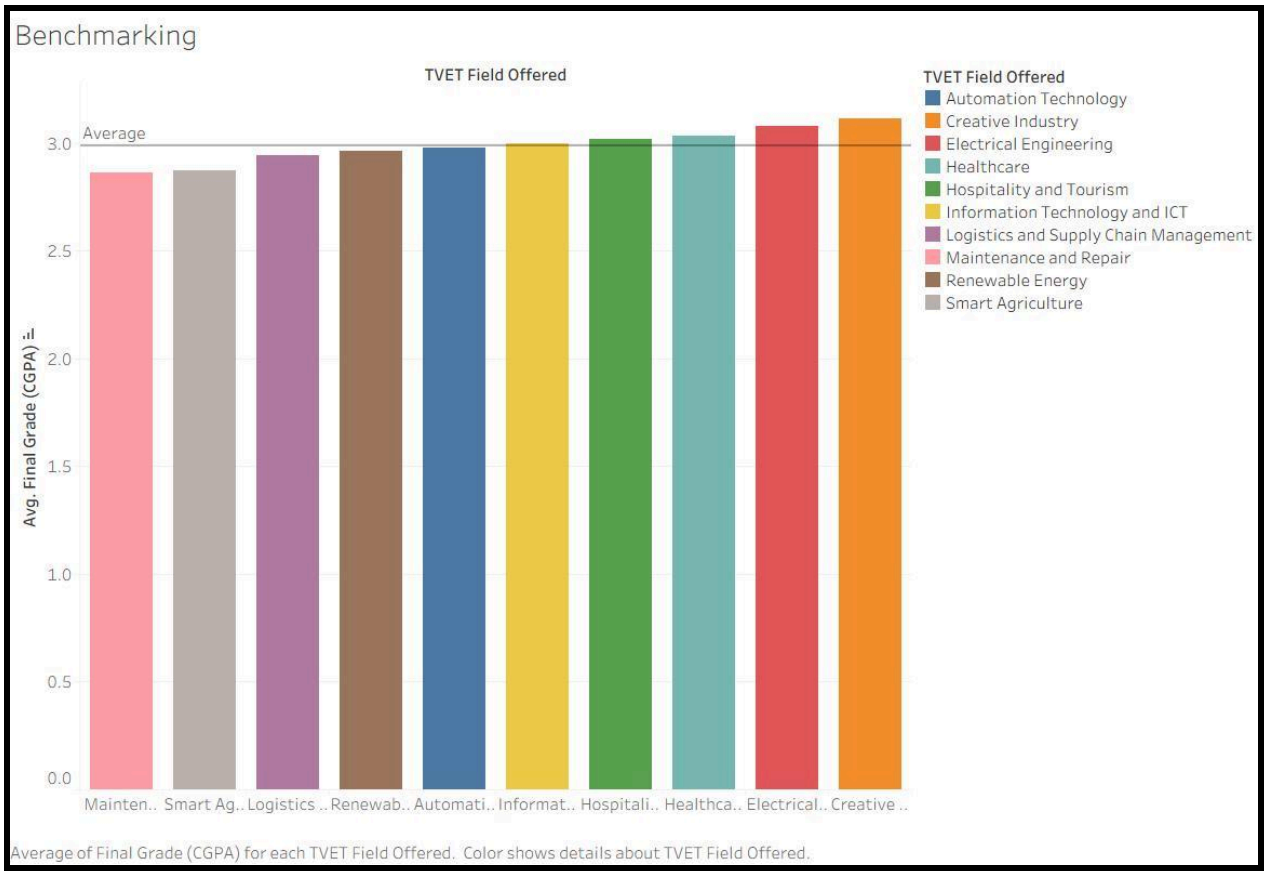
This ranking approach enables:

- Quick identification of top-performing or high-enrollment programs
- Targeting fields with high failure rates despite high student numbers
- Informing decisions about resource allocation, intervention, or curriculum reform

Such prioritization helps stakeholders focus attention where improvement is most needed.

Benchmarking – Bar Chart with Average Line

A vertical bar chart was created to display the Average Final Grade (CGPA) across various TVET Fields Offered, with a horizontal reference line indicating the overall average CGPA.Benchmarking enables the identification of categories performing above or below a defined standard. In this case, the average line serves as a benchmark to visually compare the performance of each TVET field.



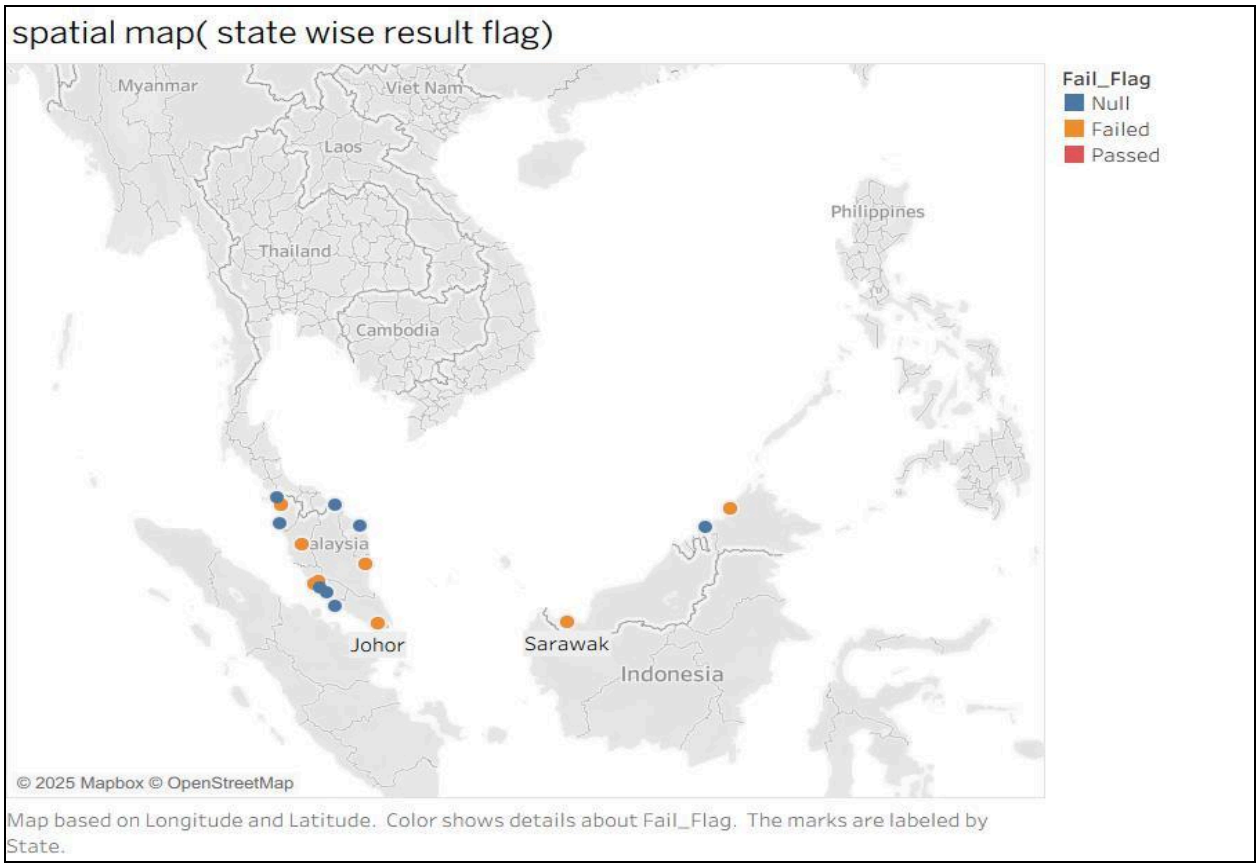
Insights from the Chart:

- Fields such as *Creative Industry* and *Electrical Engineering* show performance above the average benchmark.
- Fields like *Maintenance and Repair* or *Smart Agriculture* fall below the benchmark.
- This analytical reasoning approach supports performance evaluation, policy adjustments, and strategic planning.

By positioning a reference line, the visualization highlights the performance gap across TVET fields in a clear and intuitive manner. Benchmarking facilitates quick identification of areas requiring improvement and supports data-driven decision-making.

Clueing

Clueing refers to using visual cues such as color, shape, or size to draw the viewer's attention to specific aspects of the data. It helps users immediately recognize important patterns or anomalies without needing to explore all values in detail.



This spatial map utilizes color cues based on the Fail_Flag field to visually distinguish result outcomes (Passed, Failed, Null) across various Malaysian states. Each dot on the map represents a center, and the color of each mark serves as a visual clue to its performance classification:

- Orange indicates students who failed,
- Red indicates students who passed,
- Blue indicates null or missing data.

These visual indicators act as pre-attentive attributes, allowing the viewer to instantly identify high-failure regions or anomalies in the dataset. This kind of cueing minimizes cognitive load and enhances the interpretability of geospatial performance data—making it easier to spot regional trends and areas that may require strategic attention or improvement.

Filtering

Filtering allows viewers to isolate and examine specific segments of data without being overwhelmed by the full dataset. By narrowing down the scope of information, users can focus on particular time periods, categories, or metrics, enabling detailed analysis and comparative exploration.

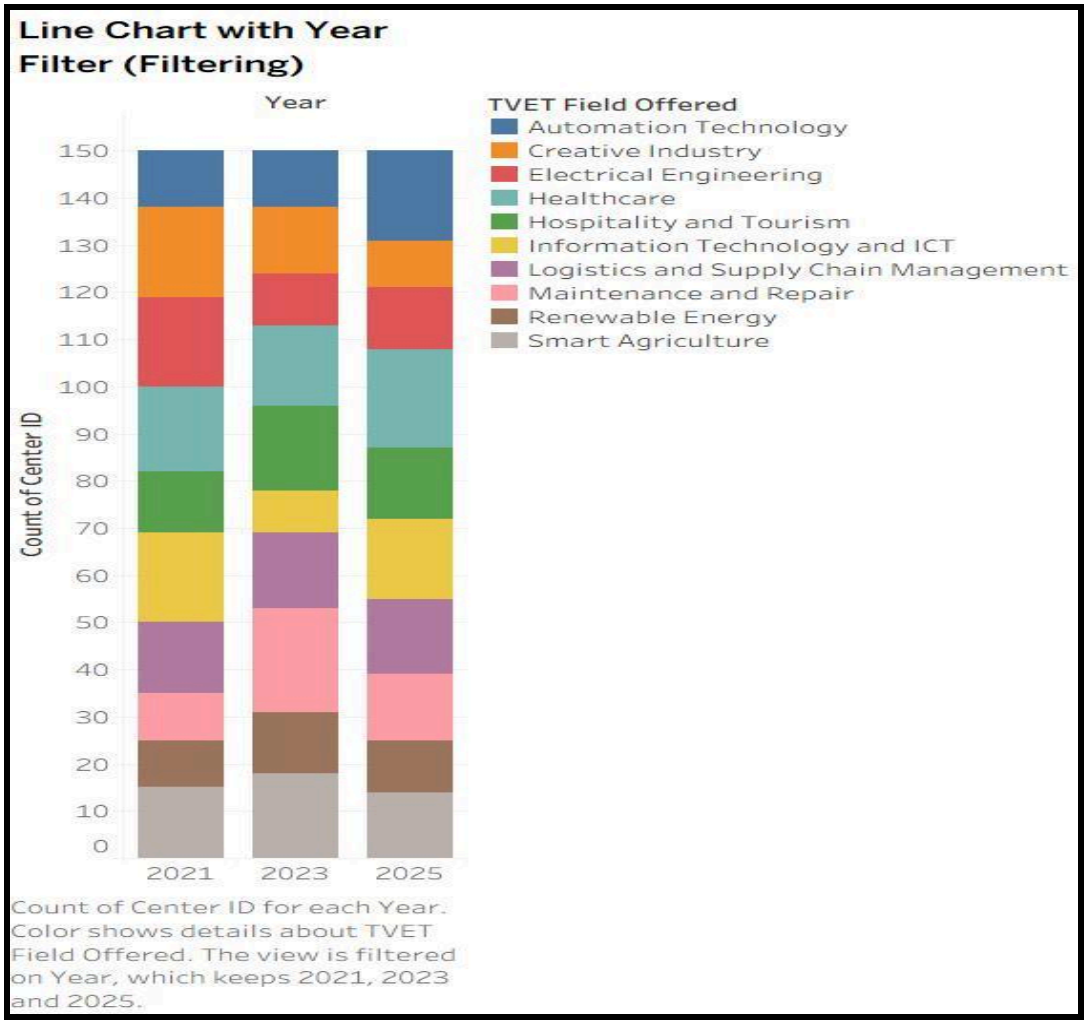


Figure: Interactive Bar Chart with Year Filter (Filtering)

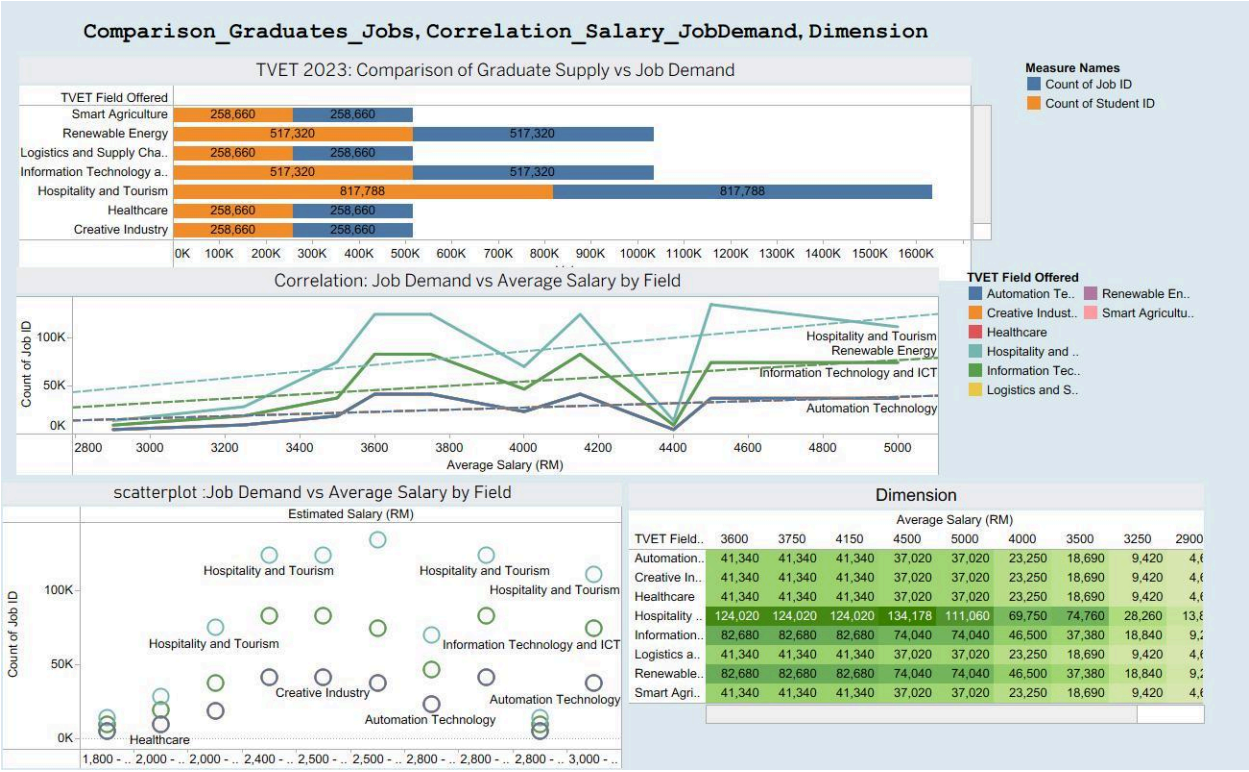
This bar chart displays the number of accredited TVET centers grouped by field and year. A filter control for Year is applied to the worksheet, allowing users to interactively select one or multiple years. This dynamic filtering enables the user to focus on a specific timeframe and analyze trends or anomalies without distractions from other periods.

The filter enhances user-driven analysis by providing flexibility to compare year-to-year changes or drill down into a particular time range. This improves clarity and supports targeted insights aligned with the principles of analytical filtering in data visualization.

Answer 4(a)Relationship Types

Below are the three required relationship types with one visual example each, labeled and explained based on the dashboards developed:

Comparison



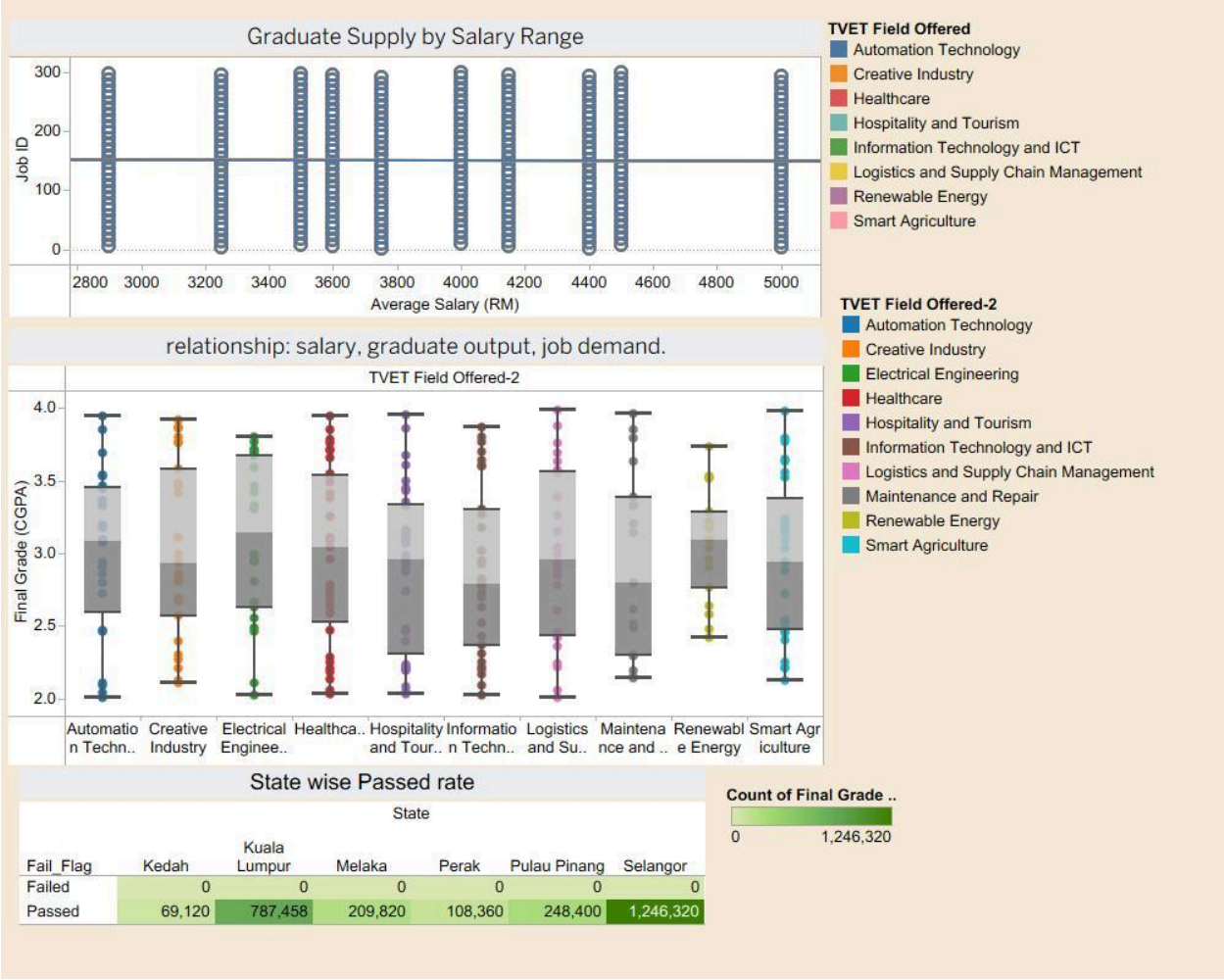
TVET Field..	3600	3750	4150	4500	5000	4000	3500	3250	2900
Automation..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Creative In..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Healthcare	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Hospitality ..	124,020	124,020	124,020	134,178	111,060	69,750	74,760	28,260	13,8
Information..	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,2
Logistics a..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Renewable..	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,2
Smart Agri..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(

This bar chart compares the number of graduates (Student ID) with available jobs (Job ID) across various TVET fields in 2023. For example, Hospitality and Tourism shows the highest job demand (over 800K), while fields like Healthcare and Smart Agriculture show a perfect 1:1 match. This comparison helps stakeholders quickly identify overproduction or undersupply in training fields, which is essential for realigning educational focus.

This line chart shows a correlation relationship between average salary (RM) and job demand (Count of Job ID) across different fields. Fields like Hospitality and Tourism and Renewable Energy show high job demand despite salary fluctuations, indicating strong industry needs. This chart reveals how salary doesn't always align with job volume, which is critical for strategic policy adjustments.

The scatter plot displays the distribution of job demand across varying salary levels for each TVET field. It shows how most Healthcare jobs cluster at lower salary levels, while Information Technology and Hospitality jobs are more spread out. This distribution helps policymakers and job seekers understand the spread and density of opportunities within salary bands, supporting informed decision-making.

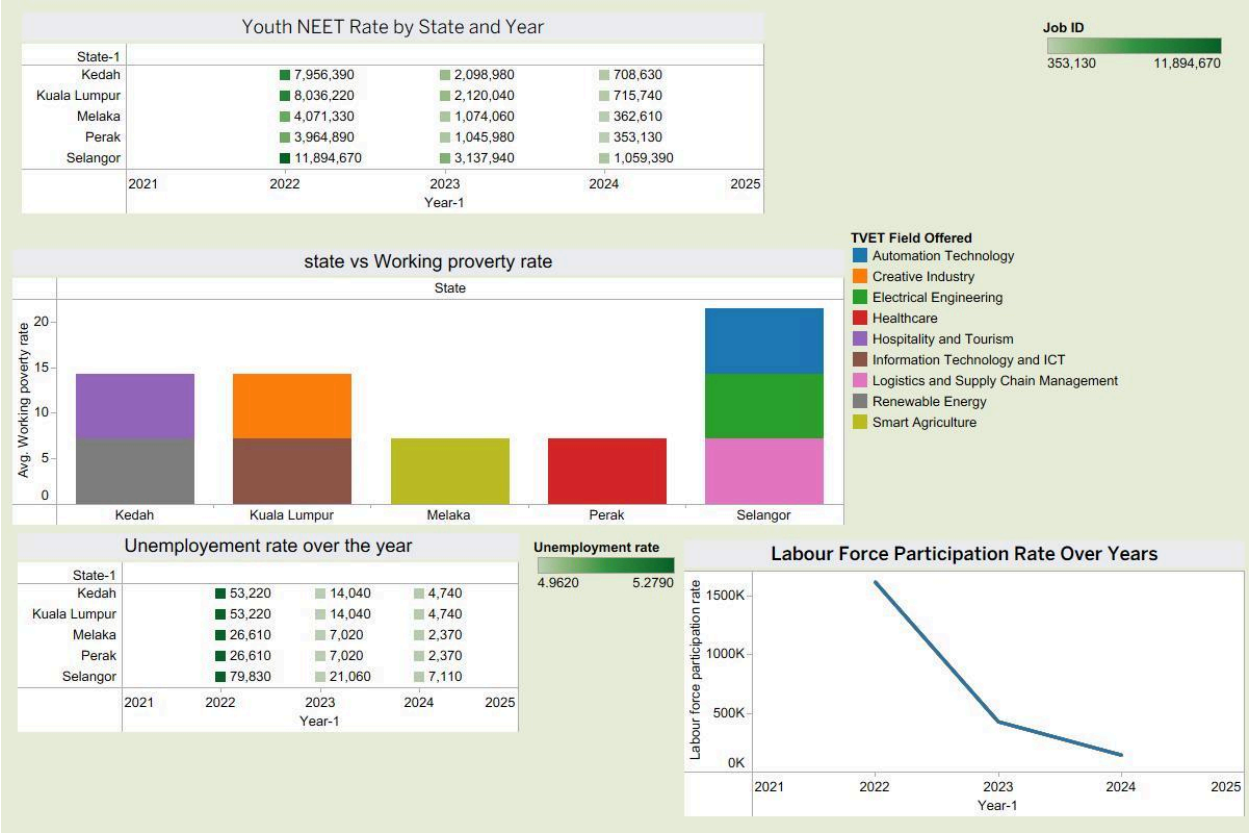
Correlation



This chart explores the correlation between student CGPA (Final Grade) and their respective TVET fields. Although not a direct numerical correlation like a scatterplot, it visually reveals that certain fields such as Creative Industry and Electrical Engineering have more consistent high performers, while others like Healthcare show a wider spread. This suggests possible relationships between field difficulty and student performance, helpful for improving curriculum or training strategies.

This dot plot shows the distribution of graduates by salary range. Each dot represents a job opportunity or graduate at a specific salary level, allowing us to see how salaries are spread out across the workforce. The relatively even spread suggests that graduates are distributed across various income levels, with no extreme concentration, indicating balanced employment across industries.

Distribution



This line chart shows the distribution of labour force participation over time from 2021 to 2024. It illustrates a downward trend, with the participation rate dropping significantly year after year. This distribution reveals a concerning national-level pattern, where fewer people are engaging in the formal workforce despite ongoing training and education programs.

This chart implies a possible correlation between state-wise development and working poverty rates. States like Selangor, which offer a wider variety of TVET fields (shown via stacked color bars), also report higher working poverty rates. This unusual trend invites deeper analysis into why diverse educational offerings do not necessarily reduce working poverty, possibly pointing to mismatched skills or underemployment.

This table allows for a comparison of NEET (Not in Employment, Education, or Training) rates across five states from 2021 to 2025. For example, Selangor consistently shows the highest NEET numbers, while Perak and Melaka have relatively lower rates. This helps identify which states may require more intervention to reduce youth unemployment and disengagement.

4(b)Pattern and Trend Identification from Overall Data Visualization

The development of the overall dashboards has uncovered several insightful patterns and trends that can support data-driven decision-making in the context of TVET infrastructure and workforce planning in Malaysia.

Identified Pattern: Mismatch Between Graduate Supply and Job Demand

One significant pattern observed is the discrepancy between the number of graduates and the availability of jobs across TVET fields. As visualized in the *Comparison_Graduates_Jobs* dashboard, fields such as *Hospitality and Tourism* and *Information Technology and ICT* show a considerable oversupply of graduates compared to available job positions. Conversely, fields like *Creative Industry* and *Healthcare* demonstrate more balanced or undersupplied conditions. This mismatch suggests that there is a misalignment between training output and labour market needs, potentially leading to underemployment or skill wastage.

This pattern highlights a critical area for policy intervention. By identifying which fields are producing an excess of graduates and which are lacking supply, education and labour authorities can realign training programs, revise course offerings, and adjust student intake according to market realities. Such data can also guide industry-academic partnerships to strengthen job placement pipelines and foster sector-specific talent development.

Identified Trend: Declining Labour Force Participation Rate

In the *Dimension* dashboard, a clear downward trend is evident in the labour force participation rate from 2021 to 2024. This indicates a steady decline in the number of individuals actively participating in the labour market, despite increased efforts in technical and vocational education and training. This trend may point to broader systemic issues such as job inaccessibility, regional disparity in employment opportunities, or a lack of incentives for workforce retention.

Understanding this trend is crucial for long-term planning. A declining participation rate undermines economic productivity and reflects potential gaps in infrastructure, policy execution, or support systems for graduates. Policymakers can leverage this insight to explore root causes, such as mismatches in wage expectations, inadequate career support services, or regional barriers to employment, and develop targeted initiatives to reverse the trend.

In summary, the dashboards not only provide a comprehensive overview of Malaysia's TVET ecosystem but also reveal actionable insights. The mismatch between supply and demand across fields, combined with the declining labour force engagement, underscores the importance of integrated planning between education, labour, and regional development sectors. These findings serve as a valuable foundation for evidence-based policy formulation and future infrastructure investment decisions.

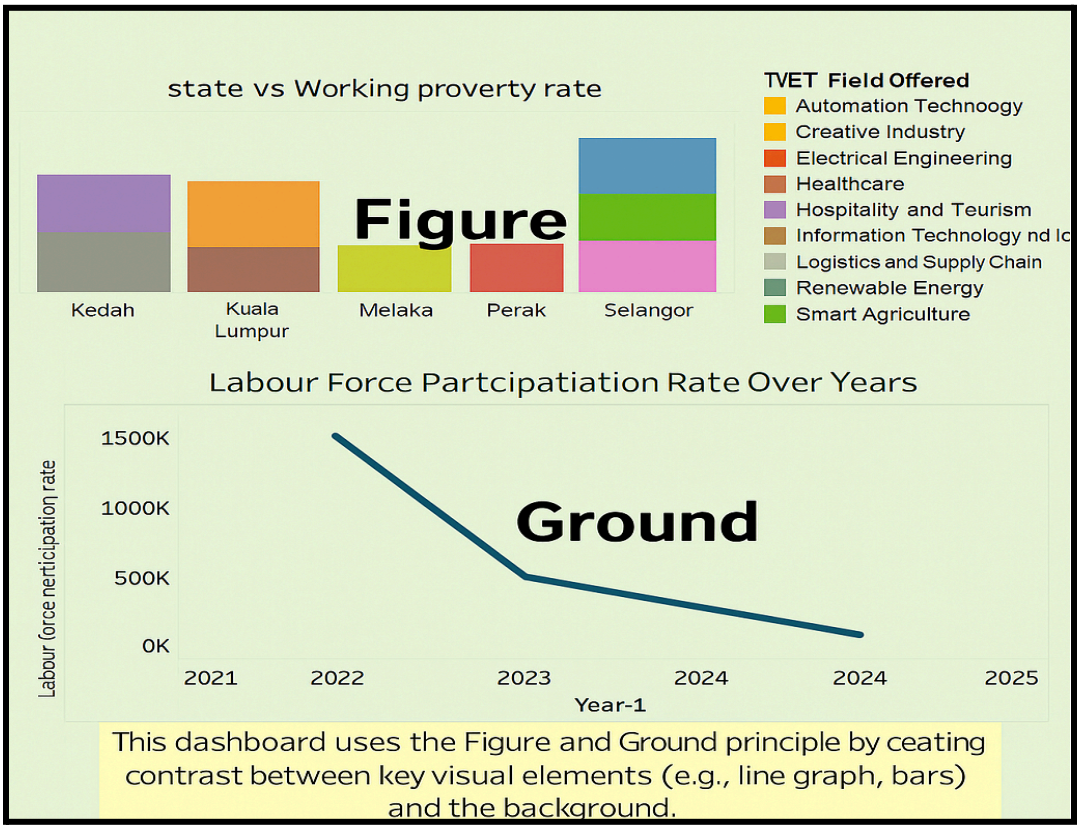
4c)Gestalt Principles

Figure and Ground

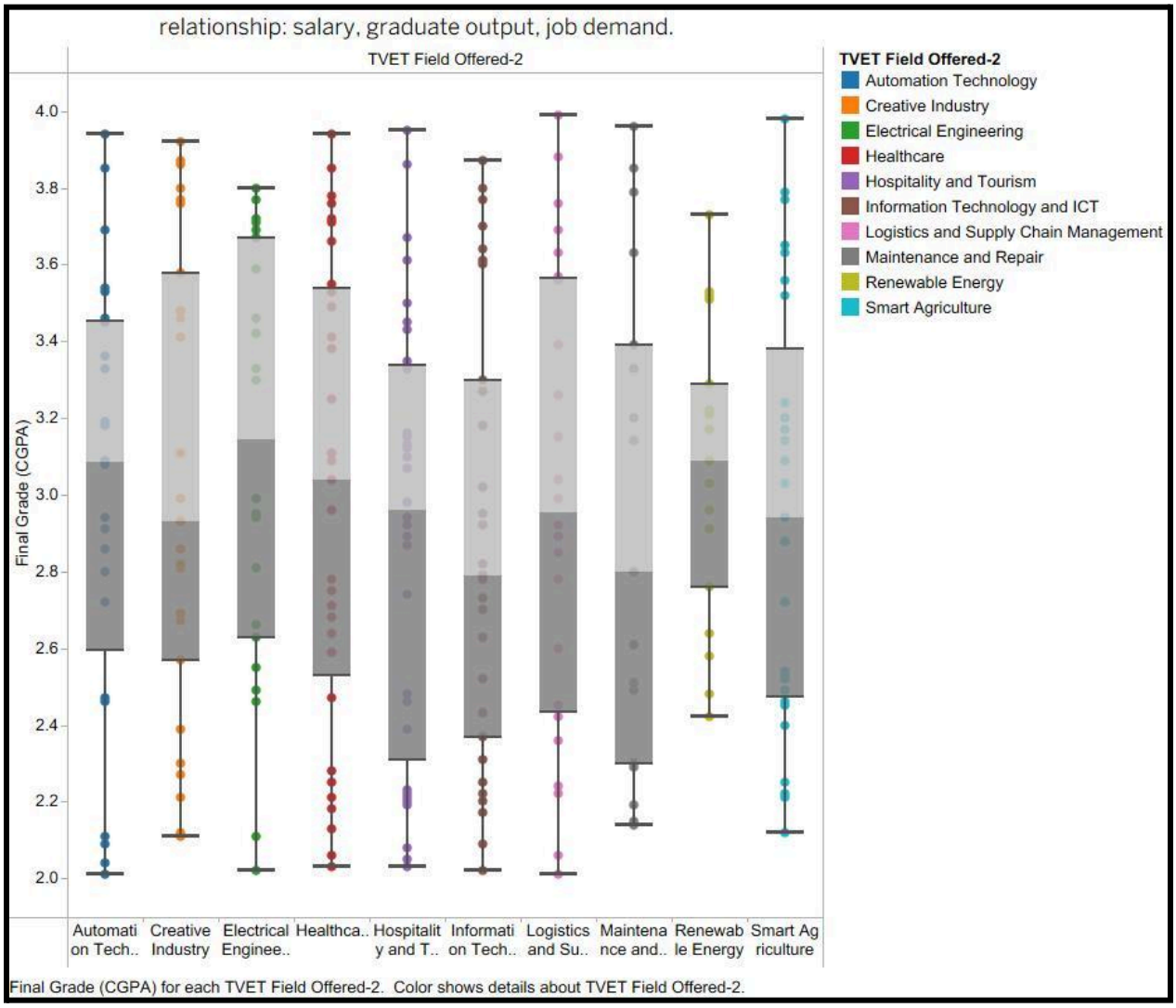
This dashboard applies the Figure and Ground principle by creating strong visual contrast between the key data elements (the “figure”) and the background (the “ground”).

- In the bar chart (top), each state's poverty rate is shown with bold, colorful bars that stand out clearly against the light background.
- In the line chart (bottom), the labour force participation rate is represented by a thick blue line that contrasts with the pale chart background.

This contrast makes it easy for viewers to focus on the most important information without being distracted, helping improve understanding and insight from the dashboard.



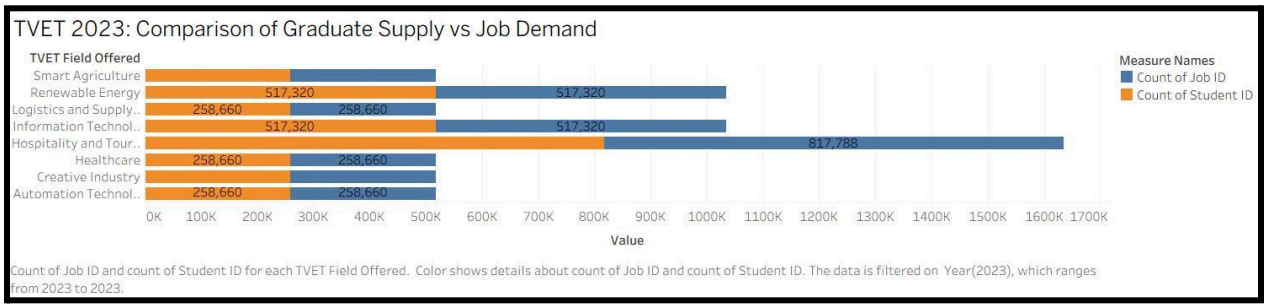
Proximity



This dashboard effectively applies the Proximity principle by visually grouping data points (CGPA scores) according to their corresponding TVET Field. Each vertical set of dots and boxes represents students' performance within a specific field, and the minimal spacing between groups allows the user to quickly interpret field-wise academic distribution.

The proximity of marks within each box encourages the brain to perceive them as a collective group rather than isolated points. This layout simplifies comparative analysis of academic performance across fields, aiding education policy analysts or administrators in making data-driven decisions regarding curriculum focus or intervention areas.

Pragnanz



This dashboard applies the Gestalt principle of Pragnanz by visually simplifying complex data into clean and easily understandable shapes. The stacked horizontal bars, separated by TVET fields, make it immediately clear where gaps exist between job demand (blue bars) and graduate supply (orange bars). Despite the large volume of data, the use of uniform bar shapes, consistent alignment, and distinct color coding allows viewers to perceive the imbalance intuitively.

For instance, the Hospitality and Tourism field shows a significant job demand exceeding graduate supply, which is visually prominent due to the extended length of the blue bar. This simple yet effective design supports decision-making by helping users identify priority areas without needing to analyze raw numbers.

5 (a) Story Development in Tableau

Introduction

In Malaysia, TVET (Technical and Vocational Education and Training) institutions play a crucial role in developing skilled workers for key economic sectors. However, questions remain about the alignment between graduate output, job demand, salary levels, and socioeconomic disparities. This Tableau story visualizes data from 2021 to 2025, revealing mismatches in supply-demand, salary disparities, and socioeconomic indicators such as poverty and unemployment.

General and Specific Concepts (Theme from Business Understanding)

The main themes of this analysis revolve around providing a comprehensive understanding of the alignment between Malaysia's TVET (Technical and Vocational Education and Training) education system and labor market dynamics. This story focuses on three primary objectives:

1. **Graduate Supply vs Job Demand Alignment**
   This theme investigates the balance between the number of graduates produced by TVET institutions and the actual demand for those skills in the job market. It highlights fields where oversupply or undersupply is evident, helping stakeholders identify gaps in workforce planning.

2. **Salary Distribution and Employment Opportunity**
   This aspect evaluates the salary trends across various TVET fields and how these relate to job demand. It provides insights into whether sectors with high demand are offering competitive remuneration, which directly affects graduate motivation, job satisfaction, and retention.

3. **Socioeconomic Disparities and Regional Workforce Readiness**
   This component explores how factors such as working poverty rate, unemployment rate, NEET rate, and labor force participation vary across Malaysian states. It assesses how these socioeconomic indicators influence graduate outcomes, helping policymakers design targeted interventions for workforce development.

Relevant Story Type

This is an "Exploratory-Explanatory" hybrid story:

- Exploratory: It allows users to interact with dashboards and compare fields, states, and salary ranges.
- Explanatory: It guides users through clear insights using comparative and trend visuals, supported by captions and filters.

Story Punchline

There is a clear misalignment between the skills produced by TVET institutions and what the job market demands—exacerbated by regional salary inequality and socioeconomic pressures. This mismatch may hinder graduate employment and workforce productivity.

Conclusion

The visual data story reveals that while TVET programs contribute significantly to Malaysia's workforce, strategic mismatches exist. To build a more effective and inclusive system, data insights must be used to realign education with actual industry needs, promote salary equity, and support underrepresented regions.

(b) Three Rationales/Justifications for Visualization in Decision-Making

1. **Strategic Workforce Planning through Graduate-Job-Salary Alignment**
   The dashboards visualize graduate supply, job demand, and salary data by TVET fields. This enables policymakers and training agencies to:

   - Identify oversupply (e.g., Smart Agriculture, Healthcare) or undersupply (e.g., Hospitality and Tourism).
   - Allocate training resources to fields with higher demand and better salary prospects.
   - Forecast future demand and plan graduate output accordingly.

→ Decision Impact: Supports strategic realignment of education pathways with labour market needs.

2. **Identifying Socioeconomic Risk Zones Across States**
   By mapping Youth NEET rate, unemployment, and working poverty rate over time and across states, the dashboard provides:

   - Targeted insights into which regions are lagging behind (e.g., Selangor has higher working poverty rate and NEET numbers).
   - Evidence to channel resources for job creation, upskilling, and state-specific policy intervention.
   - Understanding of how social inequalities affect employment and workforce participation.

→ Decision Impact: Helps government prioritize support for high-risk states and populations.

3. **Benchmarking CGPA and Employability by Field**
   The CGPA box plots and salary distribution charts by TVET field reveal:
   - Which fields consistently produce high-achieving students.
   - Whether good academic performance is translating into well-paid job opportunities.
   - Whether specific fields need curriculum revamp, better industry linkage, or employment support.

→ Decision Impact: Informs curriculum planners and academic boards to improve employability outcomes.

(c) Proposed Solutions and Recommendations for TVET Improvement

Based on the insights from the developed visualizations, the following data-driven recommendations are proposed to strengthen Malaysia's TVET workforce development:

1. **Realign TVET Programs with Job Market Needs**
   Focus on high-demand sectors like Hospitality and Tourism and reduce overproduction in saturated fields through intake planning.

2. **Establish Salary Benchmarks to Attract Talent**
   Ensure competitive salaries in growing sectors (e.g., Renewable Energy, Logistics) to retain skilled workers and reduce brain drain.

3. **Expand Targeted Support to Socioeconomically Disadvantaged States**
   Introduce special employment schemes, skill subsidies, or partnerships in states with high NEET/unemployment rates.

4. **Develop a National Graduate-to-Job Matching Portal**
   Link TVET graduates with employers using data insights on demand-supply balance by field and region.

5. **Monitor and Optimize Graduate Performance (CGPA)**
   Encourage performance-based funding or curriculum enhancements in fields showing low employment despite high grades.

6. **Promote Industry Collaboration**
   Regularly update course offerings in collaboration with industry experts to keep TVET programs aligned with real-world skills.

Answer 6(a): Lower-Level Structure – 15 Worksheets

To support the business understanding defined in Question 1, I have developed 15 worksheets in Tableau, each reflecting a unique insight related to TVET education, graduate outcomes, and job market dynamics in Malaysia. These visualizations help uncover patterns, mismatches, and opportunities within the education-to-employment pipeline.

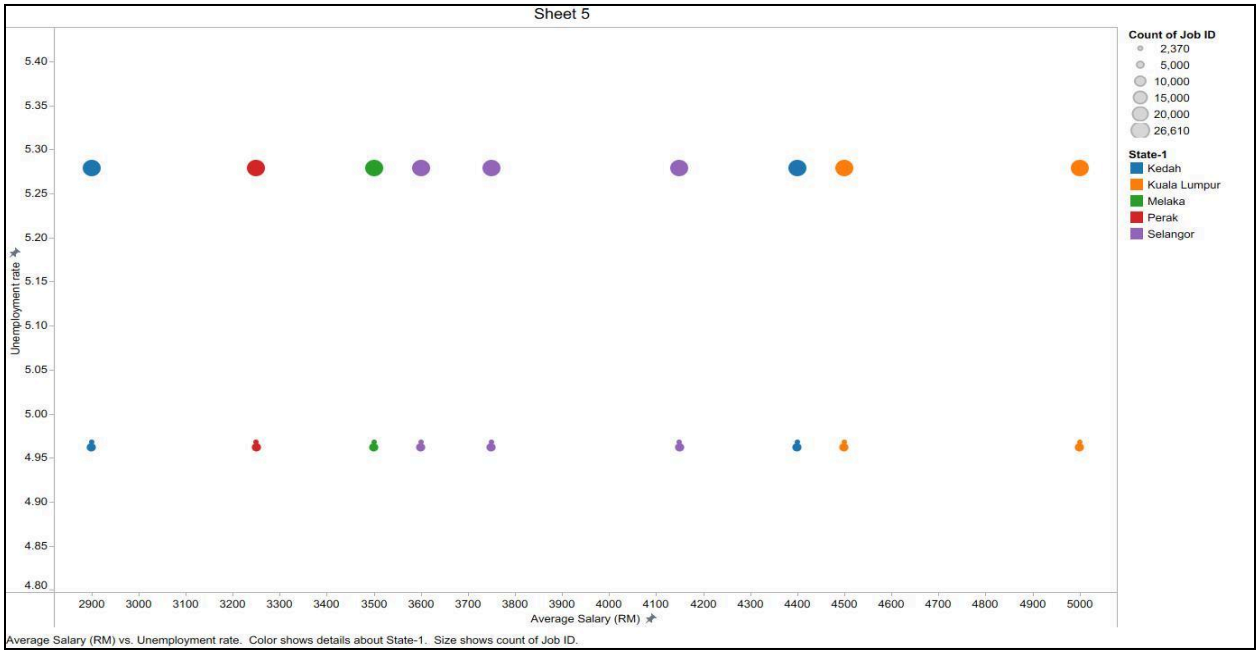
Among these, I have incorporated at least three advanced visualization techniques from the required list:

1. Heatmap

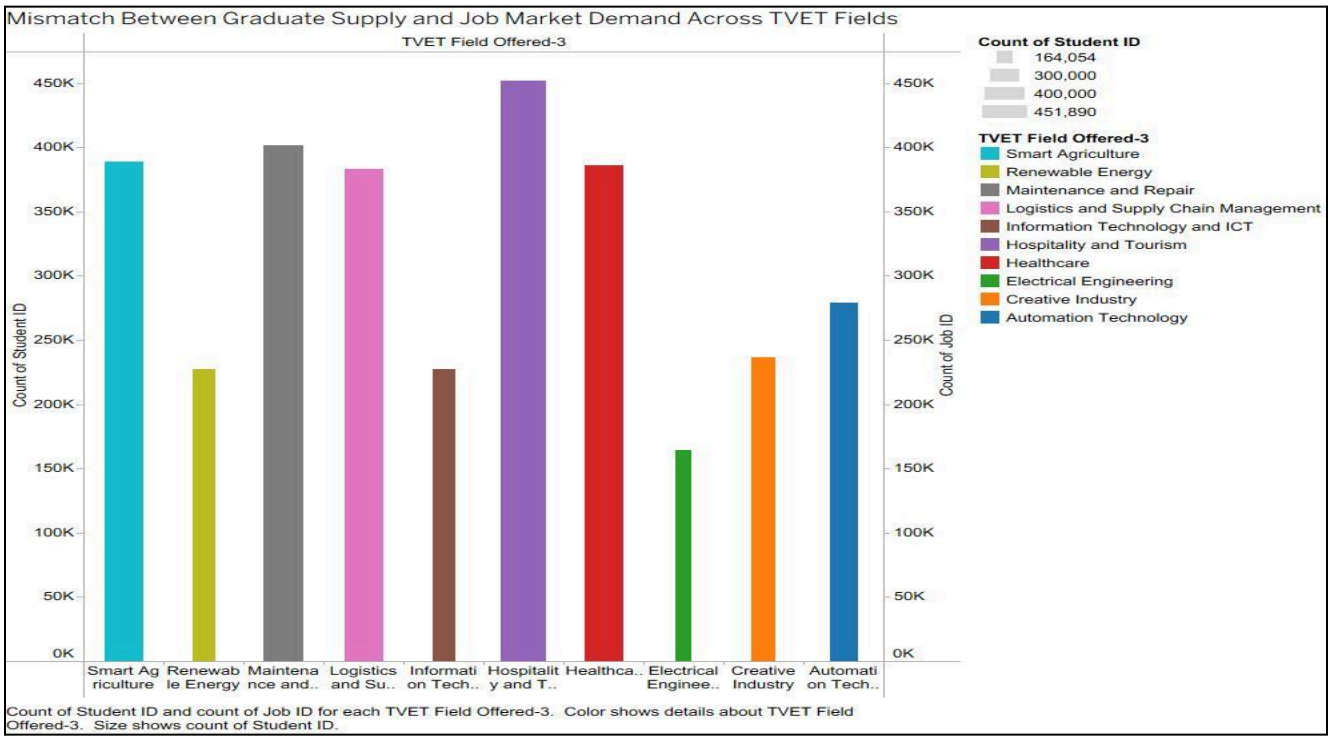
TVET Field Offered	3600	3750	4150	4500	5000	4000	3500	3250	2900	4400
Automation Technology	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Creative Industry	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Healthcare	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Hospitality and Tourism	124,020	124,020	124,020	134,178	111,060	69,750	74,760	28,260	13,860	13,860
Information Technology a..	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,240	9,240
Logistics and Supply Cha..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Renewable Energy	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,240	9,240
Smart Agriculture	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620

Count of Student ID broken down by Average Salary (RM) vs. TVET Field Offered. Color shows count of Student ID. The marks are labeled by count of Student ID.

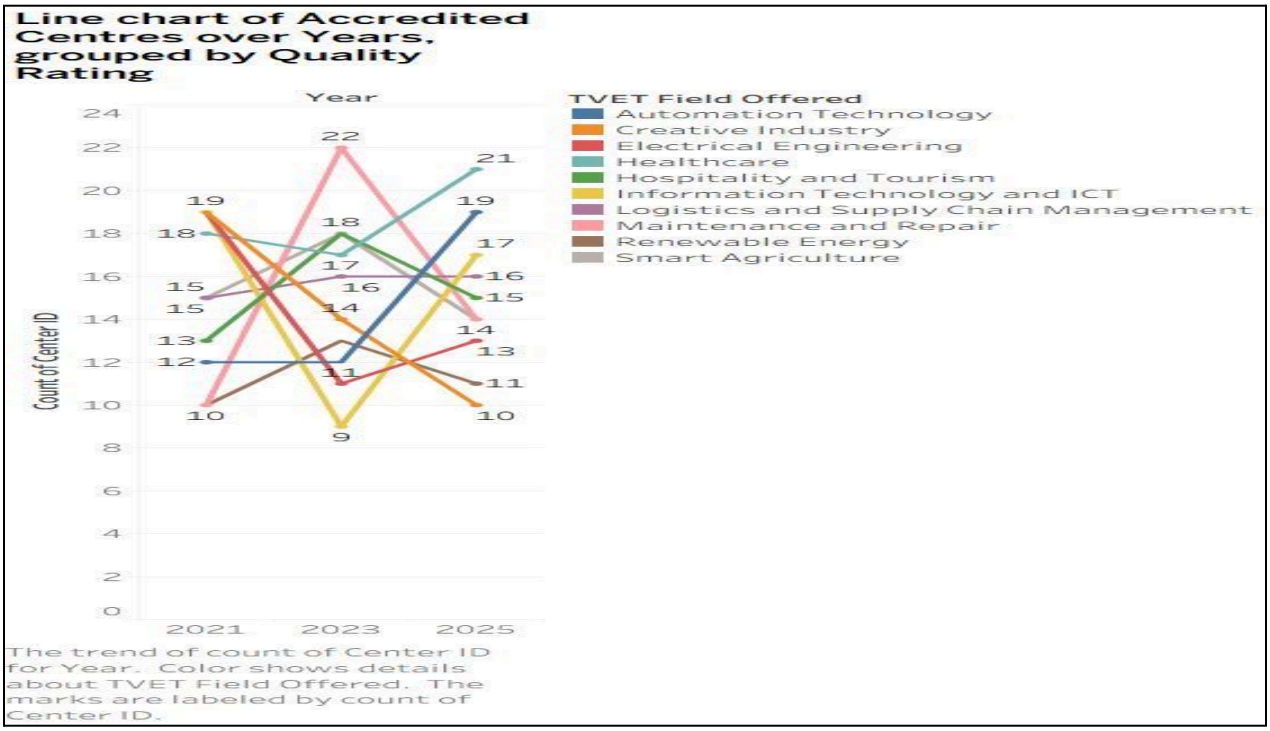
2. GapMinder-style Bubble Chart



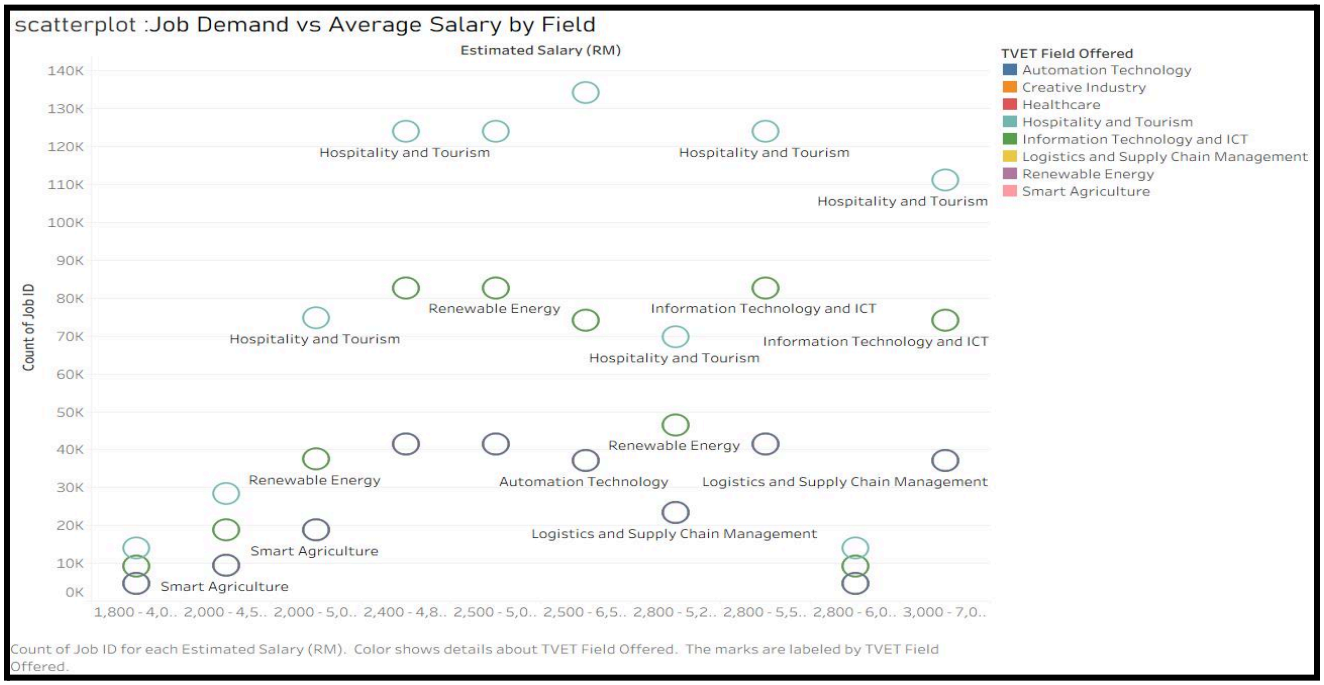
3. GapMinder-style Chart



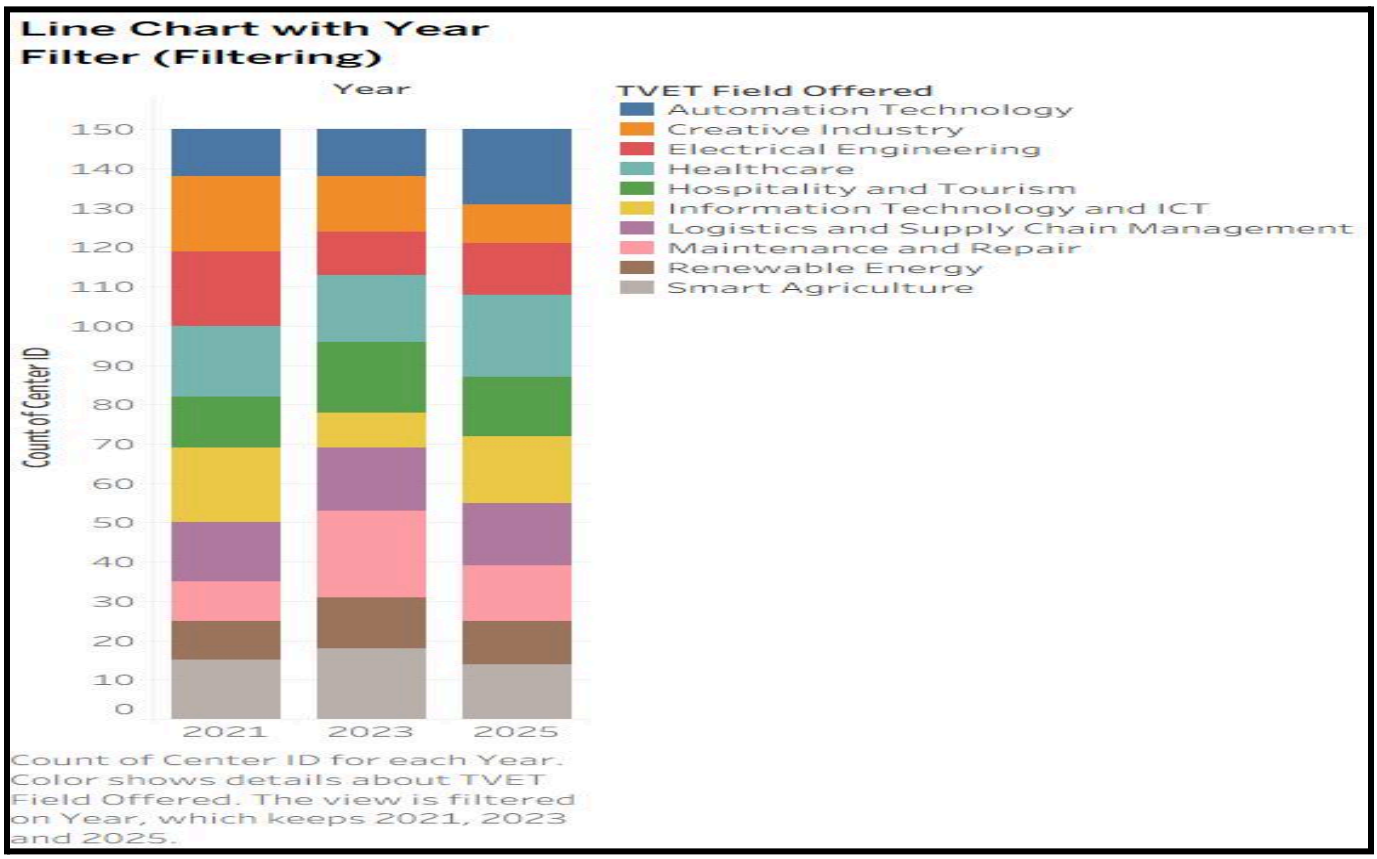
4. Accredited TVET Centres Over Time by Field (Line Chart)



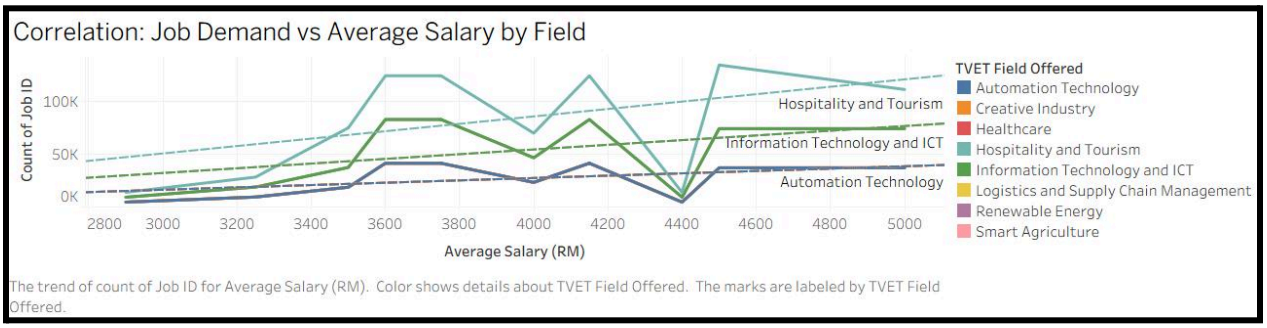
5. Job Demand vs Average Salary by Field (Scatter Plot)



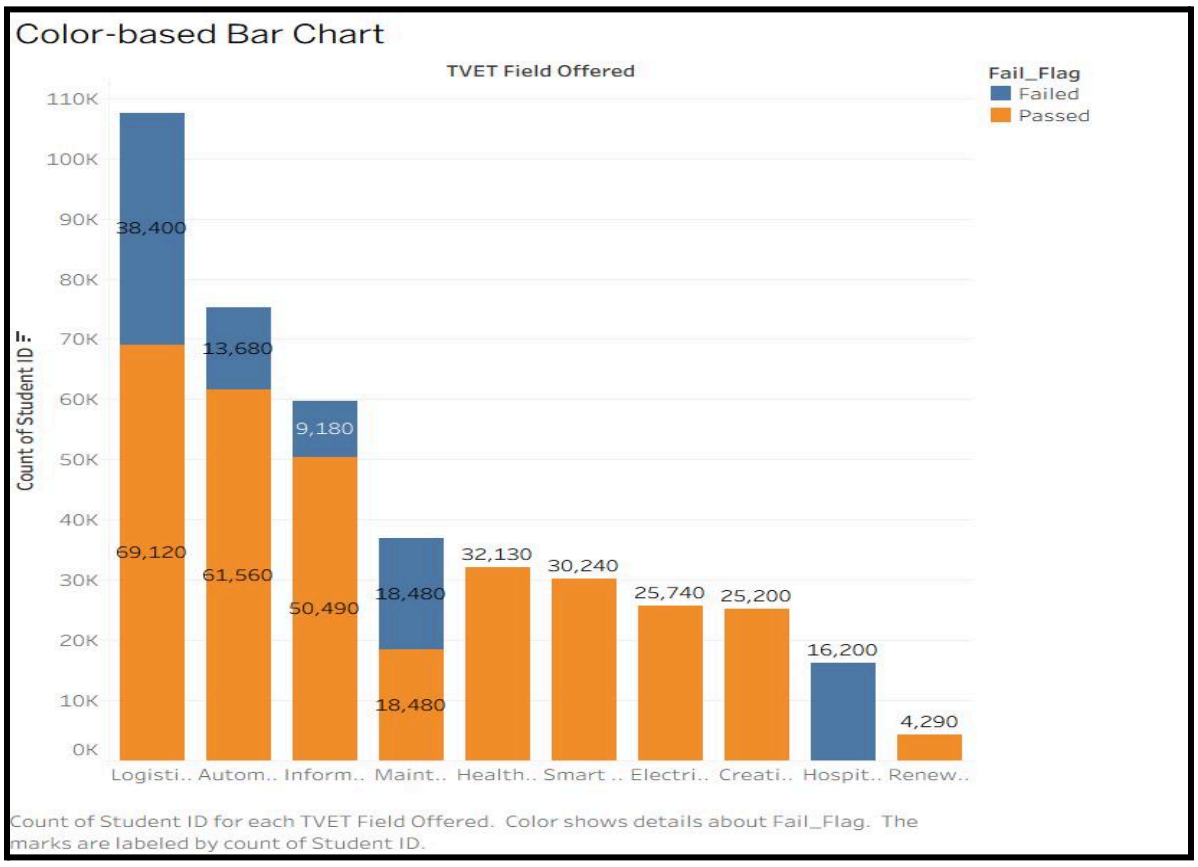
6. TVET Centre Distribution Over Years (Stacked Bar with Year Filter)



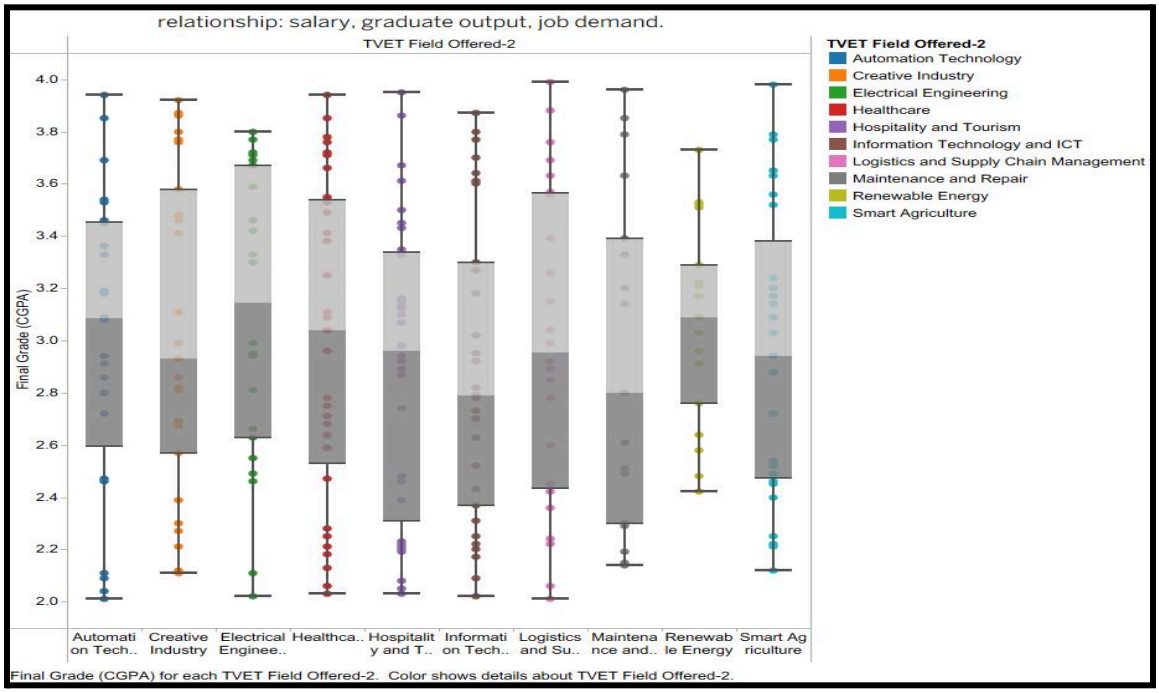
8. Scatterplot: Job Demand vs Average Salary by Field



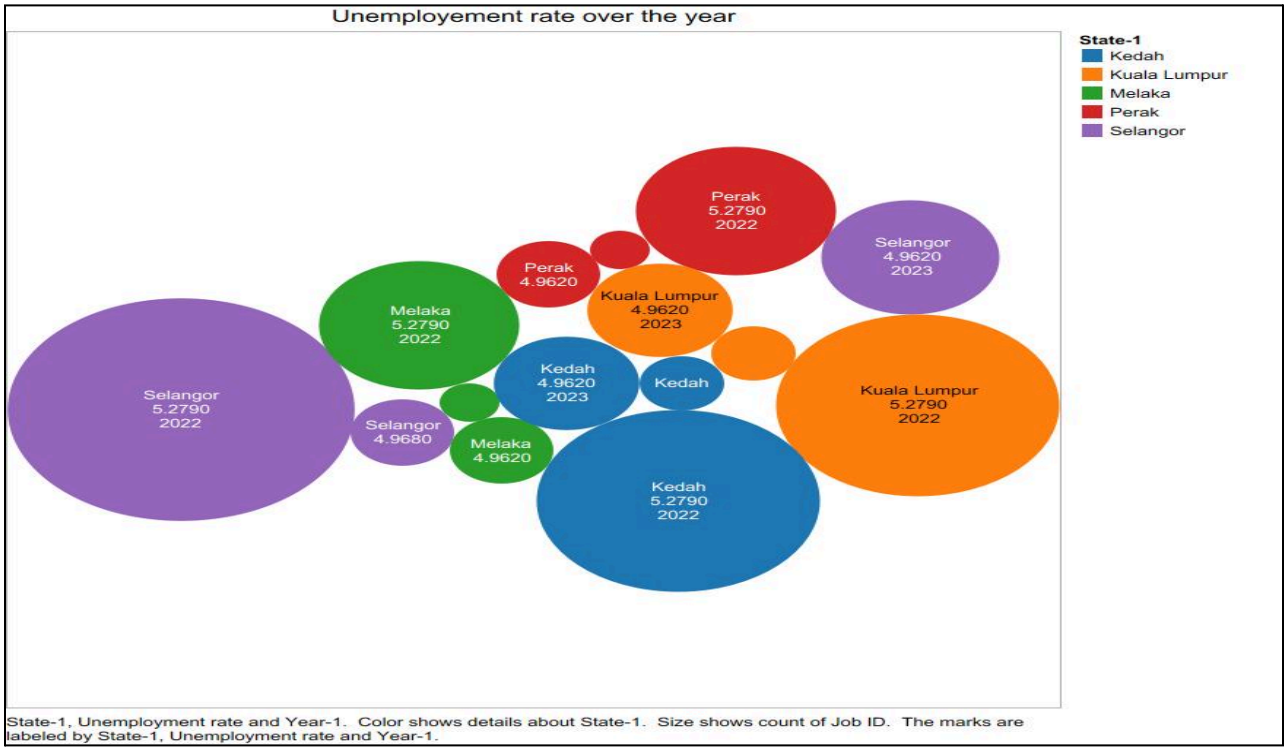
9. Color-based Bar Chart (Pass/Fail Rate by Field)



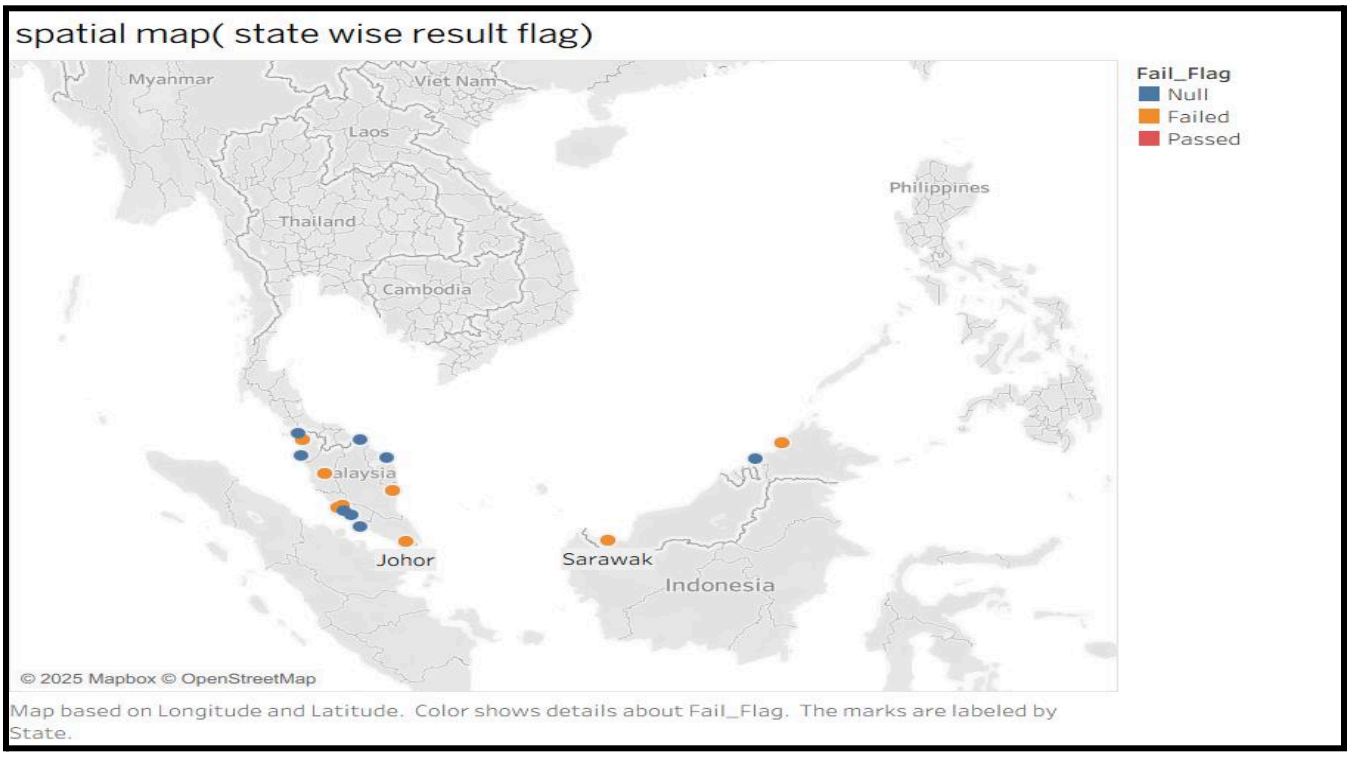
10. Boxplot- CGPA Distribution by State



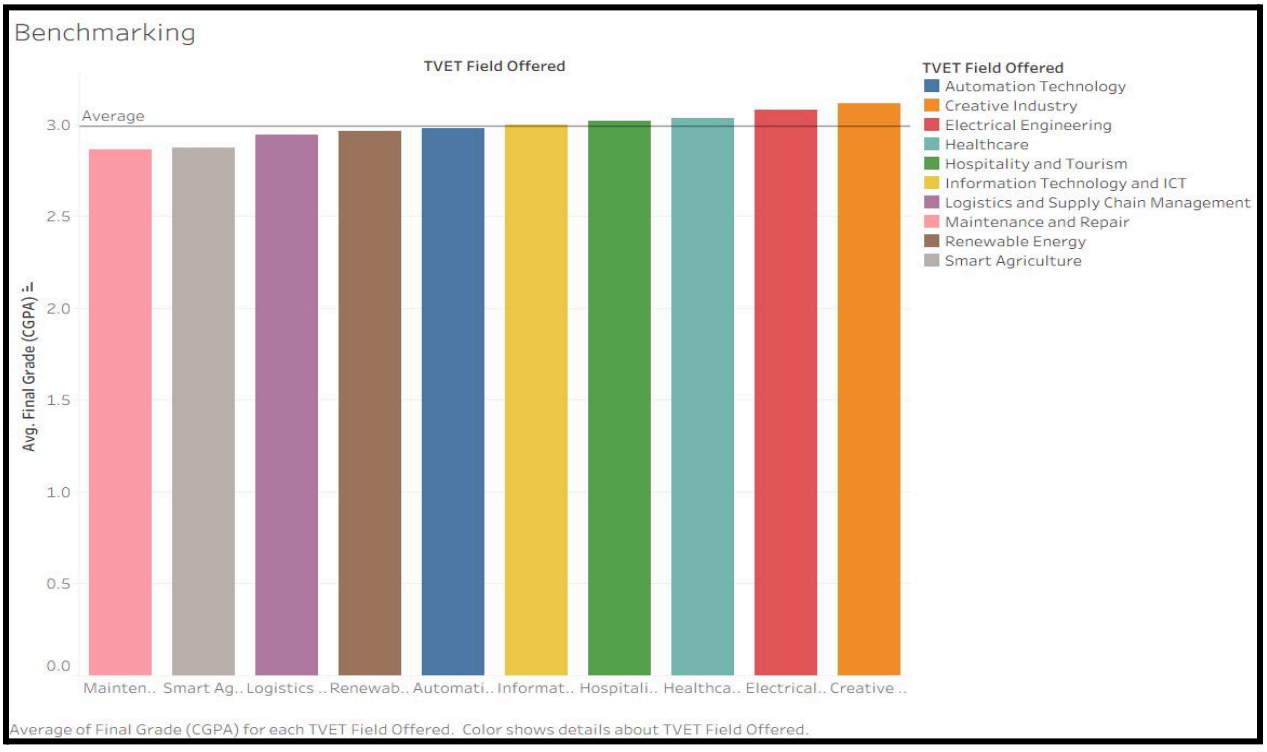
11. Bubble Chart – Unemployment Rate



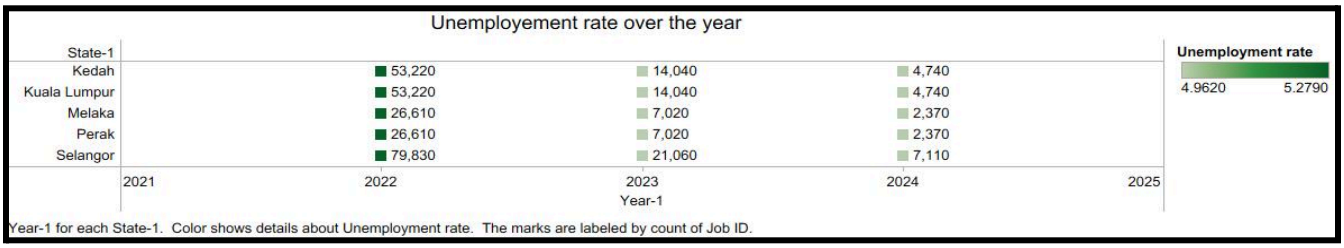
12. Spatial Map (Result Flags by State)



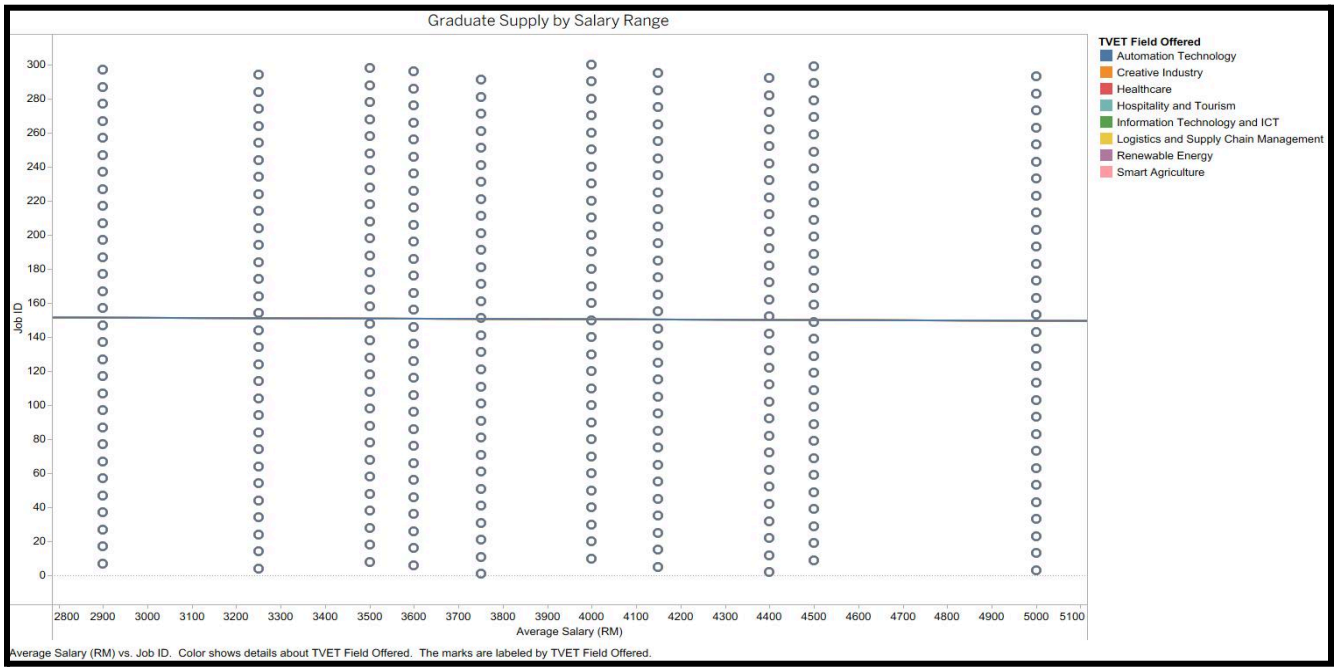
13. Bar Chart of Avg. CGPA by Field



14. Unemployment Rate Over the Years (2021–2024) – Heatmap Table by State

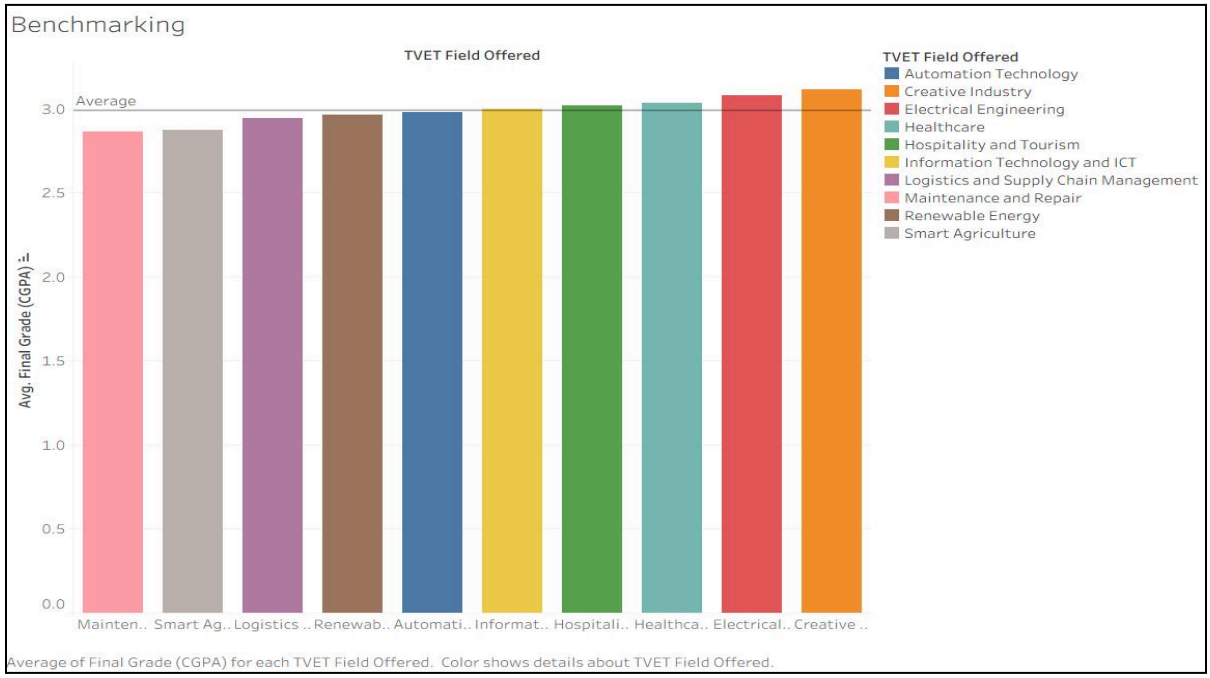


15. Dot Matrix Plot – Salary Distribution



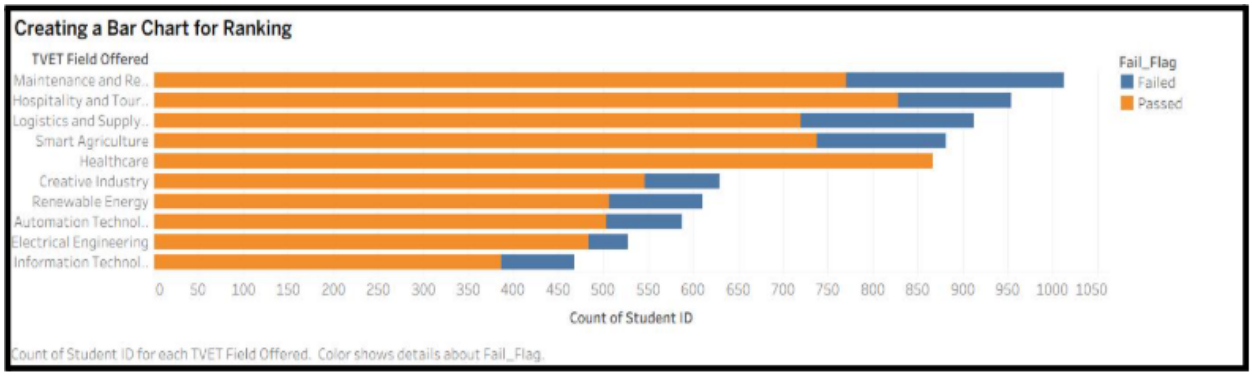
6(b) Application of Analytical Reasoning Techniques in Tableau Visualizations

Benchmarking



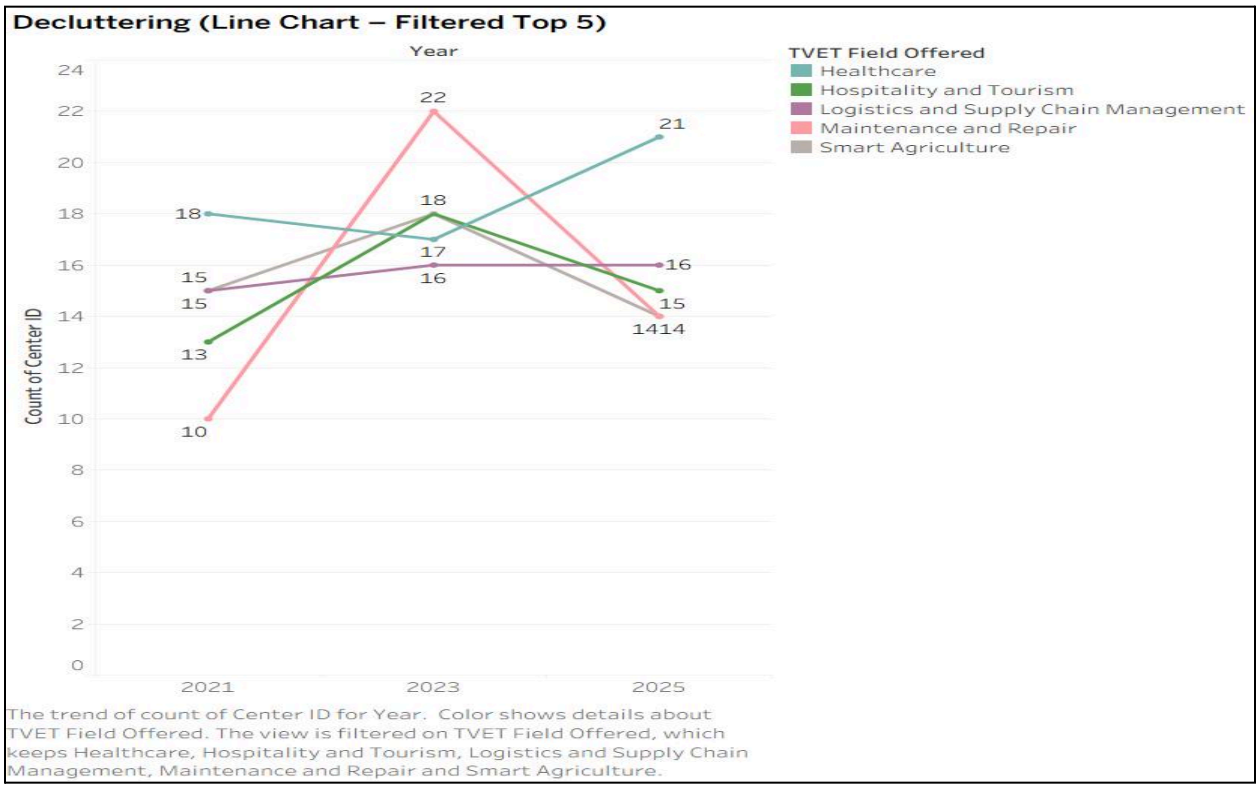
- **Purpose**: This chart helps compare each TVET field's average CGPA against the overall average line. It identifies which fields are performing above or below the benchmark, facilitating performance evaluation.
- **Reasoning**: Users can quickly recognize strong and weak-performing fields relative to the national average.

Ranking



- **Purpose**: The chart ranks TVET fields based on student count, enabling identification of fields with the highest number of students and fail flags.
- **Reasoning**: It supports decision-makers in spotting overcrowded or underperforming fields and prioritizing improvement strategies.

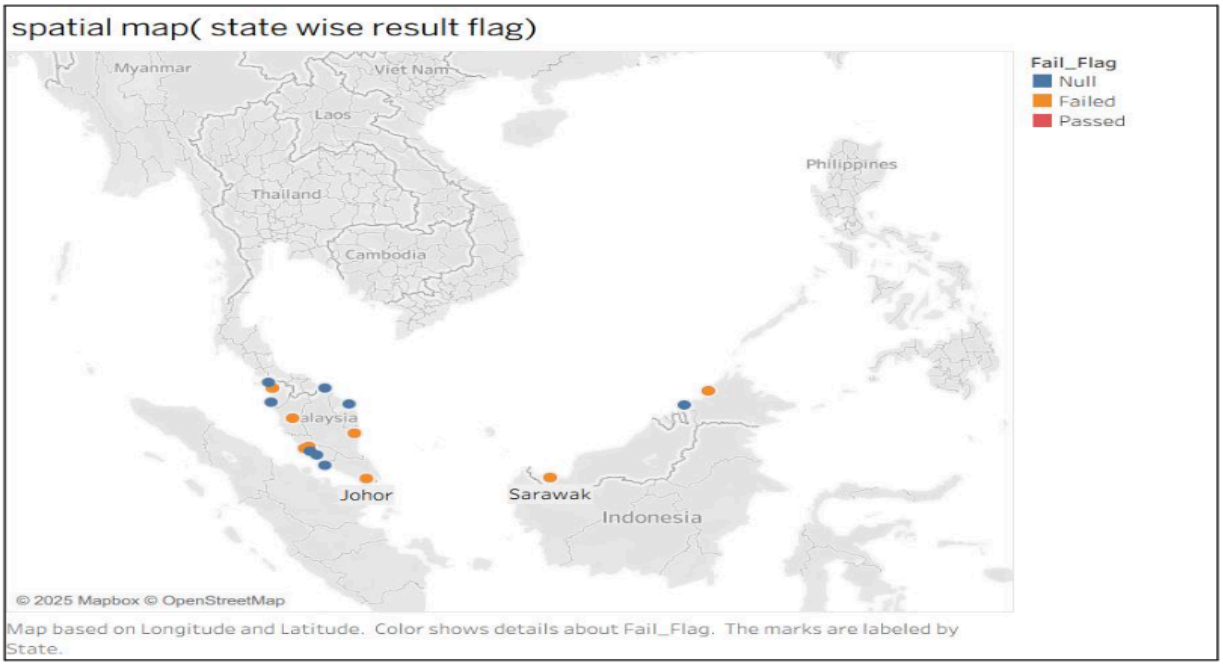
Decluttering



- **Purpose**: This line chart is simplified by showing only the top 5 most relevant TVET fields, avoiding visual overload and enabling clearer pattern detection.

- **Reasoning**: Reducing data clutter allows users to focus only on key trends, making interpretation faster and cleaner.

Clueing



- **Purpose**: The map uses colors (red/orange/blue) to give visual clues about pass/fail status in each state, guiding the viewer to potential problem regions.
- **Reasoning**: This aids in regional targeting of education policies or interventions by visually indicating performance zones.

Answer 7. Interconnection

a. Development of THREE Dashboards with Two Relationship Types

In this project, a total of three interactive Tableau dashboards were developed using worksheets from Question 6. Each dashboard visualizes distinct aspects of TVET graduate data and labor market dynamics using different types of analytical reasoning. The two reasoning types highlighted are Differences and Distribution.

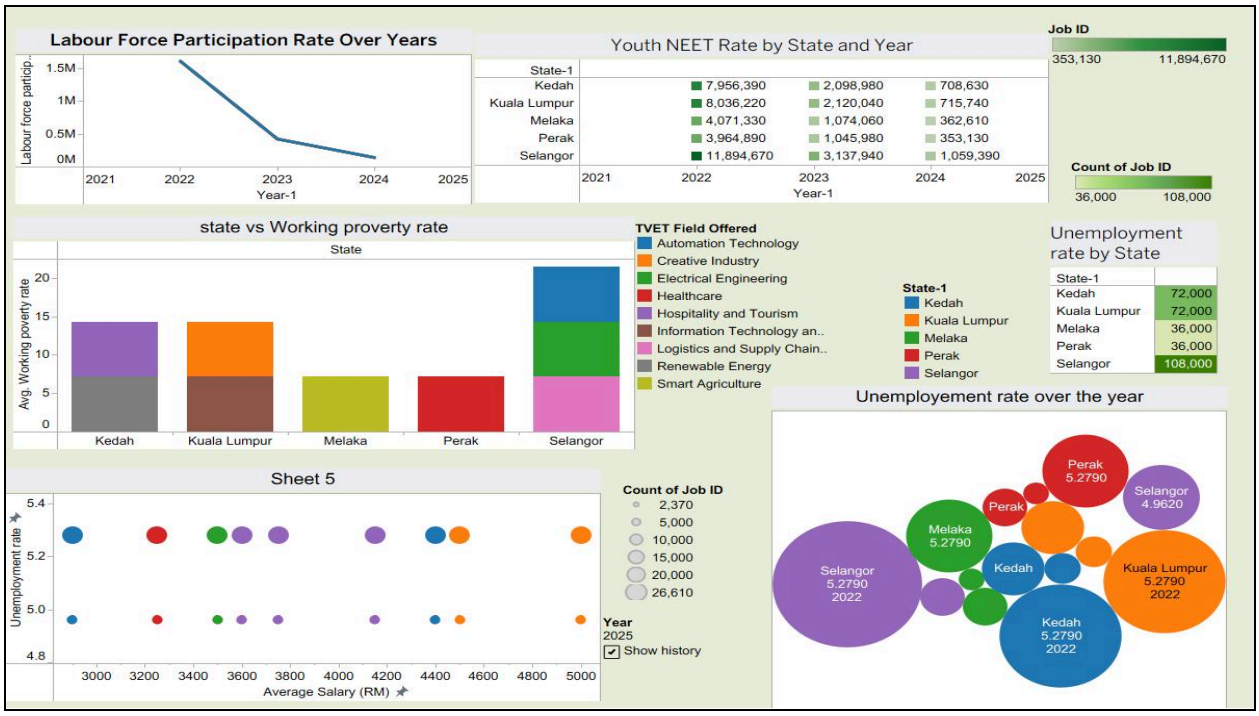
Dashboard 1: Graduate Supply vs Job Demand and Salary Trends

- Differences: This dashboard includes a bar chart comparing the number of graduates vs. job market demand across various TVET fields. This highlights the supply-demand mismatch.

- Distribution: A box plot shows the distribution of CGPA scores by field, and a dot plot visualizes graduate supply across salary ranges, demonstrating the spread of graduates in relation to salary expectations

Dashboard 2: Socioeconomic Indicators and Employment Outcomes

- **Differences**: The working poverty rate and unemployment rate are compared across states using bar charts and bubble charts, indicating disparities between regions.
- **Distribution:** A scatter plot (Sheet 5) visualizes unemployment rate spread across salary levels, revealing variations in employment status across salary brackets.



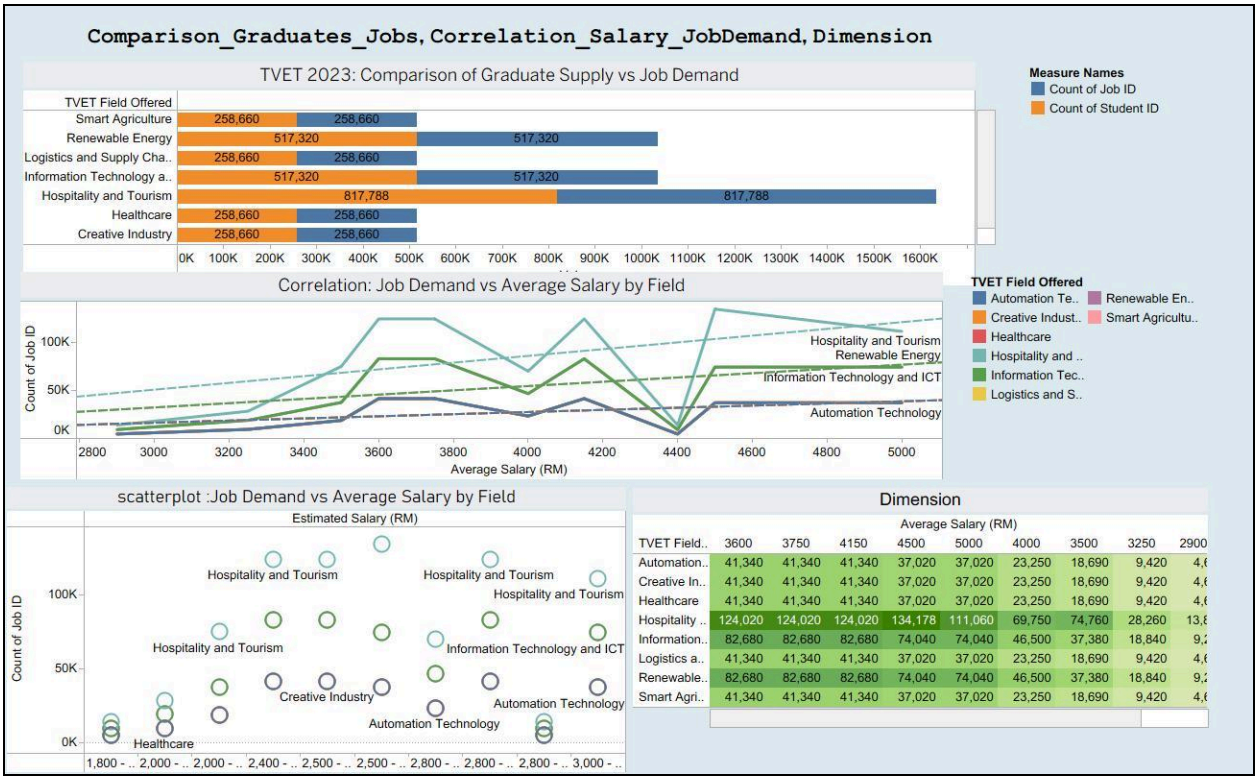
Dashboard 3: Graduate Performance and Field-Wise Salary Heatmap

Differences:

The horizontal bar chart titled "TVET 2023: Comparison of Graduate Supply vs Job Demand" effectively highlights the **differences** between the number of graduates and the actual job market demand across various TVET fields. Each bar visually contrasts the graduate supply (student ID count) against job demand (Job ID count), enabling stakeholders to easily identify mismatches such as surplus in Smart Agriculture and shortages in fields like Hospitality and Tourism.

Distribution:

The scatter plot titled "Job Demand vs Average Salary by Field" demonstrates **distribution** by plotting the spread of job opportunities across different salary ranges for each TVET field. Each bubble represents a field, with the size indicating the volume of job demand. This visualization allows us to see how job demand is distributed across salary brackets, revealing fields like Hospitality and Tourism with widespread opportunities at various salary levels, while others like Healthcare remain more concentrated in the lower range.



7b. Pattern and Trend Identified from the Dashboard

Pattern Identified:

From the scatter plot and correlation line chart, a consistent mismatch pattern is observed between graduate supply and job demand. For example, fields like Smart Agriculture and Creative Industry show a high number of graduates but relatively low job demand. In contrast, Hospitality and Tourism has higher job demand than graduate supply, indicating an imbalance between educational output and labor market needs.

Trend Identified:

A positive trend is visible in the line chart titled *"Correlation: Job Demand vs Average Salary by Field."* Fields with higher job demand such as Hospitality and Tourism and Renewable Energy tend to offer higher average salaries, especially in the RM 4000–5000 range. This suggests a trend where industries with more job openings are also offering better pay, possibly to attract talent.

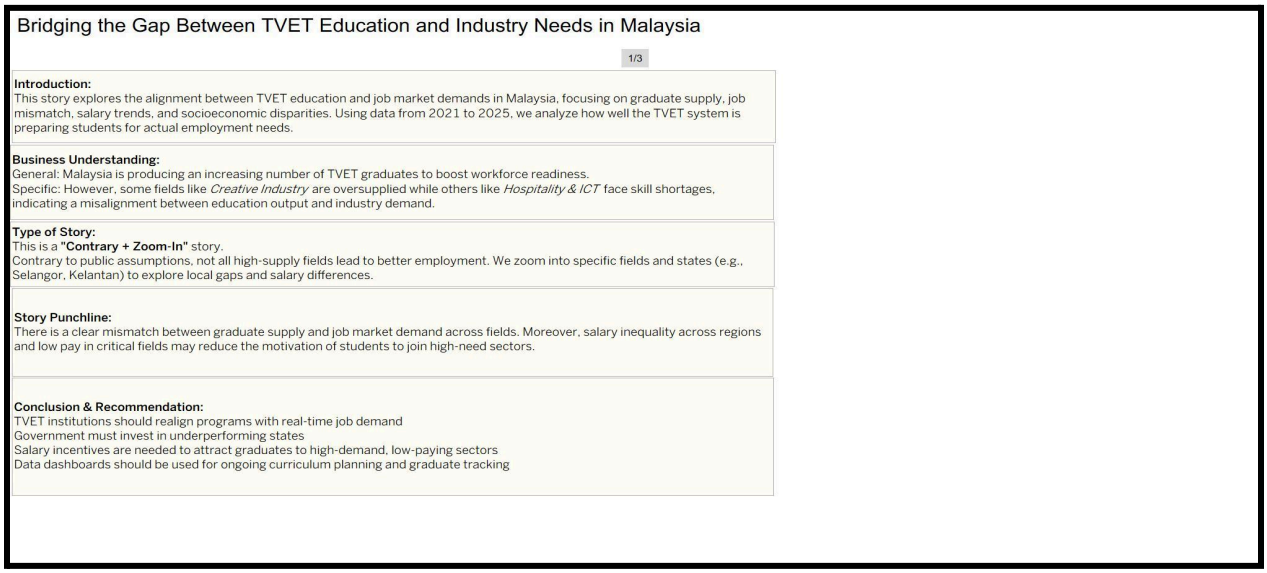
8(a): Develop ONE STORY in Tableau using dashboards and worksheets

Answer:

A single Tableau Story was developed to present the critical issue of graduate supply and job market demand mismatch in Malaysia's TVET (Technical and Vocational Education and Training) sector. The story consolidates multiple dashboards and worksheets into three logical segments:

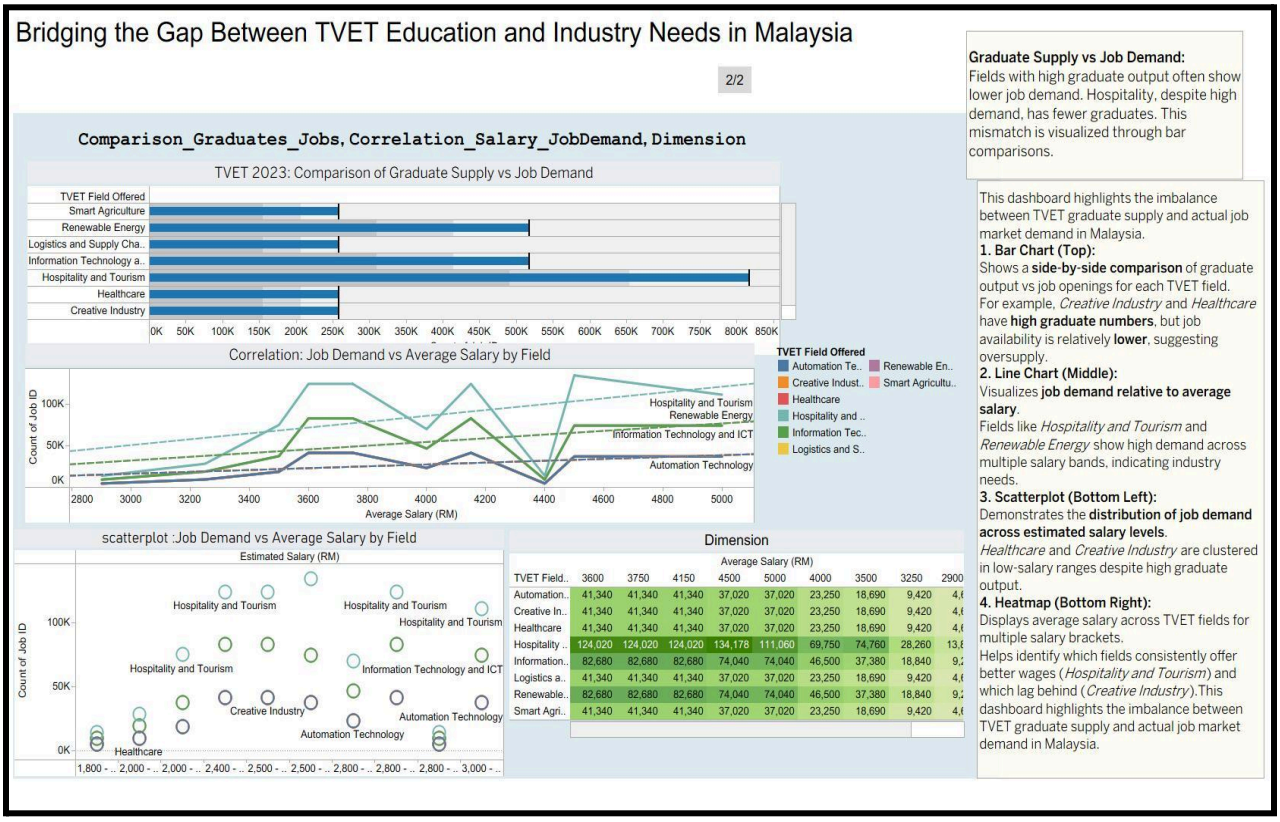
1. **Slide 1 – Introduction & Business Understanding:**

    - Introduces the problem by outlining the rise in TVET graduates vs job market absorption.
    - Explains the misalignment between supply and demand, especially in fields like *Creative Industry* (oversupply) and *Hospitality & ICT* (undersupply).



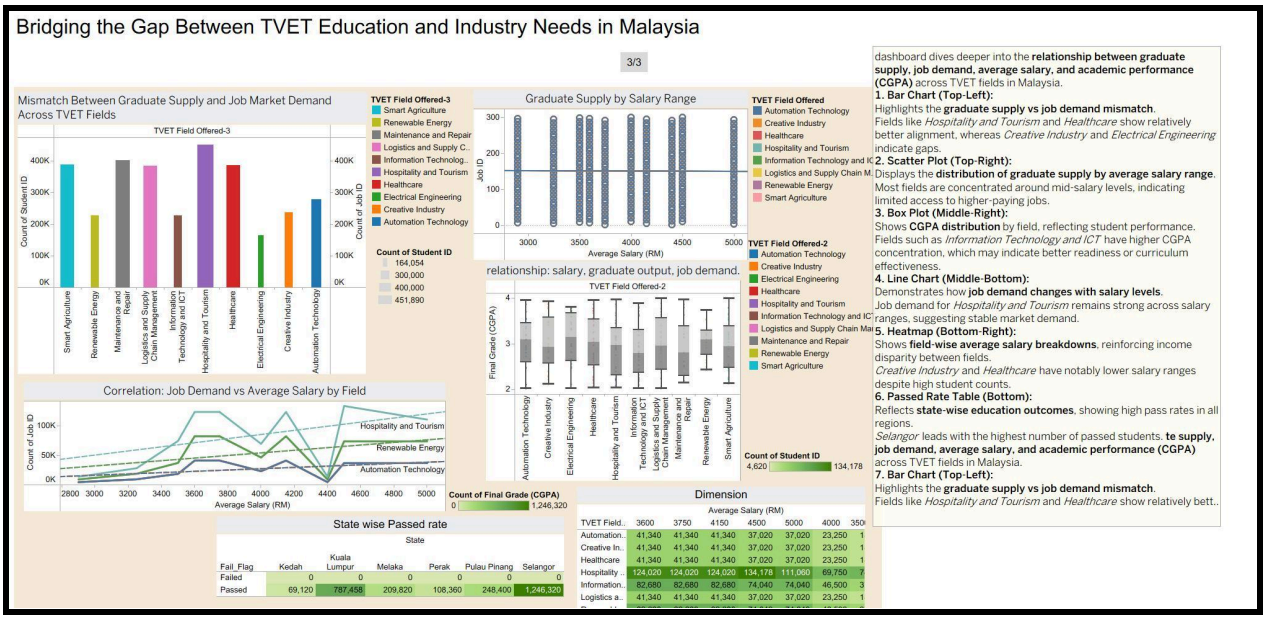
2. **Slide 2 – Dashboard 1 Analysis:**

    - Visuals include a bar chart (graduate vs job demand), line chart (job demand vs salary), scatterplot (distribution of demand across salary), and heatmap (average salary range).
    - The analysis shows contradictions—fields with many graduates (e.g., Healthcare) have fewer job openings, while fields with fewer graduates (e.g., Hospitality) show higher demand and better salaries.
    - Key insight: Mismatch in training vs real-world job needs.



3. **Slide 3 – Dashboard 2 Deeper Dive:**

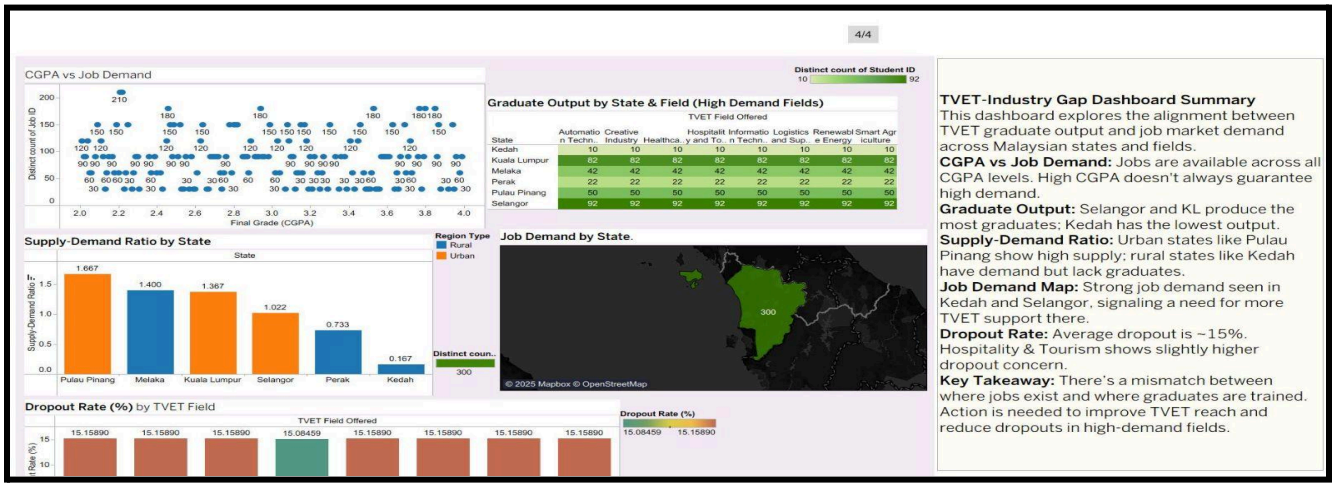
   - More granular analysis using **box plots (CGPA by field)**, **salary distribution scatterplots**, and **state-wise pass rate tables**.
   - Focuses on **academic performance**, **salary inequality**, and **regional education outcomes**.
   - Reveals salary disparities and suggests that even students with high grades are entering fields with fewer job opportunities.



Slide 4: Graduate Performance, Demand & Dropout Trends

- **Differences:** This dashboard compares regional and field-based disparities using a map and a table. The map highlights **job demand concentration by state**, while the graduate output table shows how graduate distribution varies by state and TVET field. This showcases the **regional imbalance** in supply and demand.

- **Distribution:** A **dot plot** visualizes the relationship between **CGPA scores and job demand**, indicating that high academic performance does not always correlate with high-demand fields. A **bar chart** presents the **supply-demand ratio by state**, showing that **urban states** tend to have better alignment. Additionally, a **dropout rate chart** by field reveals that most fields have similar dropout rates (~15%), with minor deviations in Hospitality & Tourism.

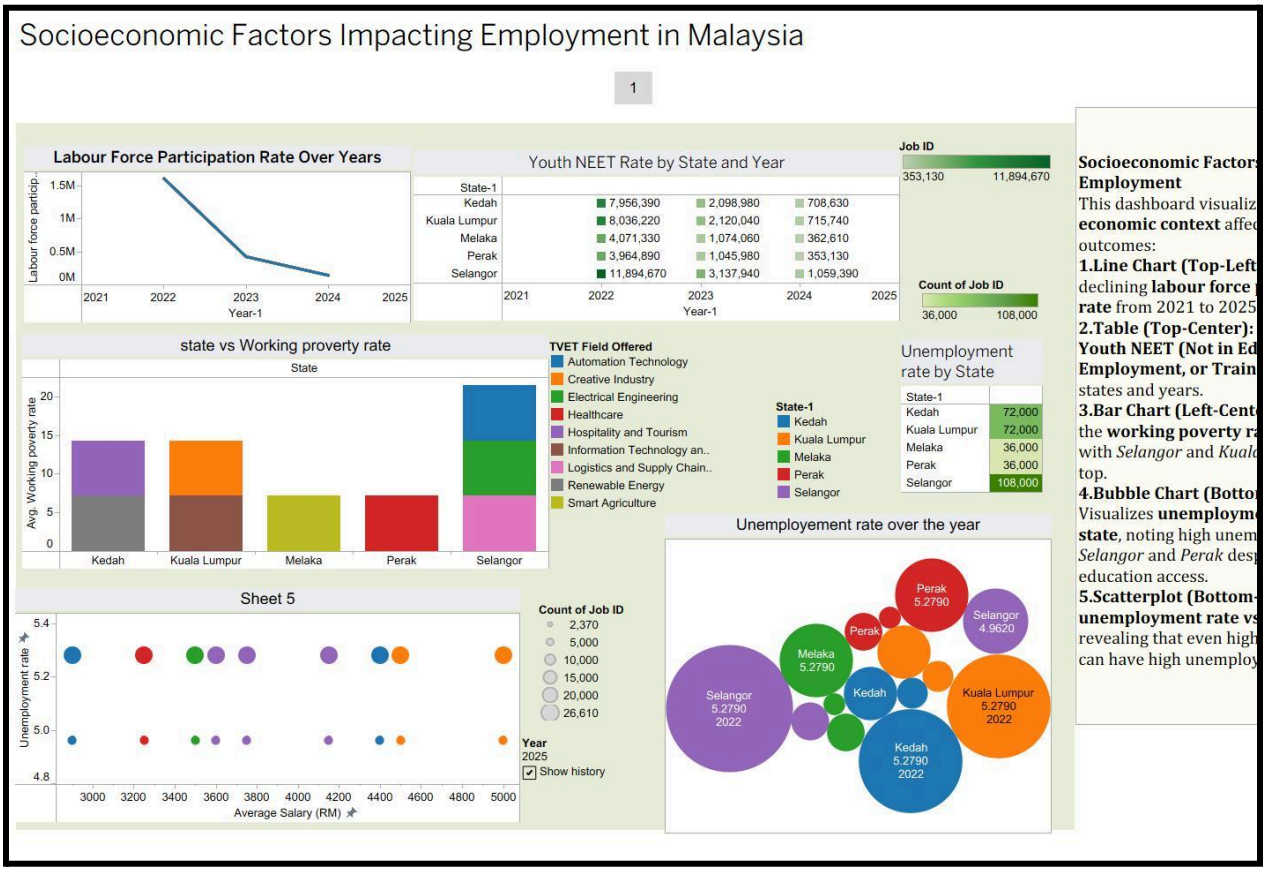


Slide 5: Socioeconomic Factors Impacting Employment

This dashboard visualizes the broader economic context affecting graduate outcomes:

- Line Chart (Top-Left): Shows a declining labour force participation rate from 2021 to 2025.
- Table (Top-Center): Displays the Youth NEET (Not in Education, Employment, or Training) rate across states and years.
- Bar Chart (Left-Center): Highlights the working poverty rate by state, with *Selangor* and *Kuala Lumpur* at the top.
- Bubble Chart (Bottom-Right): Visualizes unemployment rate by state, noting high unemployment in *Selangor* and *Perak* despite high education access.
- Scatterplot (Bottom-Left): Plots unemployment rate vs average salary, revealing that even high-paying states can have high unemployment.

This final slide connects education outcomes with labor market and socioeconomic disparities, providing critical policy insights.



8(b): Structure the Story Using Storytelling Components

Introduction

This data-driven story explores the misalignment between TVET education and job market demands in Malaysia. It highlights key issues like graduate oversupply in some fields, low job availability in others, unequal salary distributions, regional academic performance, and social inequalities. Using Tableau dashboards, the story visually examines data from 2021 to 2025 to assess how well the current education system is serving industry needs.

Business Understanding

Malaysia has prioritized TVET education as a way to address employment readiness and national skill gaps. However, the data reveals clear mismatches. Fields such as *Creative Industry* and *Healthcare* produce more graduates than the job market requires. Meanwhile, fields like *Hospitality and ICT*—which are in high demand—face skill shortages. This misalignment not only reduces employment opportunities but also contributes to wage stagnation in oversupplied sectors.

Type of Story

This story follows a "Contrary + Zoom-In" format. Contrary to the belief that more graduates in a field will automatically lead to better job outcomes, the story shows that *Creative Industry* and *Healthcare* have oversupply issues. Zooming in, it explores how specific states (e.g., *Selangor*, *Kelantan*) perform in terms of job demand, salary levels, and education outcomes. It also incorporates time-based trends to show changes in labor force participation and youth NEET rates.

Story Punchline

There is a clear mismatch between TVET graduate supply and actual job market demand. Some fields are flooded with graduates but offer few jobs and low salaries. Conversely, high-demand fields lack qualified candidates. This mismatch is further aggravated by regional socioeconomic issues such as high NEET rates, rising unemployment, and persistent working poverty—even in industrial hubs like *Selangor*. These findings indicate the urgent need for data-informed education reforms.

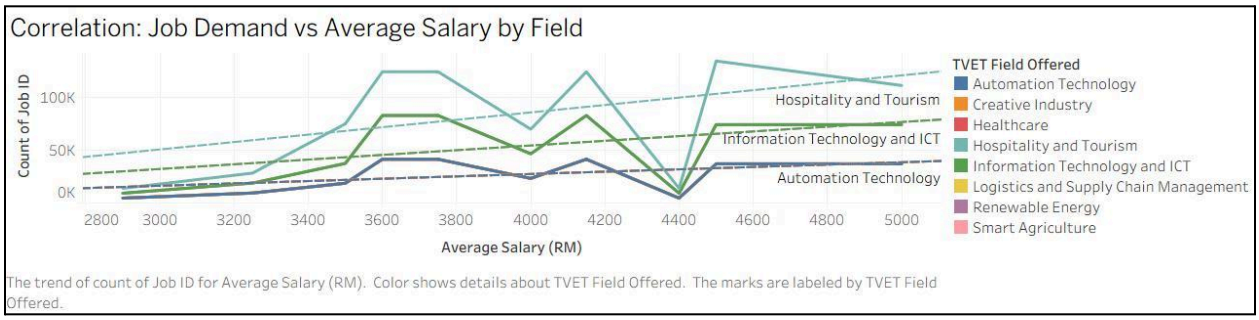
Conclusion and Recommendations

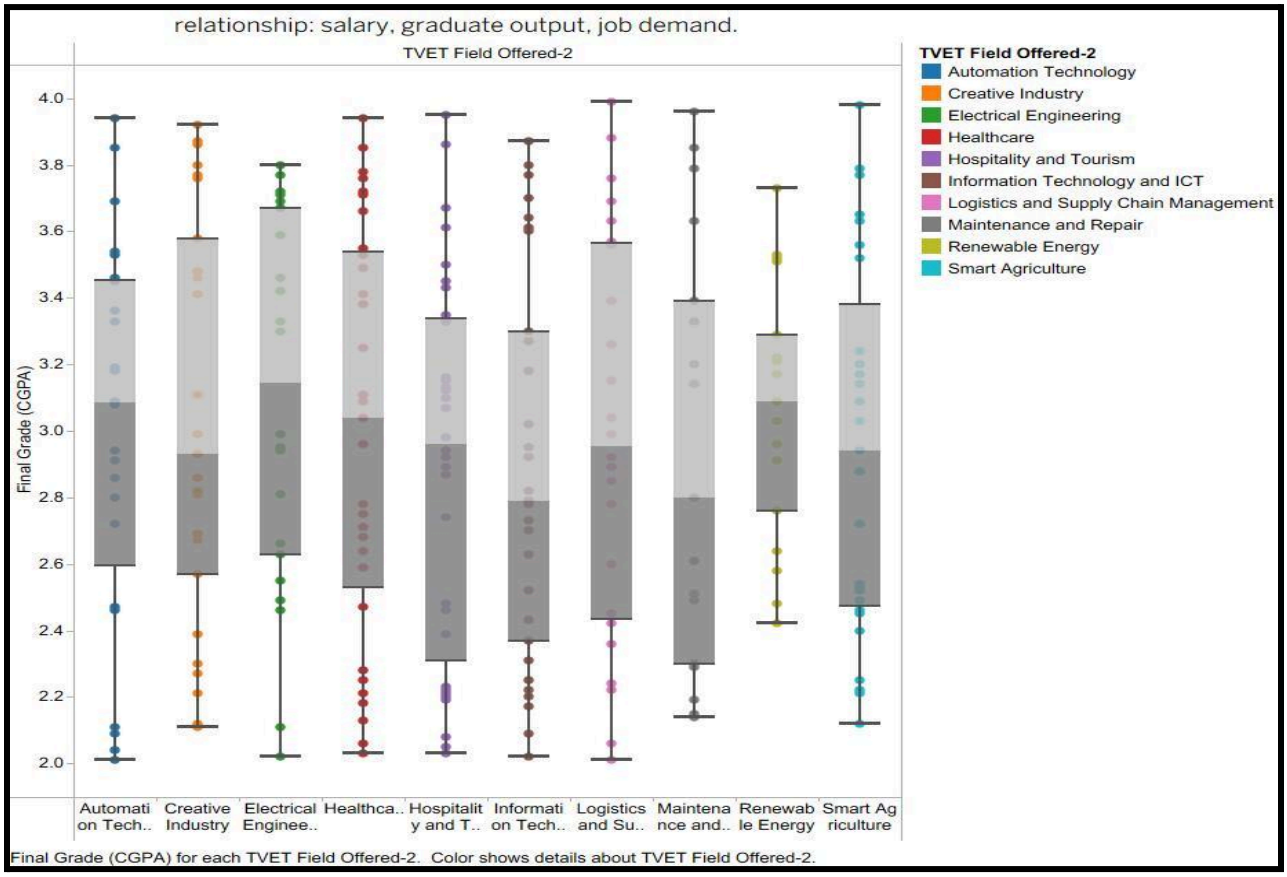
Several key insights emerge from the full story:

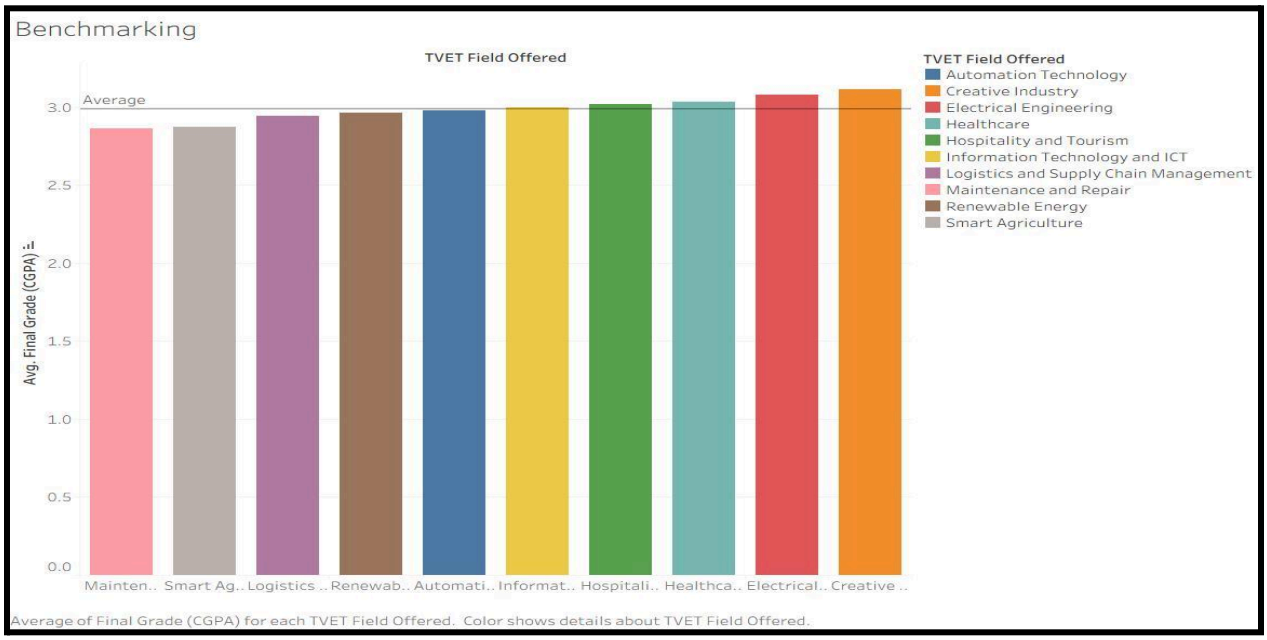
- **Curriculum Realignment:** TVET programs must be redesigned based on real-time job market data, focusing on undersupplied fields with strong demand.
- **Salary Incentives:** High-demand but low-paying fields (e.g., *Healthcare*) require better pay to attract and retain talent.
- **Regional Investment:** States like *Perak* and *Selangor*, which show high unemployment and working poverty rates, need targeted economic support and job-matching programs.

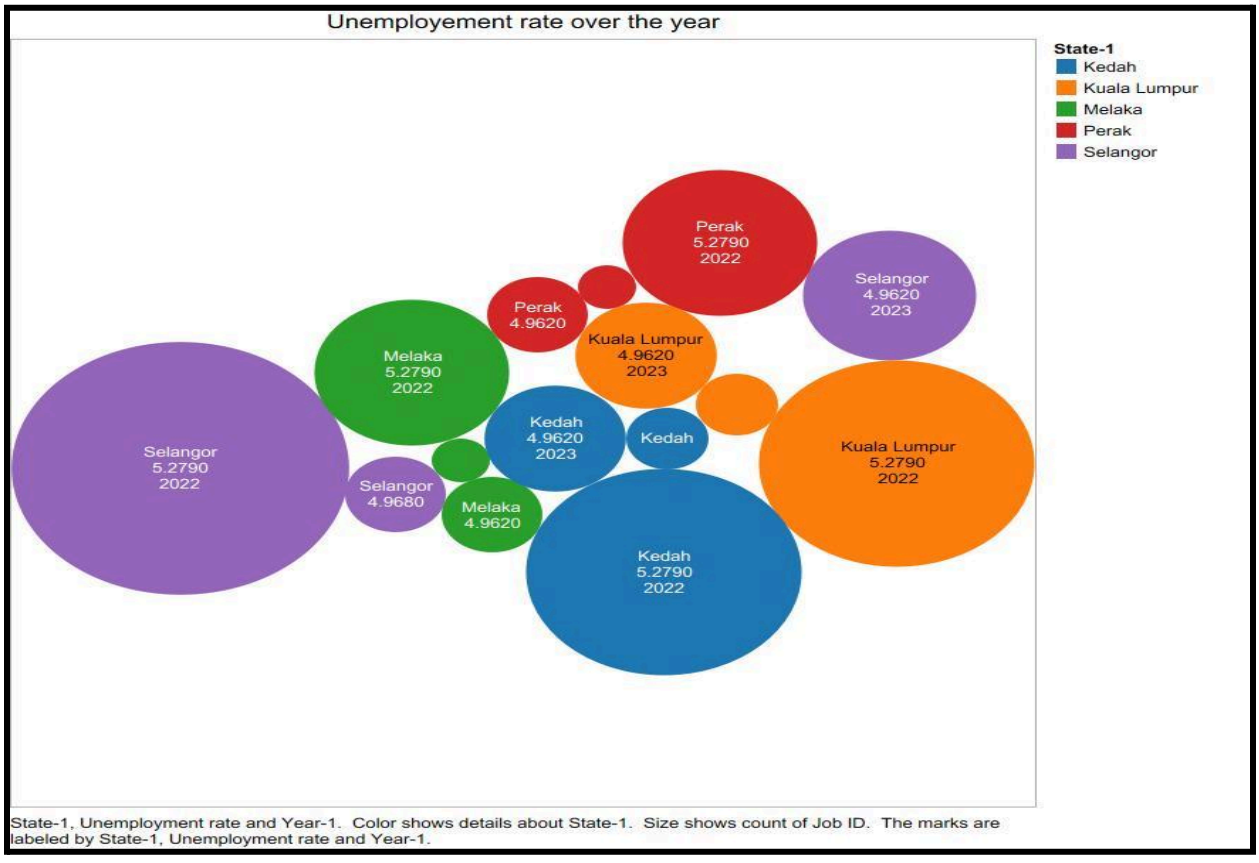
- **Socioeconomic Monitoring:** Declining labor force participation and rising NEET rates indicate growing disengagement among youth, necessitating both educational and policy interventions.
- **Data-Driven Planning:** Tableau dashboards can help stakeholders monitor trends, optimize curriculum planning, and forecast employment shifts more effectively.

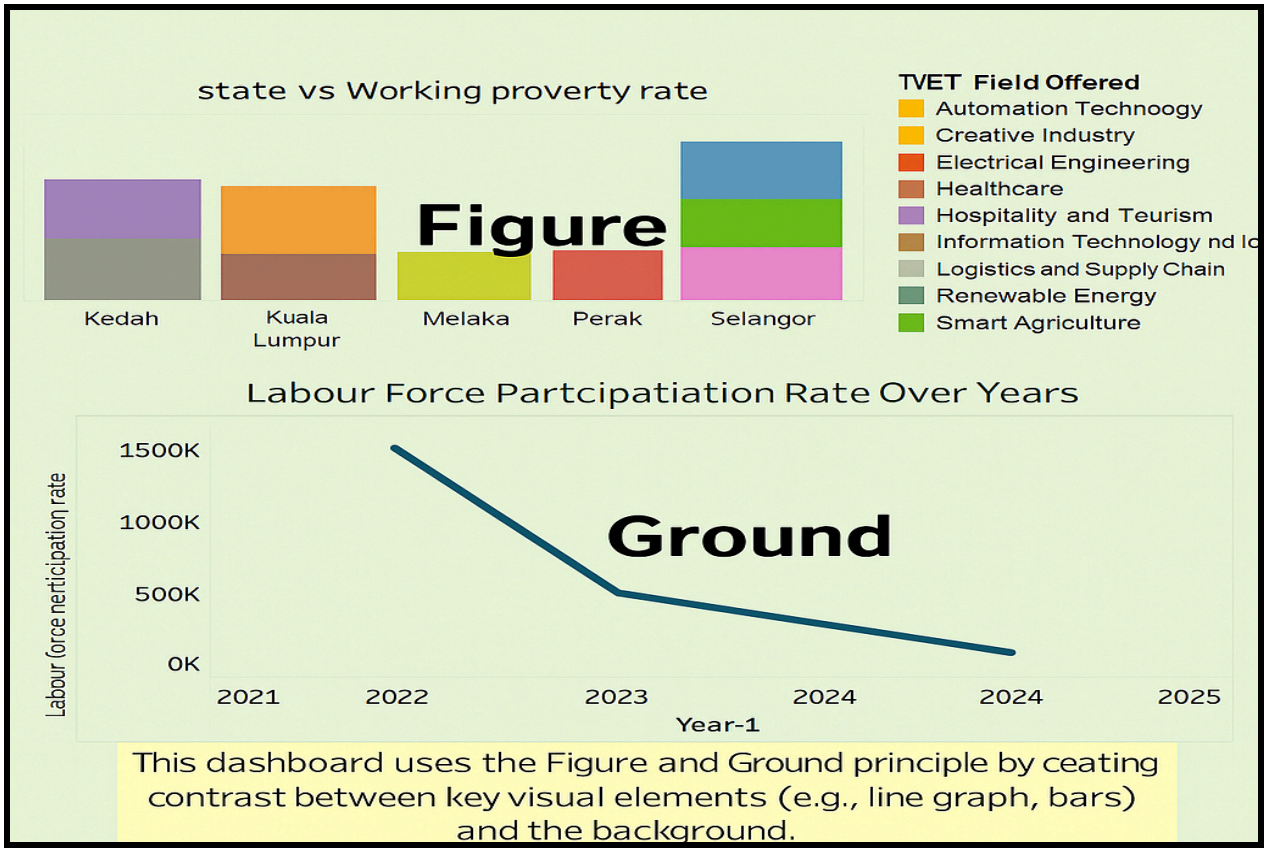
Appendix (Worksheets)

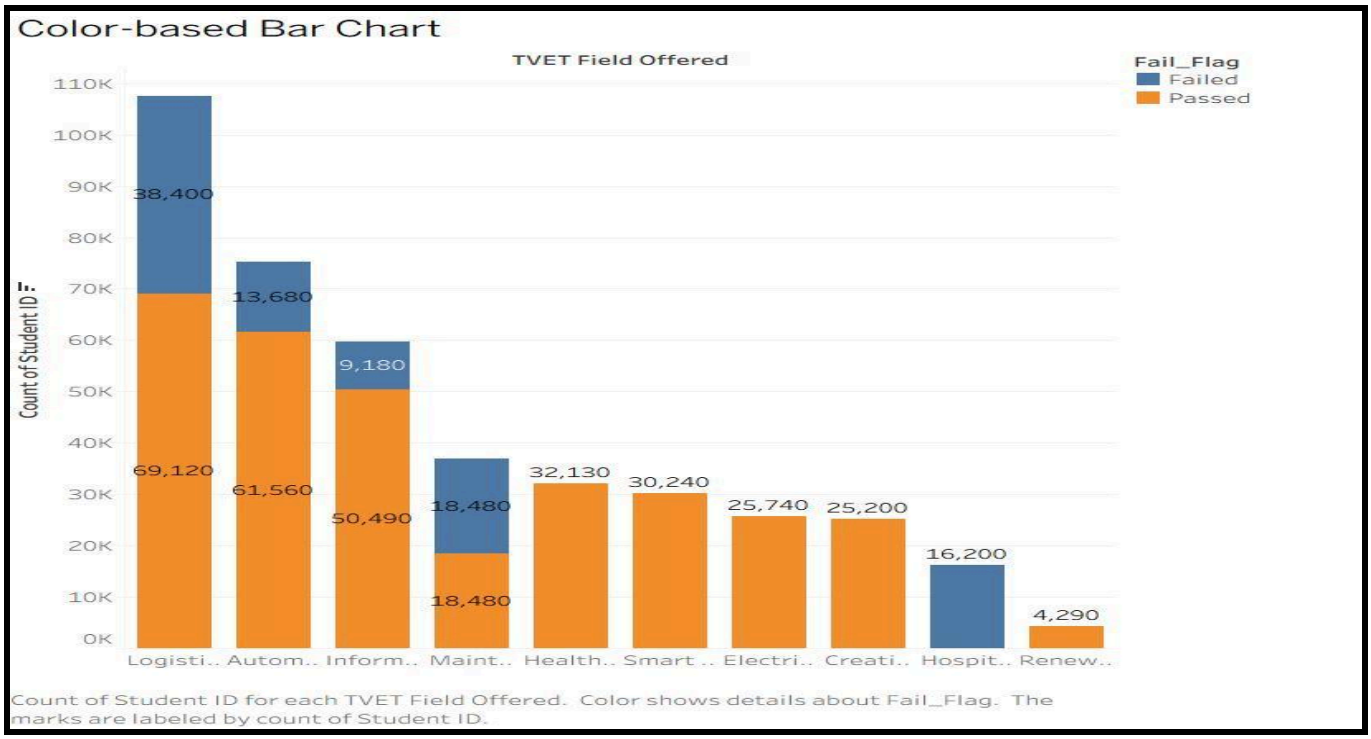


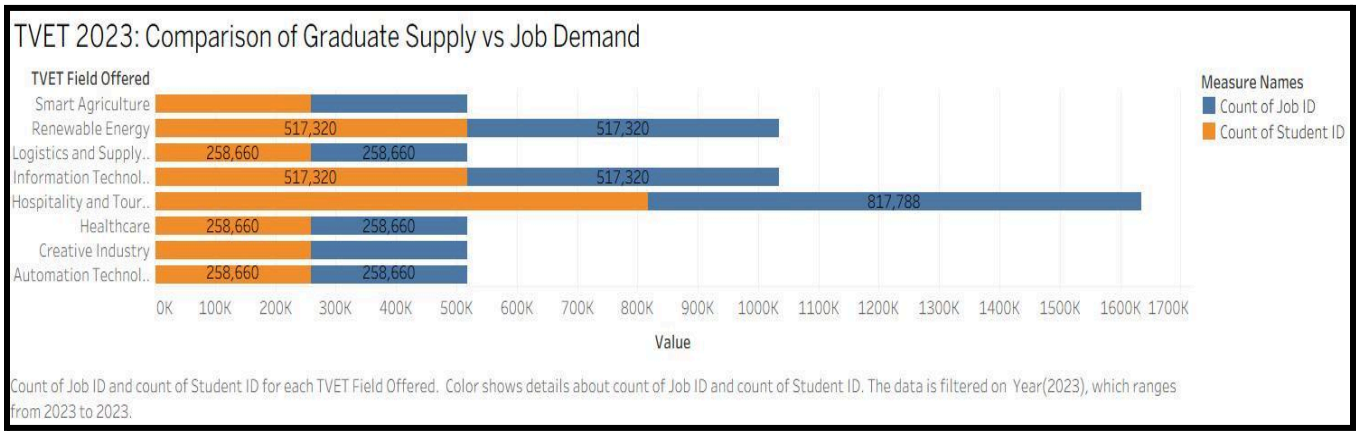


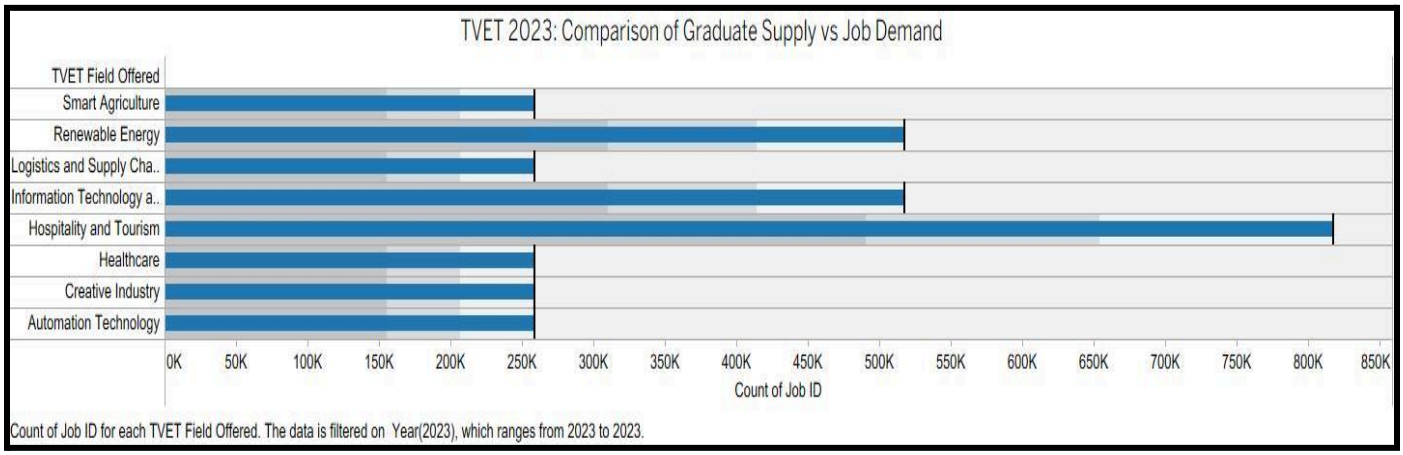

Benchmarking
TVET Field Offered
Average
Avg. Final Grade (CGPA)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mainten..
Smart Ag..
Logistics ..
Renewab..
Automati..
Informat..
Hospitali..
Healthca..
Electrical..
Creative ..
TVET Field Offered
Automation Technology
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Maintenance and Repair
Renewable Energy
Smart Agriculture
Average of Final Grade (CGPA) for each TVET Field Offered. Color shows details about TVET Field Offered.


Unemployement rate over the year
State-1
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
Perak 5.2790 2022
Selangor 4.9620 2023
Perak 4.9620
Kuala Lumpur 4.9620 2023
Melaka 5.2790 2022
Kedah 4.9620 2023
Kedah
Selangor 5.2790 2022
Kuala Lumpur 5.2790 2022
Selangor 4.9680
Melaka 4.9620
Kedah 5.2790 2022
State-1, Unemployment rate and Year-1. Color shows details about State-1. Size shows count of Job ID. The marks are labeled by State-1, Unemployment rate and Year-1.

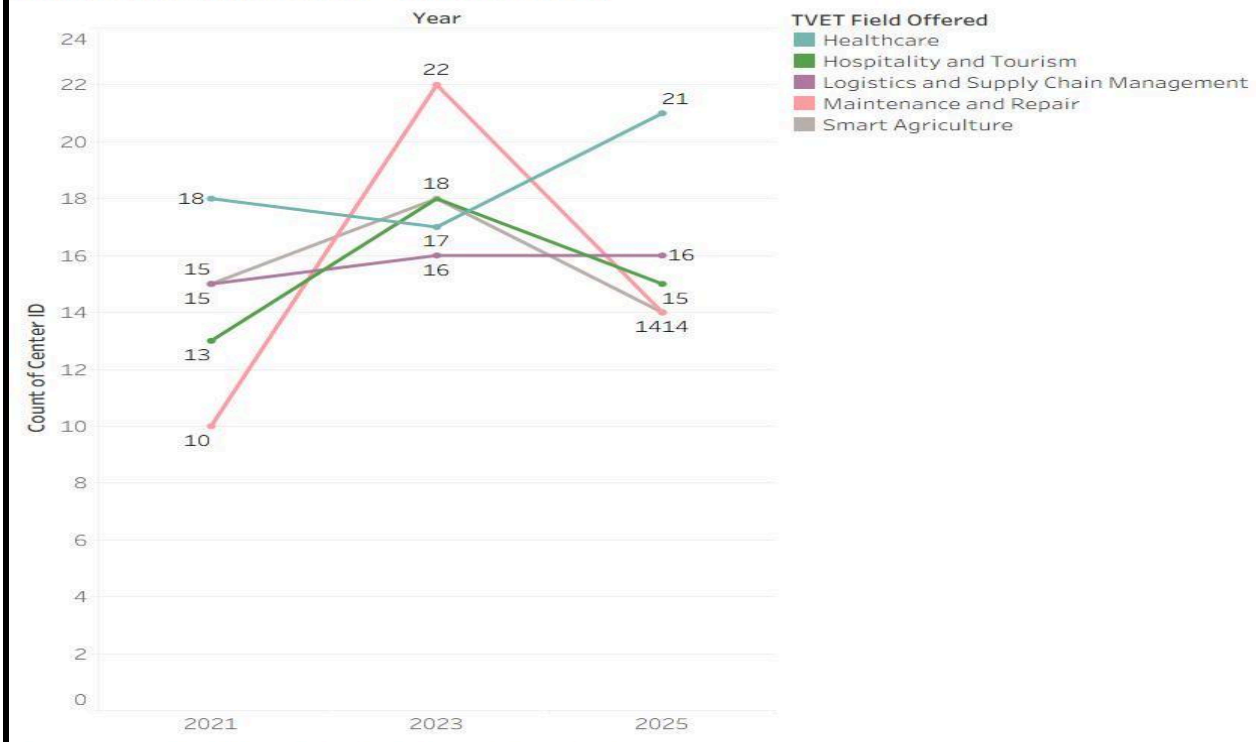

state vs Working proverty rate
Figure
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
TVET Field Offered
Automation Technoogy
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Teurism
Information Technology nd lo
Logistics and Supply Chain
Renewable Energy
Smart Agriculture
Labour Force Partcipatiation Rate Over Years
Ground
1500K
1000K
500K
0K
Labour force nerticipation rate
2021
2022
2023
2024
2024
2025
Year-1
This dashboard uses the Figure and Ground principle by ceating contrast between key visual elements (e.g., line graph, bars) and the background.


Color-based Bar Chart
TVET Field Offered
Fail_Flag
Failed
Passed
Count of Student ID
110K
100K
90K
80K
70K
60K
50K
40K
30K
20K
10K
0K
38,400
69,120
13,680
61,560
9,180
50,490
18,480
18,480
32,130
30,240
25,740
25,200
16,200
4,290
Logisti..
Autom..
Inform..
Maint..
Health..
Smart ..
Electri..
Creati..
Hospit..
Renew..
Count of Student ID for each TVET Field Offered. Color shows details about Fail_Flag. The marks are labeled by count of Student ID.


TVET 2023: Comparison of Graduate Supply vs Job Demand
TVET Field Offered
Smart Agriculture
Renewable Energy
Logistics and Supply..
Information Technol..
Hospitality and Tour..
Healthcare
Creative Industry
Automation Technol..
517,320
517,320
258,660
258,660
517,320
517,320
817,788
258,660
258,660
258,660
258,660
0K
100K
200K
300K
400K
500K
600K
700K
800K
900K
1000K
1100K
1200K
1300K
1400K
1500K
1600K
1700K
Value
Measure Names
Count of Job ID
Count of Student ID
Count of Job ID and count of Student ID for each TVET Field Offered. Color shows details about count of Job ID and count of Student ID. The data is filtered on Year(2023), which ranges from 2023 to 2023.

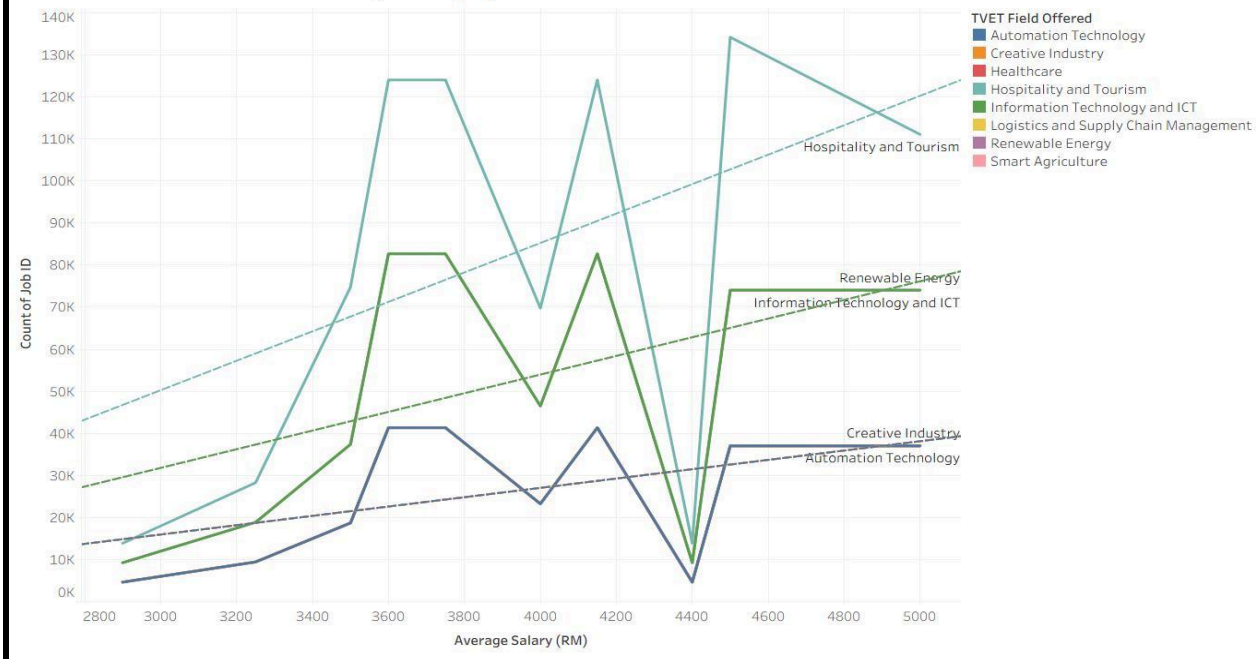

TVET 2023: Comparison of Graduate Supply vs Job Demand
TVET Field Offered
Smart Agriculture
Renewable Energy
Logistics and Supply Cha..
Information Technology a..
Hospitality and Tourism
Healthcare
Creative Industry
Automation Technology
0K
50K
100K
150K
200K
250K
300K
350K
400K
450K
500K
550K
600K
650K
700K
750K
800K
850K
Count of Job ID
Count of Job ID for each TVET Field Offered. The data is filtered on Year(2023), which ranges from 2023 to 2023.

Decluttering (Line Chart – Filtered Top 5)

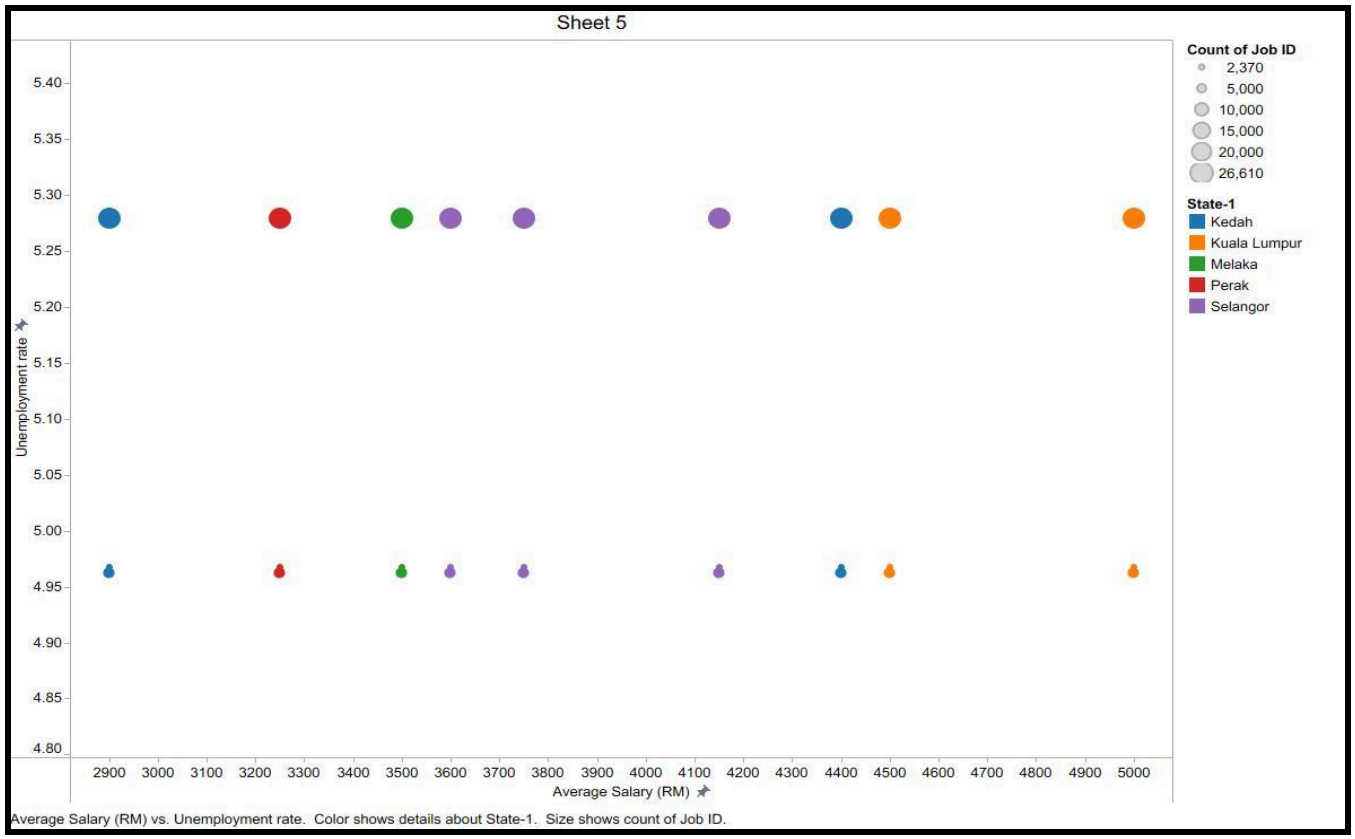


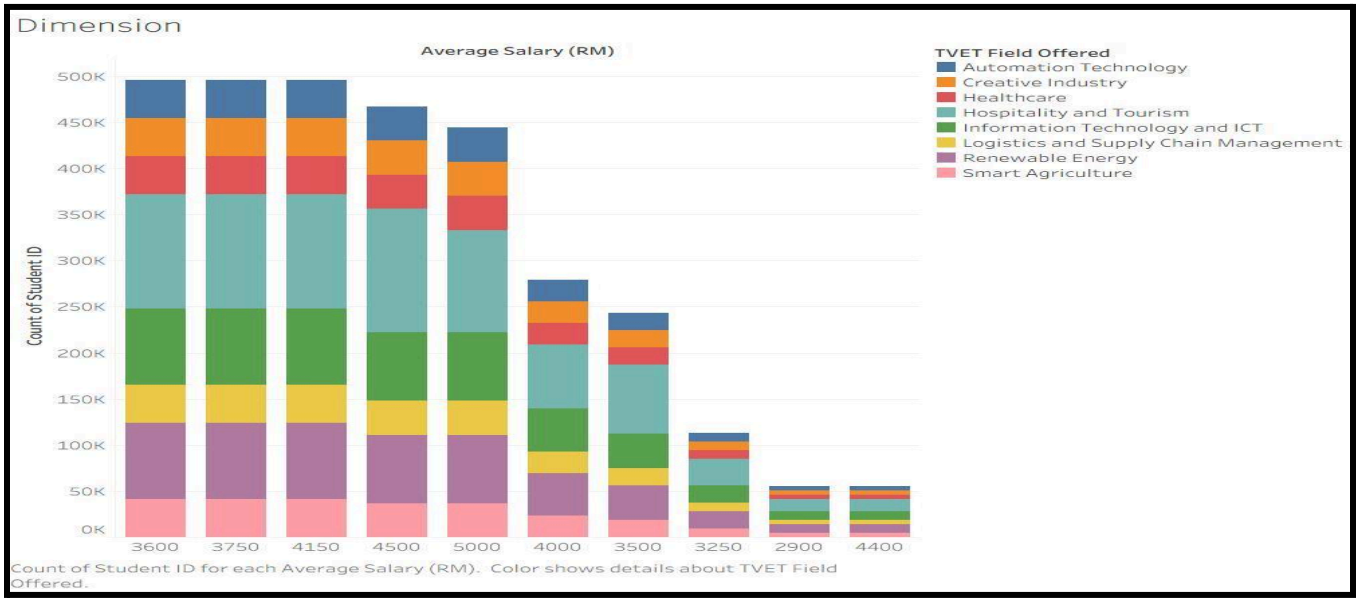
The trend of count of Center ID for Year. Color shows details about TVET Field Offered. The view is filtered on TVET Field Offered, which keeps Healthcare, Hospitality and Tourism, Logistics and Supply Chain Management, Maintenance and Repair and Smart Agriculture.

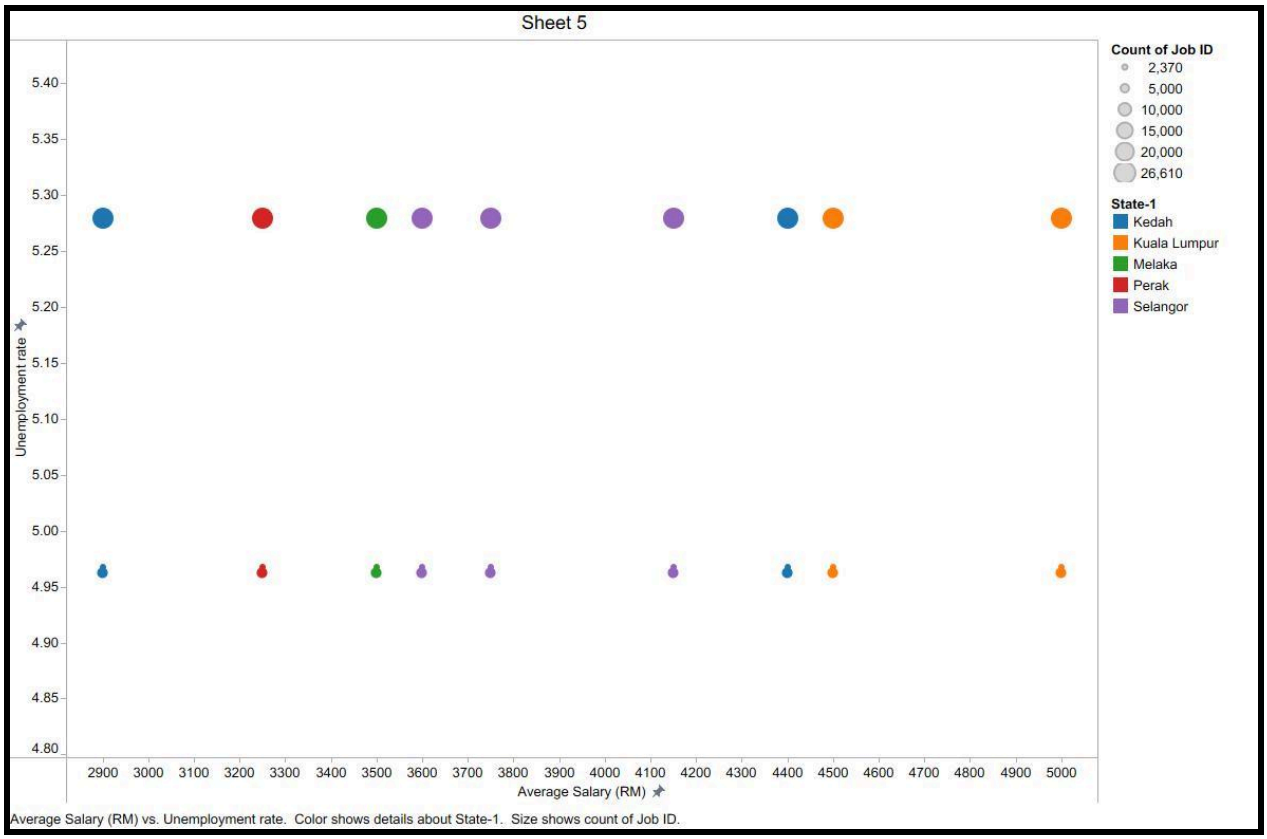
Correlation: Job Demand vs Average Salary by Field



The trend of count of Job ID for Average Salary (RM). Color shows details about TVET Field Offered. The marks are labeled by TVET Field Offered.


Sheet 5
Count of Job ID
2,370
5,000
10,000
15,000
20,000
26,610
State-1
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
Unemployment rate
5.40
5.35
5.30
5.25
5.20
5.15
5.10
5.05
5.00
4.95
4.90
4.85
4.80
2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000
Average Salary (RM)
Average Salary (RM) vs. Unemployment rate. Color shows details about State-1. Size shows count of Job ID.


Dimension
Average Salary (RM)
TVET Field Offered
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Renewable Energy
Smart Agriculture
Count of Student ID
500K
450K
400K
350K
300K
250K
200K
150K
100K
50K
0K
3600 3750 4150 4500 5000 4000 3500 3250 2900 4400
Count of Student ID for each Average Salary (RM). Color shows details about TVET Field Offered.



State wise Passed rate

State

Count of Final Grade ..
0 1,246,320

Fail_Flag	Kedah	Kuala Lumpur	Melaka	Perak	Pulau Pinang	Selangor
Failed	0	0	0	0	0	0
Passed	69,120	787,458	209,820	108,360	248,400	1,246,320

Count of Final Grade (CGPA) broken down by State vs. Fail_Flag. Color shows count of Final Grade (CGPA). The marks are labeled by count of Final Grade (CGPA).

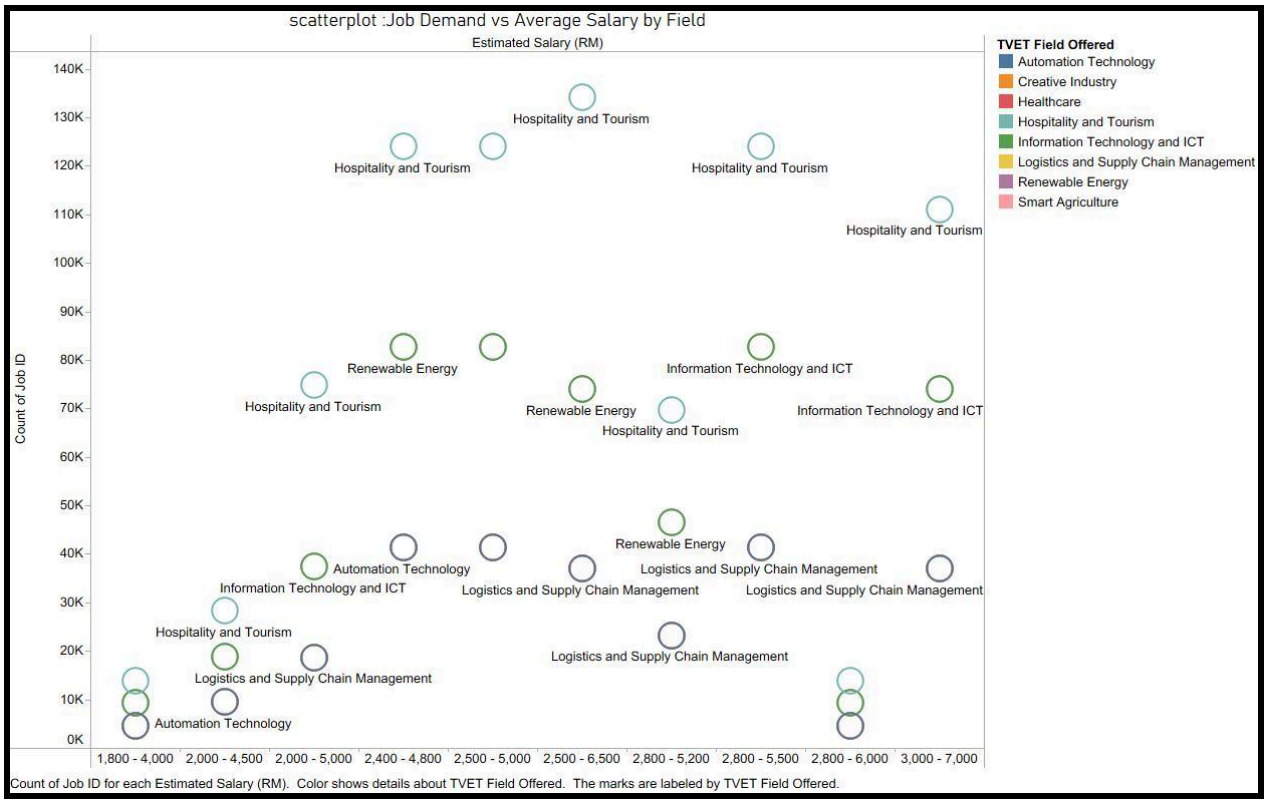
Dimension

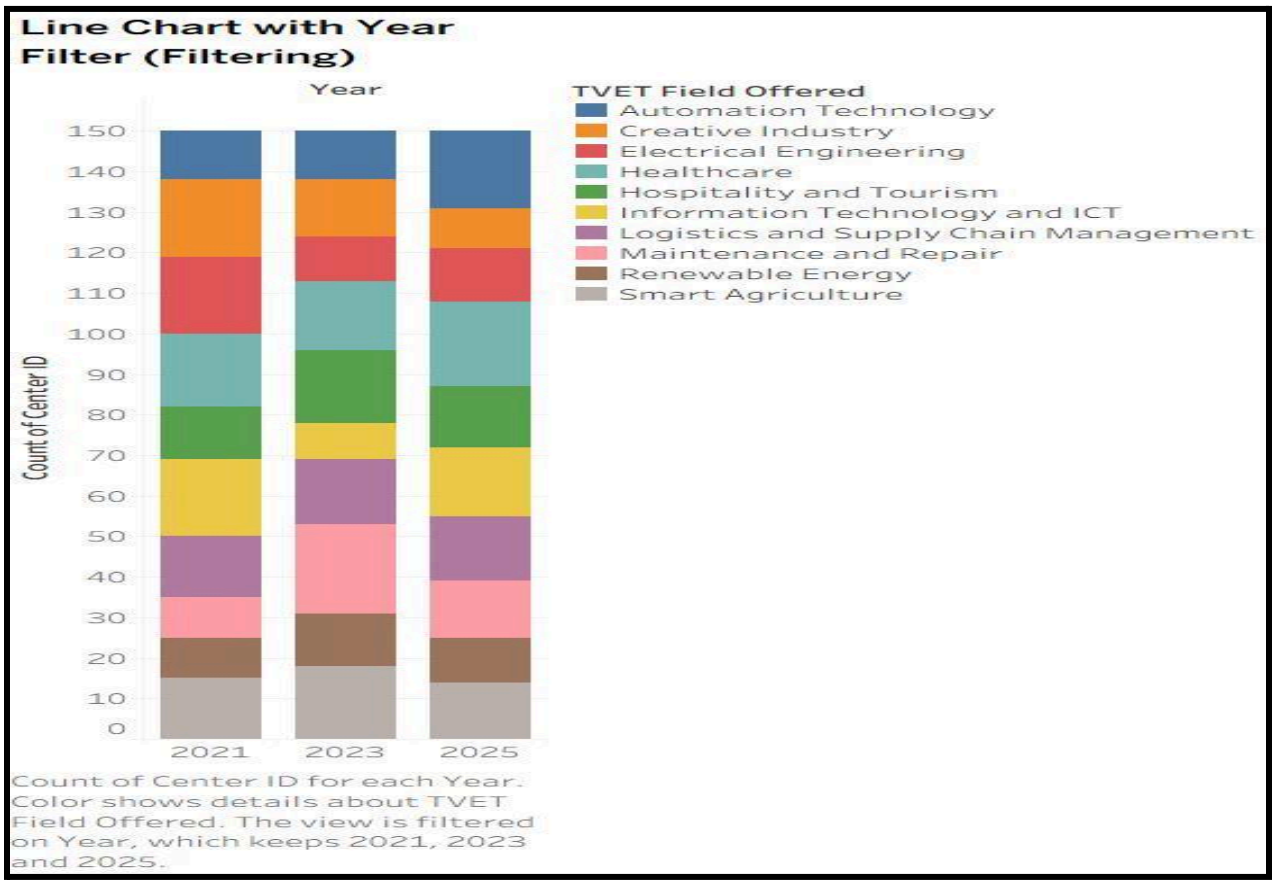
Average Salary (RM)

Count of Student ID
4,620 134,178

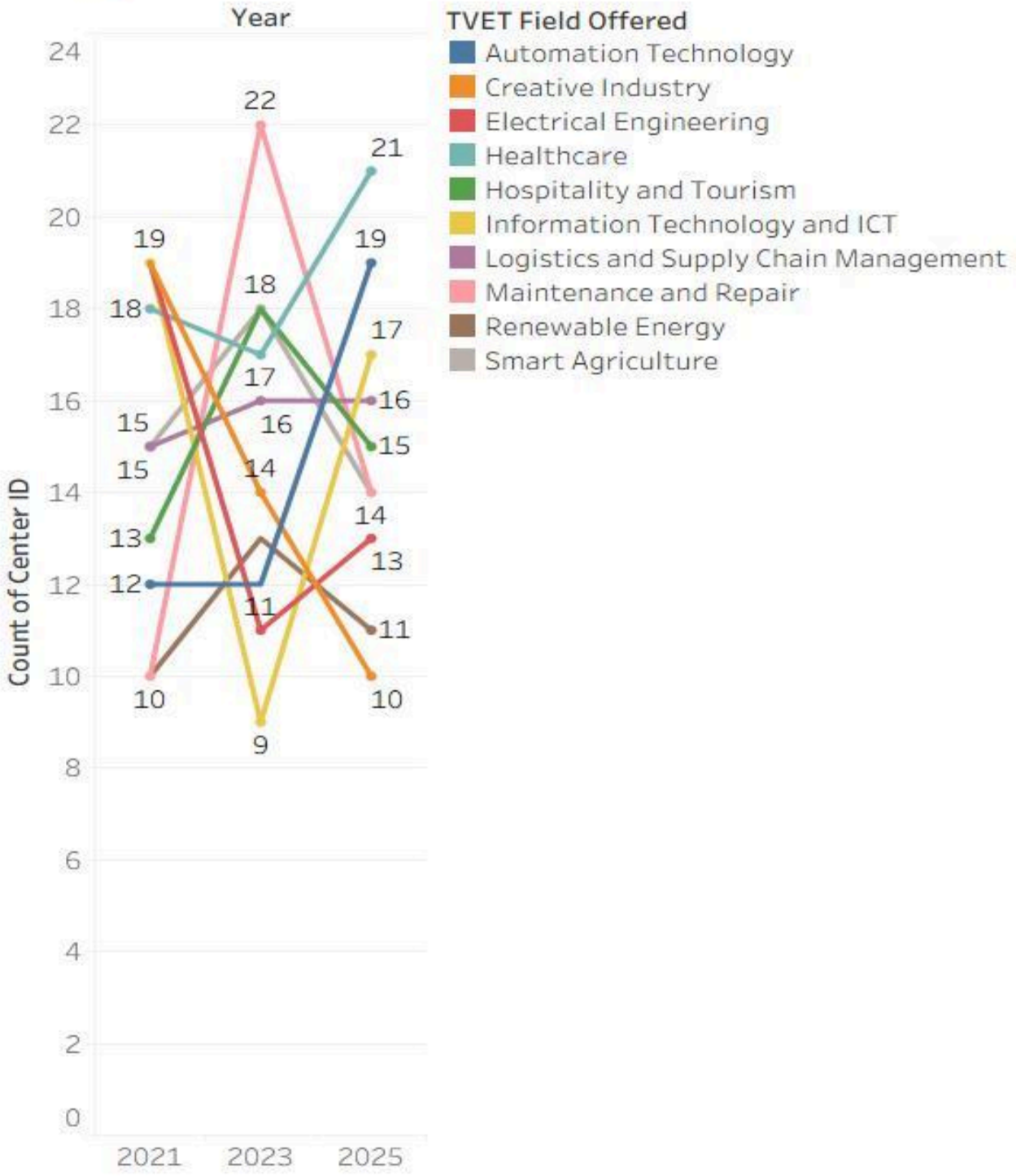
TVET Field Offered	3600	3750	4150	4500	5000	4000	3500	3250	2900	4400
Automation Technology	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Creative Industry	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Healthcare	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Hospitality and Tourism	124,020	124,020	124,020	134,178	111,060	69,750	74,760	28,260	13,860	13,860
Information Technology a..	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,240	9,240
Logistics and Supply Cha..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620
Renewable Energy	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,240	9,240
Smart Agriculture	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,620	4,620

Count of Student ID broken down by Average Salary (RM) vs. TVET Field Offered. Color shows count of Student ID. The marks are labeled by count of Student ID.

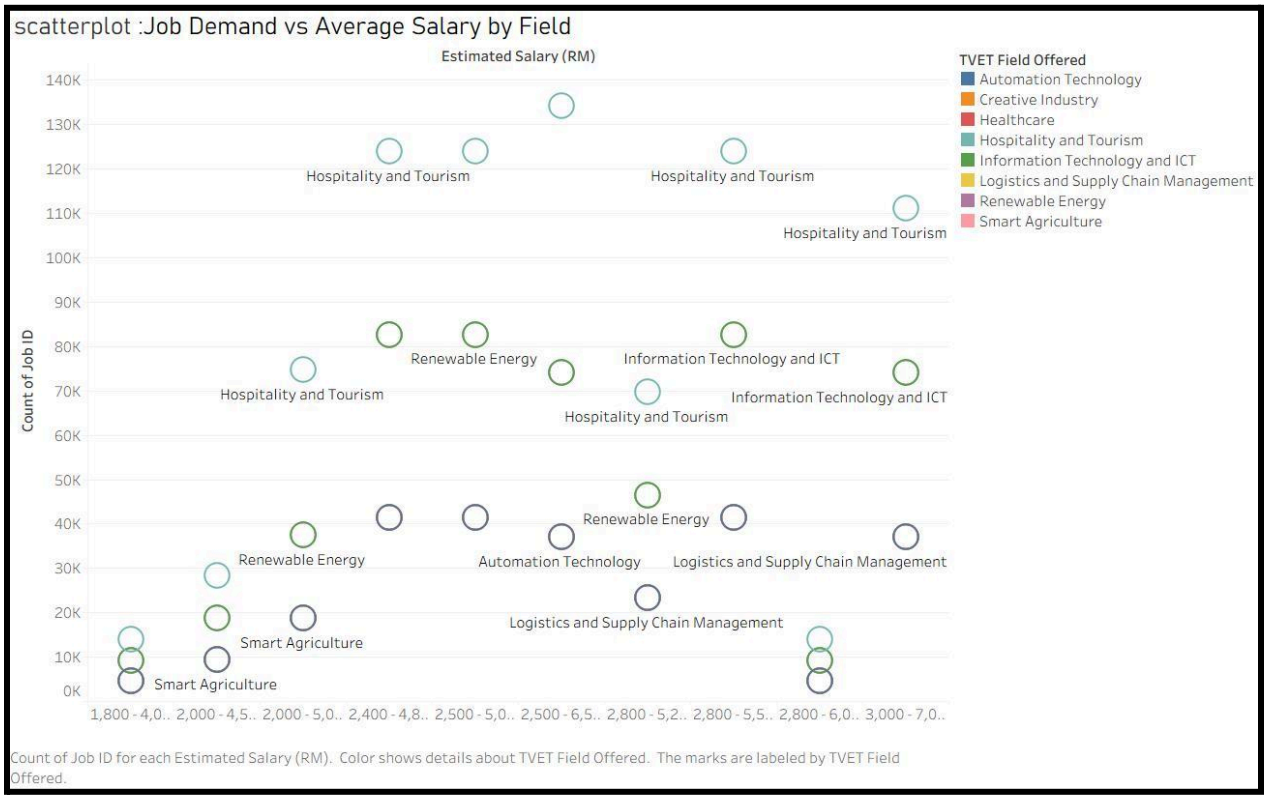

scatterplot :Job Demand vs Average Salary by Field
Estimated Salary (RM)
Count of Job ID
140K
130K
120K
110K
100K
90K
80K
70K
60K
50K
40K
30K
20K
10K
0K
Hospitality and Tourism
Hospitality and Tourism
Hospitality and Tourism
Hospitality and Tourism
Renewable Energy
Information Technology and ICT
Hospitality and Tourism
Renewable Energy
Hospitality and Tourism
Information Technology and ICT
Renewable Energy
Automation Technology
Logistics and Supply Chain Management
Information Technology and ICT
Logistics and Supply Chain Management
Logistics and Supply Chain Management
Hospitality and Tourism
Logistics and Supply Chain Management
Logistics and Supply Chain Management
Automation Technology
1,800 - 4,000
2,000 - 4,500
2,000 - 5,000
2,400 - 4,800
2,500 - 5,000
2,500 - 6,500
2,800 - 5,200
2,800 - 5,500
2,800 - 6,000
3,000 - 7,000
TVET Field Offered
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Renewable Energy
Smart Agriculture
Count of Job ID for each Estimated Salary (RM). Color shows details about TVET Field Offered. The marks are labeled by TVET Field Offered.

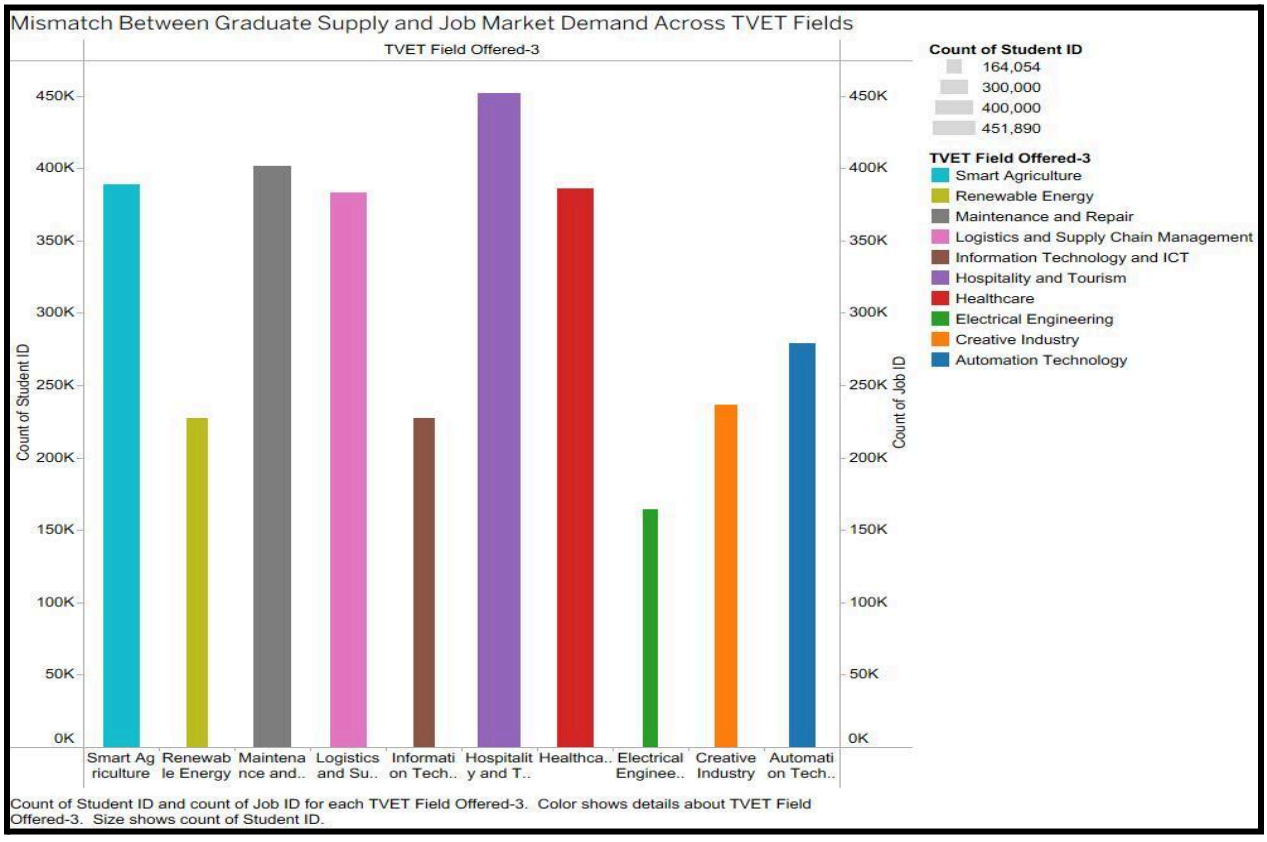

Line Chart with Year Filter (Filtering)
Year
Count of Center ID
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
2021
2023
2025
TVET Field Offered
Automation Technology
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Maintenance and Repair
Renewable Energy
Smart Agriculture
Count of Center ID for each Year. Color shows details about TVET Field Offered. The view is filtered on Year, which keeps 2021, 2023 and 2025.

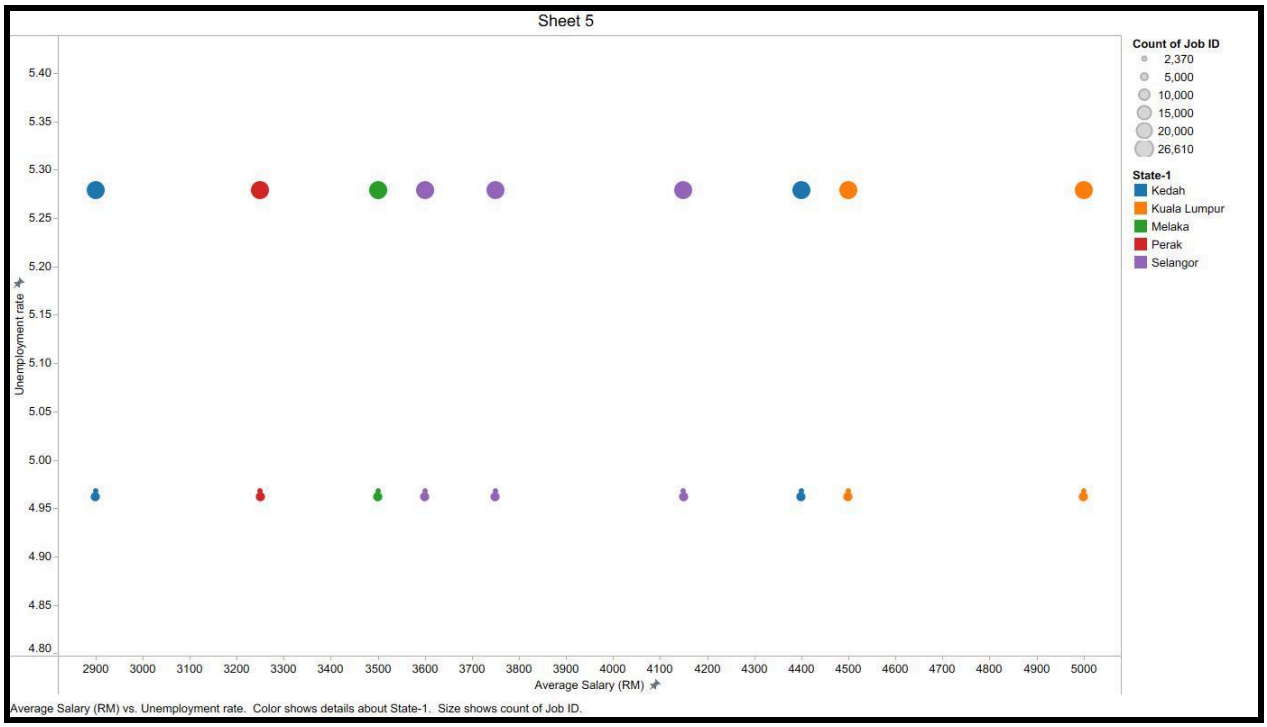
Line chart of Accredited Centres over Years, grouped by Quality Rating

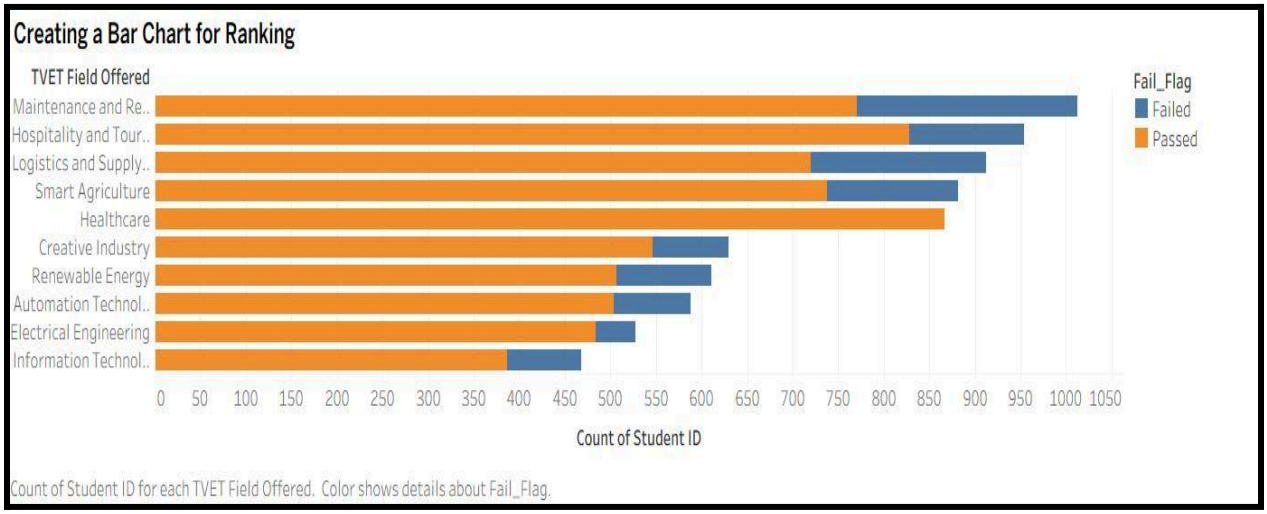


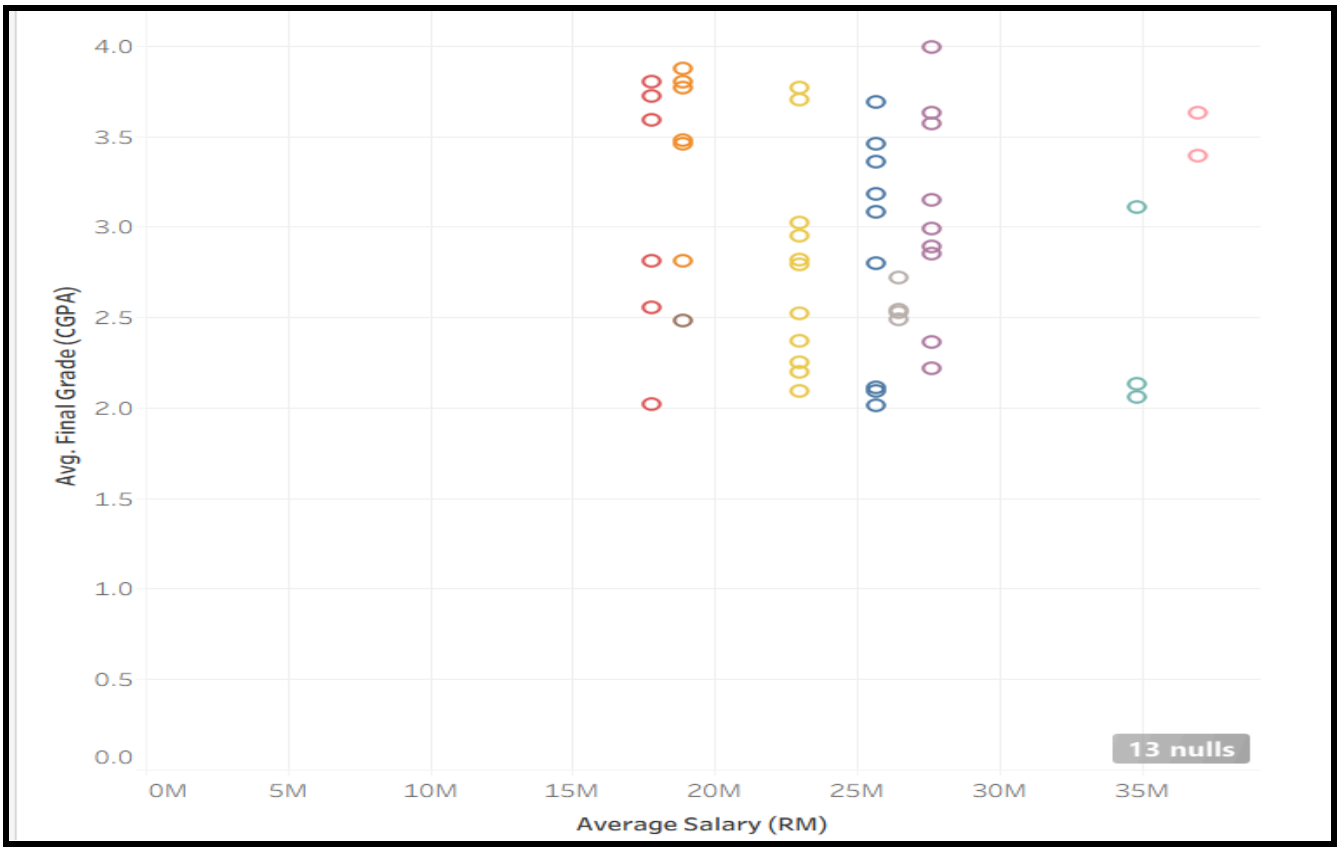
The trend of count of Center ID for Year. Color shows details about TVET Field Offered. The marks are labeled by count of Center ID.

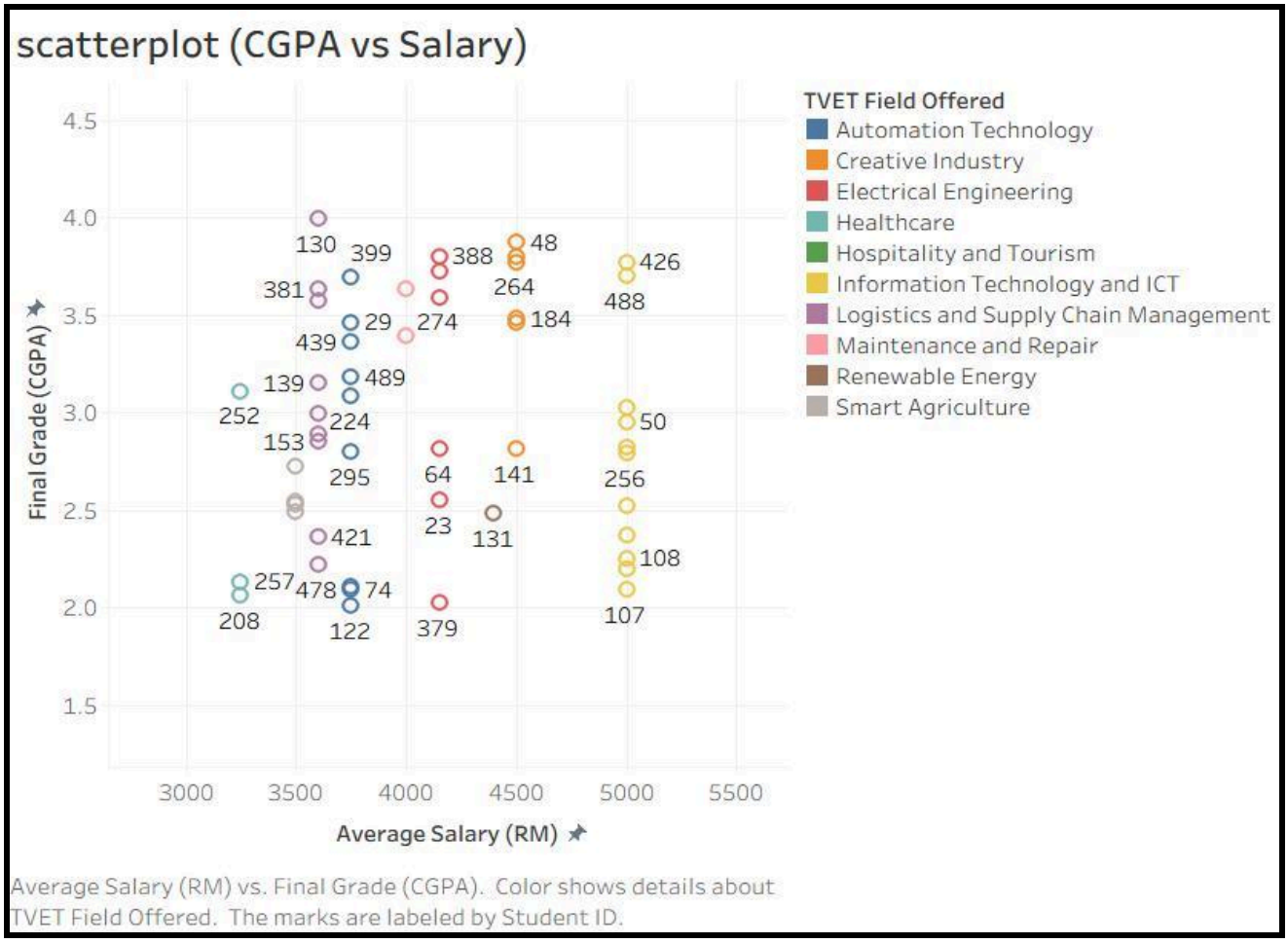

scatterplot :Job Demand vs Average Salary by Field
Estimated Salary (RM)
Count of Job ID
140K
130K
120K
110K
100K
90K
80K
70K
60K
50K
40K
30K
20K
10K
0K
Hospitality and Tourism
Hospitality and Tourism
Hospitality and Tourism
Renewable Energy
Information Technology and ICT
Hospitality and Tourism
Information Technology and ICT
Hospitality and Tourism
Renewable Energy
Renewable Energy
Automation Technology
Logistics and Supply Chain Management
Logistics and Supply Chain Management
Smart Agriculture
Smart Agriculture
1,800 - 4,0..
2,000 - 4,5..
2,000 - 5,0..
2,400 - 4,8..
2,500 - 5,0..
2,500 - 6,5..
2,800 - 5,2..
2,800 - 5,5..
2,800 - 6,0..
3,000 - 7,0..
TVET Field Offered
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Renewable Energy
Smart Agriculture
Count of Job ID for each Estimated Salary (RM). Color shows details about TVET Field Offered. The marks are labeled by TVET Field Offered.

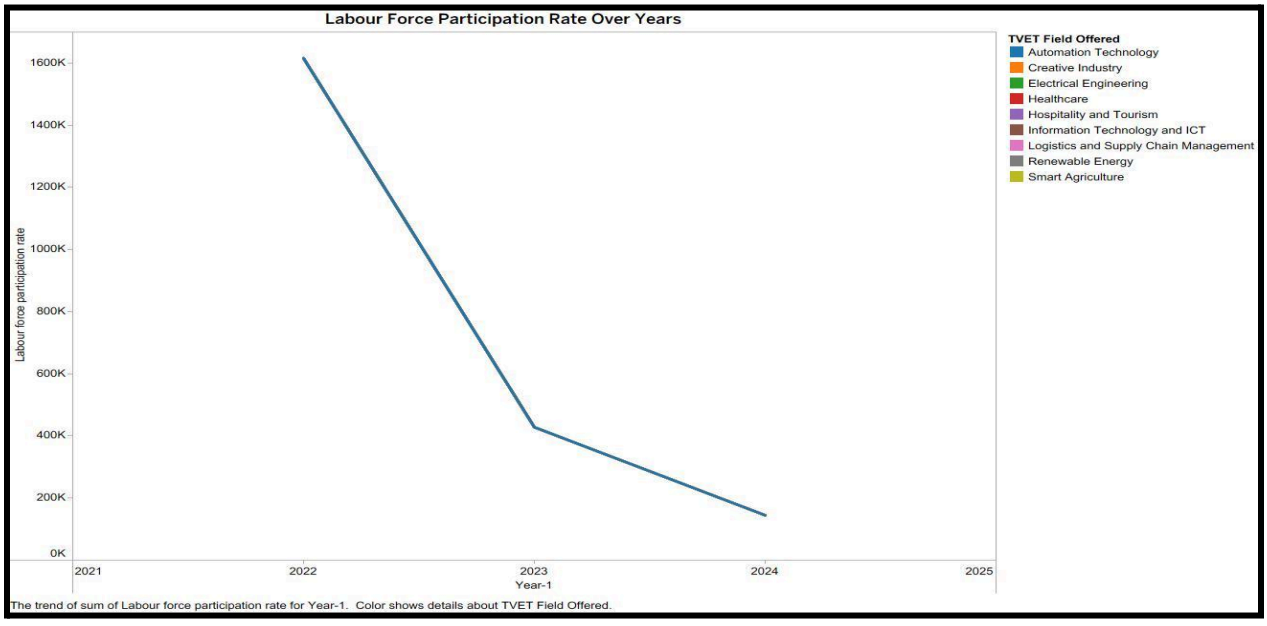

Mismatch Between Graduate Supply and Job Market Demand Across TVET Fields
TVET Field Offered-3
Count of Student ID
Count of Job ID
450K
400K
350K
300K
250K
200K
150K
100K
50K
0K
Smart Ag riculture
Renewab le Energy
Maintena nce and..
Logistics and Su..
Informati on Tech..
Hospitalit y and T..
Healthca..
Electrical Enginee..
Creative Industry
Automati on Tech..
Count of Student ID
164,054
300,000
400,000
451,890
TVET Field Offered-3
Smart Agriculture
Renewable Energy
Maintenance and Repair
Logistics and Supply Chain Management
Information Technology and ICT
Hospitality and Tourism
Healthcare
Electrical Engineering
Creative Industry
Automation Technology
Count of Student ID and count of Job ID for each TVET Field Offered-3. Color shows details about TVET Field Offered-3. Size shows count of Student ID.

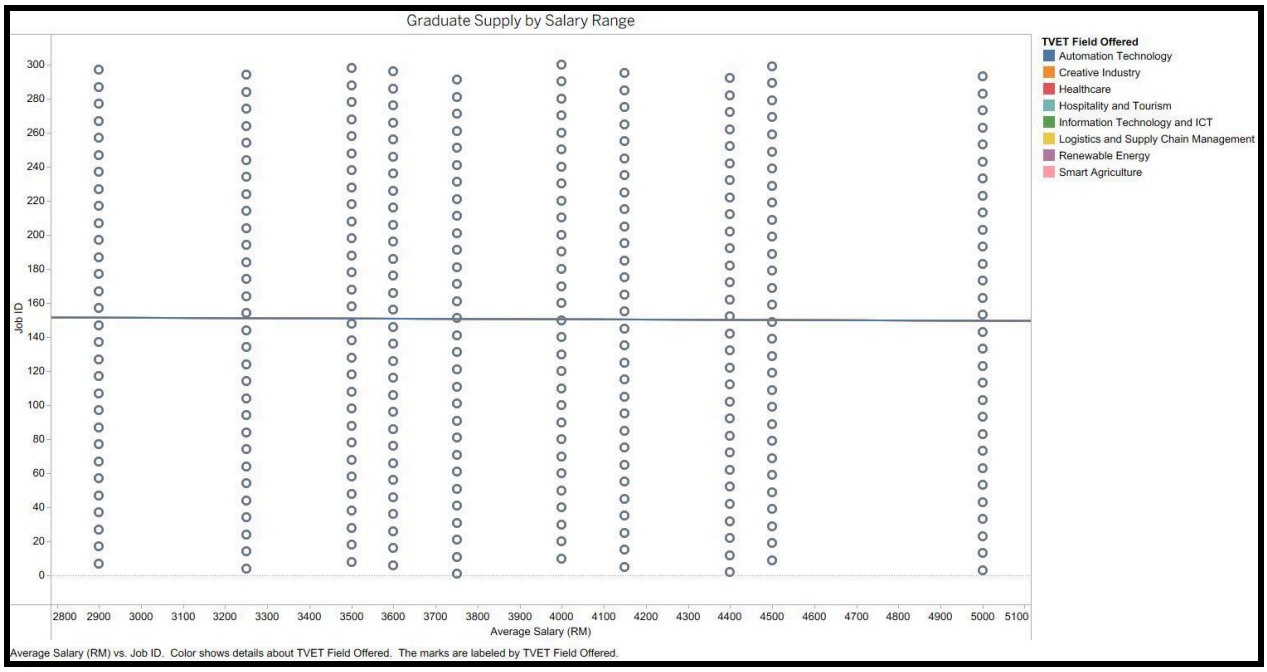

Sheet 5
Count of Job ID
2,370
5,000
10,000
15,000
20,000
26,610
State-1
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
Unemployment rate
5.40
5.35
5.30
5.25
5.20
5.15
5.10
5.05
5.00
4.95
4.90
4.85
4.80
2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000
Average Salary (RM)
Average Salary (RM) vs. Unemployment rate. Color shows details about State-1. Size shows count of Job ID.

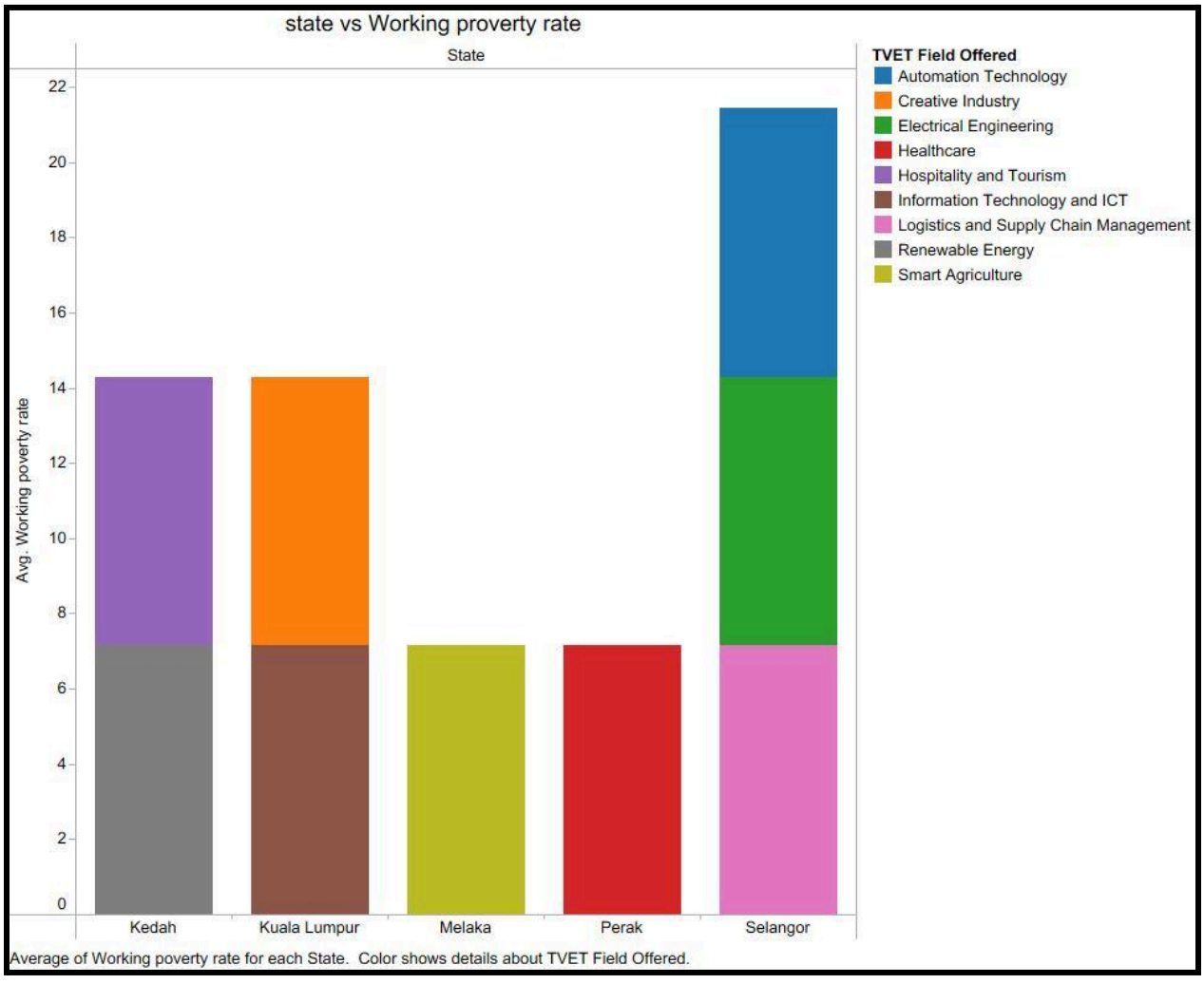

Creating a Bar Chart for Ranking
TVET Field Offered
Maintenance and Re..
Hospitality and Tour..
Logistics and Supply..
Smart Agriculture
Healthcare
Creative Industry
Renewable Energy
Automation Technol..
Electrical Engineering
Information Technol..
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050
Count of Student ID
Fail_Flag
Failed
Passed
Count of Student ID for each TVET Field Offered. Color shows details about Fail_Flag.


4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Avg. Final Grade (CGPA)
0M
5M
10M
15M
20M
25M
30M
35M
Average Salary (RM)
13 nulls

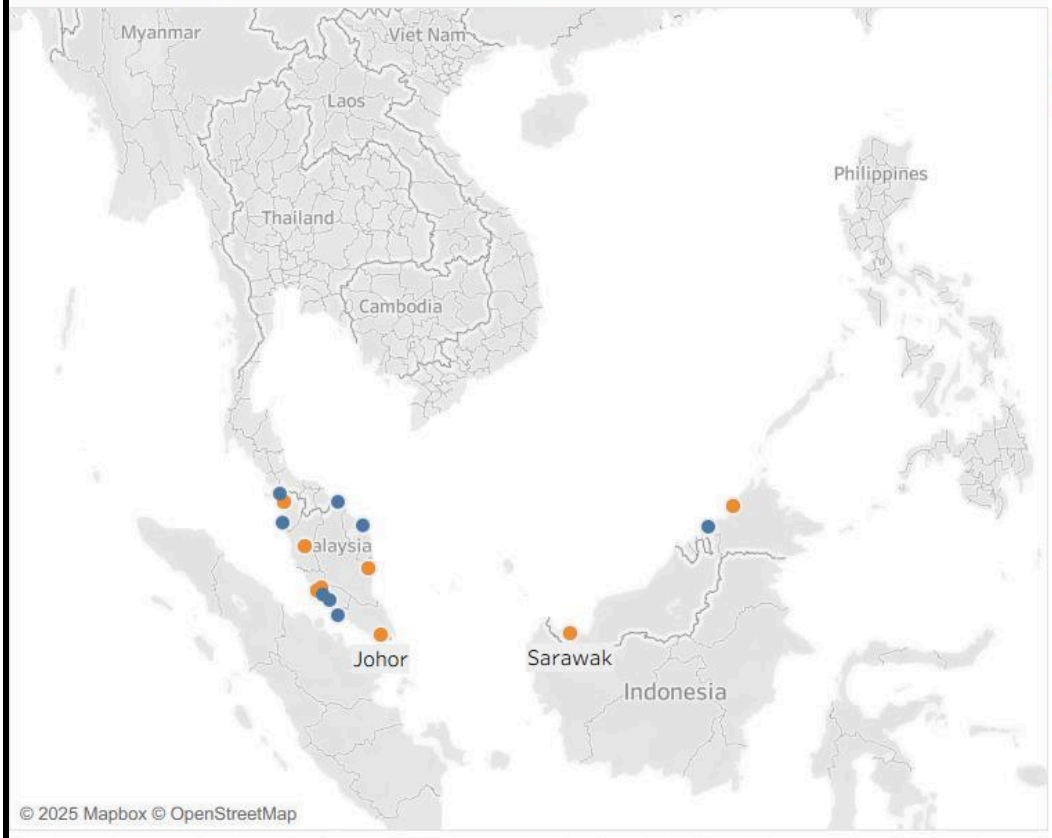

scatterplot (CGPA vs Salary)
Final Grade (CGPA)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
3000
3500
4000
4500
5000
5500
Average Salary (RM)
130
399
388
48
426
381
264
488
29
274
184
439
139
489
252
224
50
153
295
64
141
256
23
131
421
108
257
478
74
208
122
379
107
TVET Field Offered
Automation Technology
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Maintenance and Repair
Renewable Energy
Smart Agriculture
Average Salary (RM) vs. Final Grade (CGPA). Color shows details about TVET Field Offered. The marks are labeled by Student ID.


Labour Force Participation Rate Over Years
Labour force participation rate
1600K
1400K
1200K
1000K
800K
600K
400K
200K
0K
2021
2022
2023
2024
2025
Year-1
TVET Field Offered
Automation Technology
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Renewable Energy
Smart Agriculture
The trend of sum of Labour force participation rate for Year-1. Color shows details about TVET Field Offered.


Graduate Supply by Salary Range
Job ID
Average Salary (RM)
TVET Field Offered
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Renewable Energy
Smart Agriculture
Average Salary (RM) vs. Job ID. Color shows details about TVET Field Offered. The marks are labeled by TVET Field Offered.


state vs Working proverty rate
State
Avg. Working poverty rate
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
TVET Field Offered
Automation Technology
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Management
Renewable Energy
Smart Agriculture
Average of Working poverty rate for each State. Color shows details about TVET Field Offered.

spatial map(state wise result flag)



Map based on Longitude and Latitude. Color shows details about Fail_Flag. The marks are labeled by State.

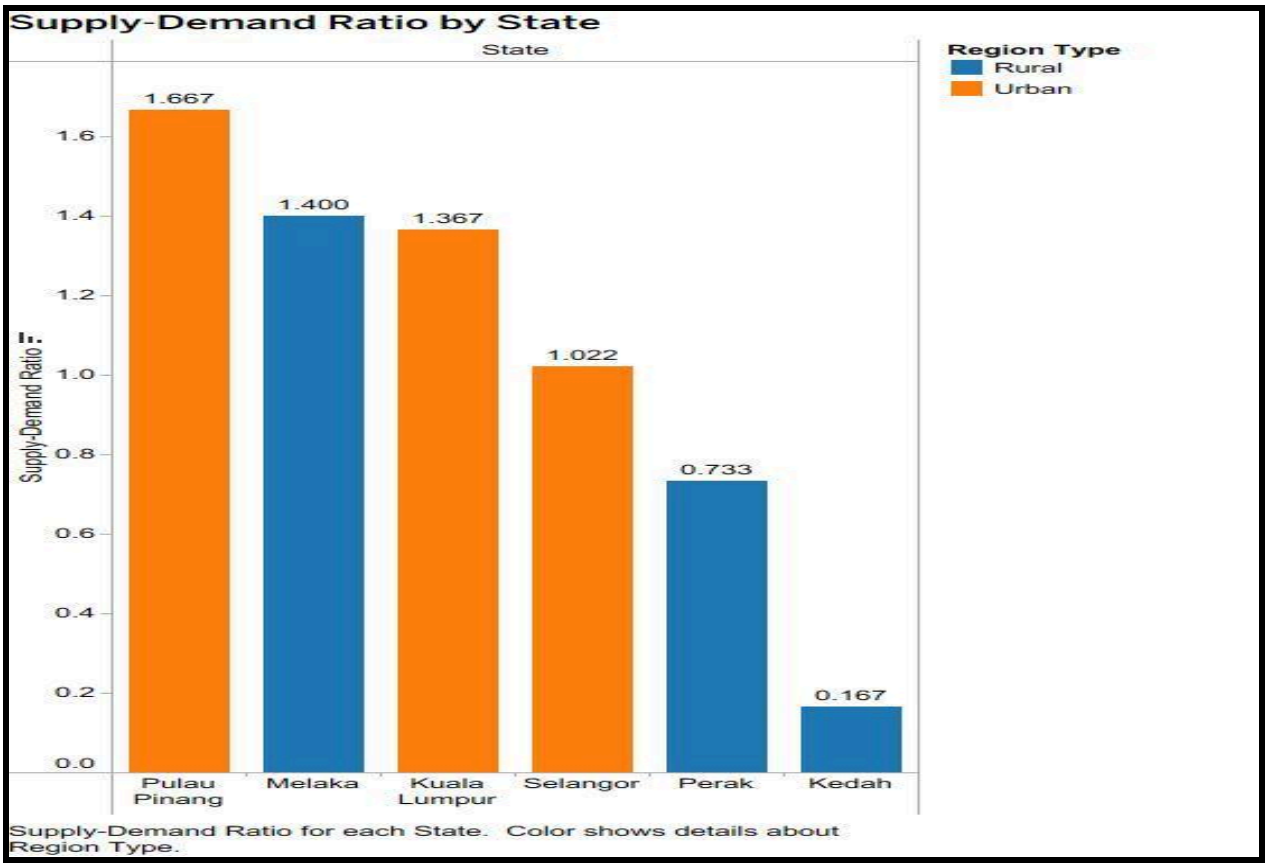
Youth NEET Rate by State and Year

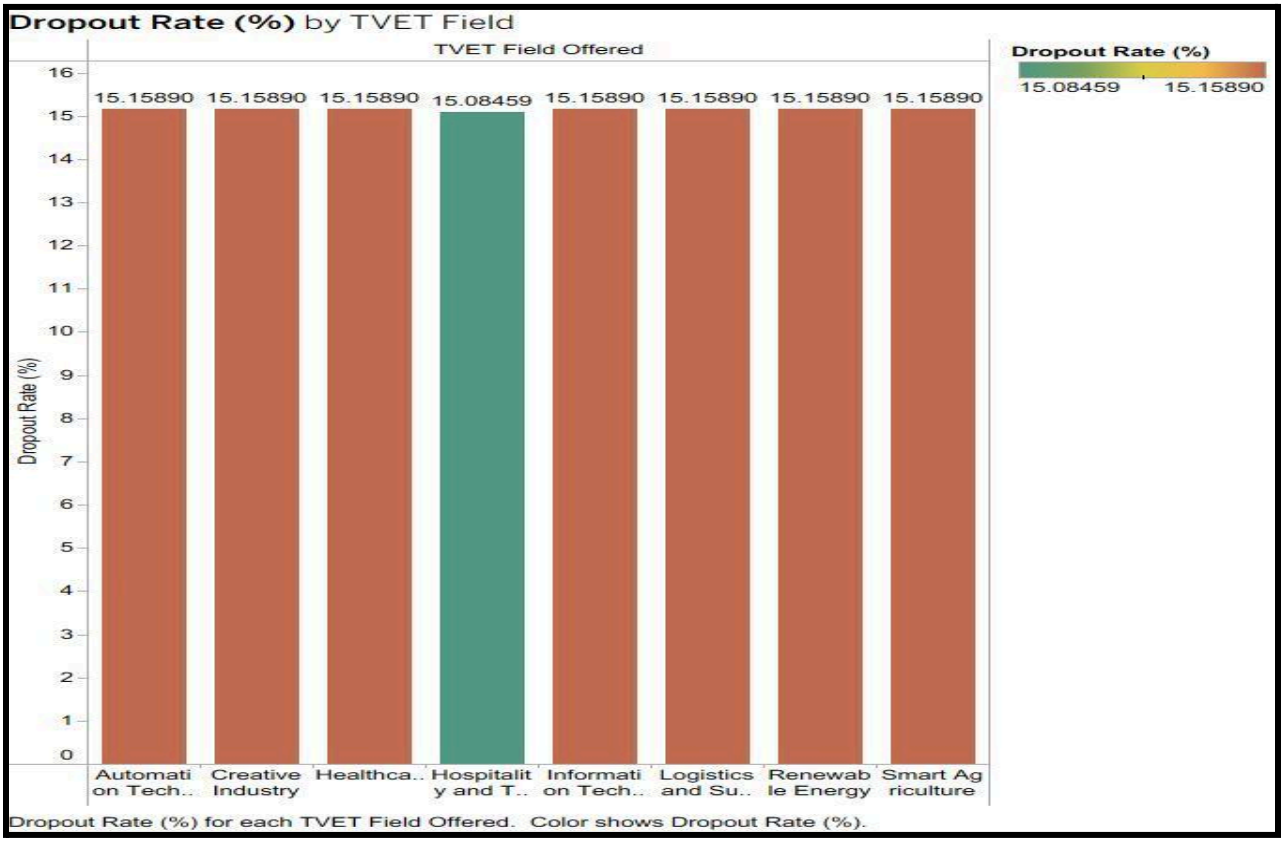
State-1	2021	2022	2023	2024	2025
Kedah		7,956,390	2,098,980	708,630	
Kuala Lumpur		8,036,220	2,120,040	715,740	
Melaka		4,071,330	1,074,060	362,610	
Perak		3,964,890	1,045,980	353,130	
Selangor		11,894,670	3,137,940	1,059,390	

Year-1

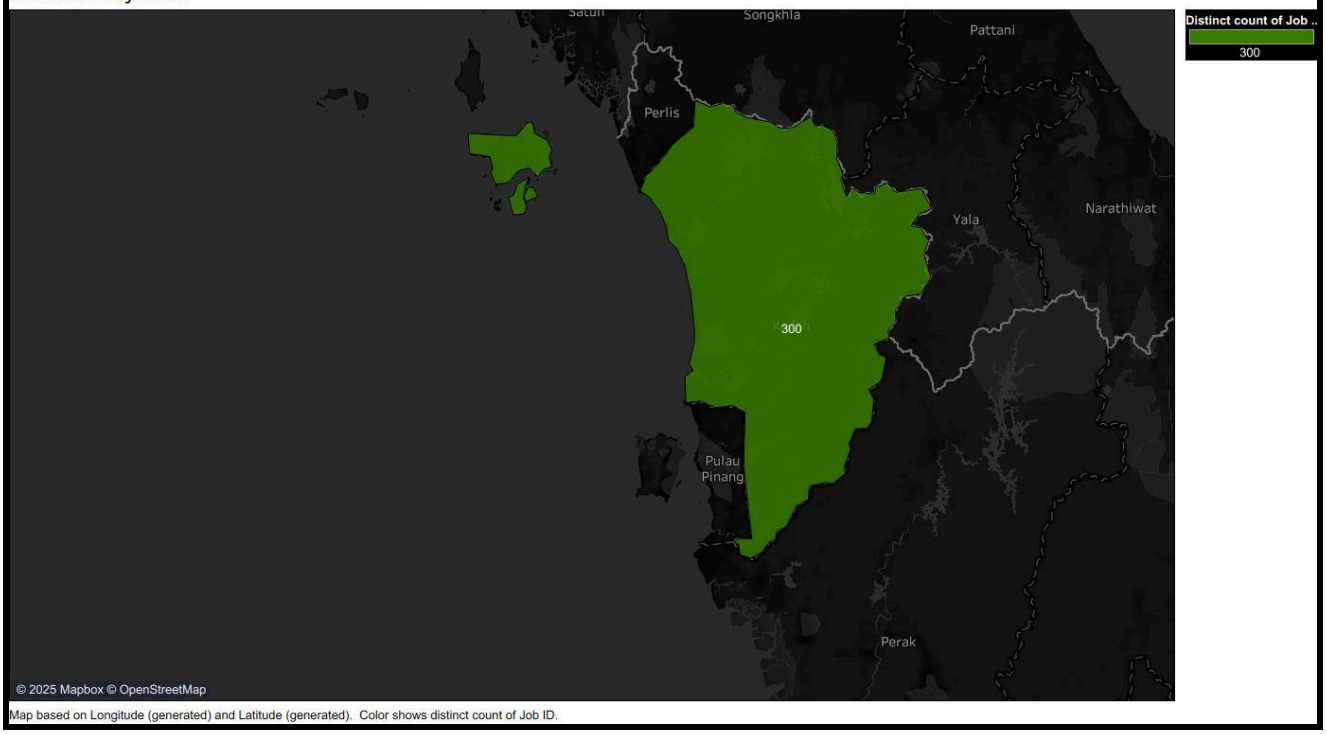
Job ID
353,130 11,894,670

Year-1 for each State-1. Color shows sum of Job ID. The marks are labeled by sum of Job ID.


Supply-Demand Ratio by State
State
Region Type
Rural
Urban
Supply-Demand Ratio
1.667
1.400
1.367
1.022
0.733
0.167
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
Pulau Pinang
Melaka
Kuala Lumpur
Selangor
Perak
Kedah
Supply-Demand Ratio for each State. Color shows details about Region Type.


Dropout Rate (%) by TVET Field
TVET Field Offered
Dropout Rate (%)
15.08459
15.15890
Dropout Rate (%)
15.15890
15.15890
15.15890
15.08459
15.15890
15.15890
15.15890
15.15890
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Automation Tech..
Creative Industry
Healthca..
Hospitality and T..
Information Tech..
Logistics and Su..
Renewable Energy
Smart Agriculture
Dropout Rate (%) for each TVET Field Offered. Color shows Dropout Rate (%).

Job Demand by State.



Map based on Longitude (generated) and Latitude (generated). Color shows distinct count of Job ID.

Graduate Output by State & Field (High Demand Fields)

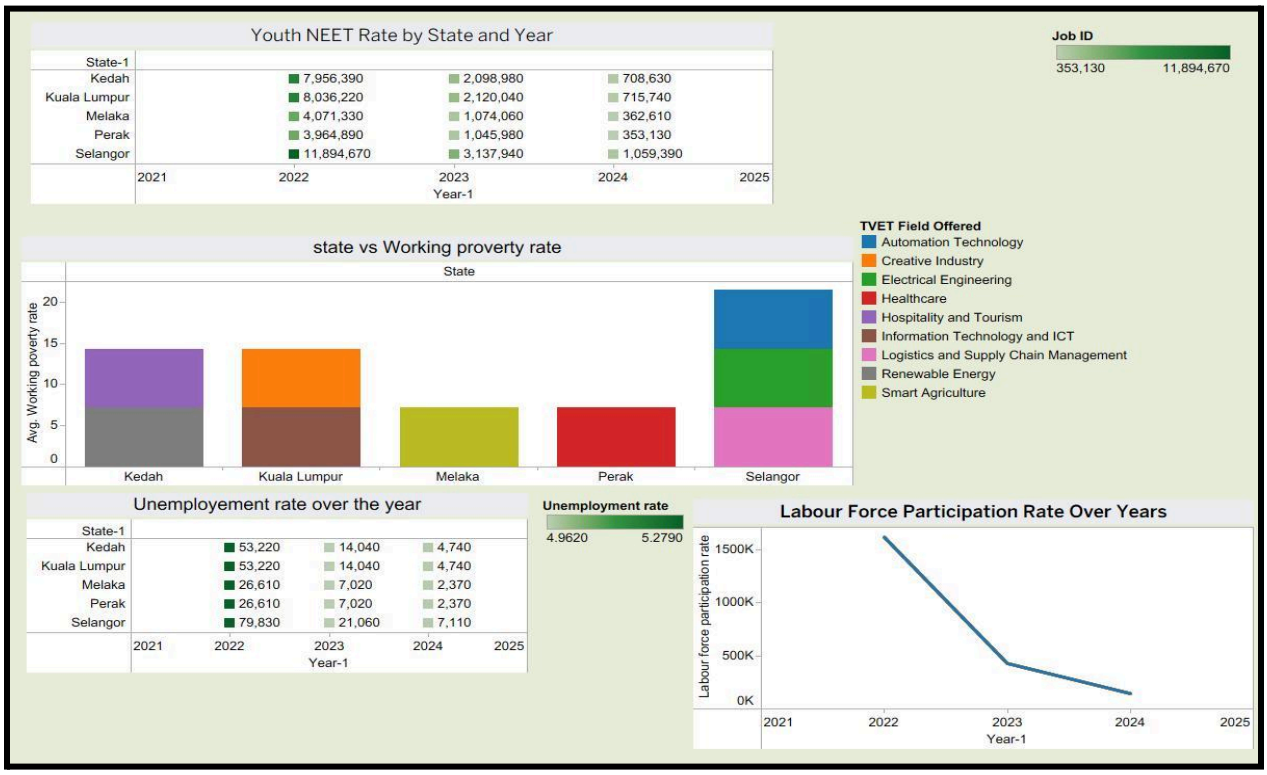
TVET Field Offered

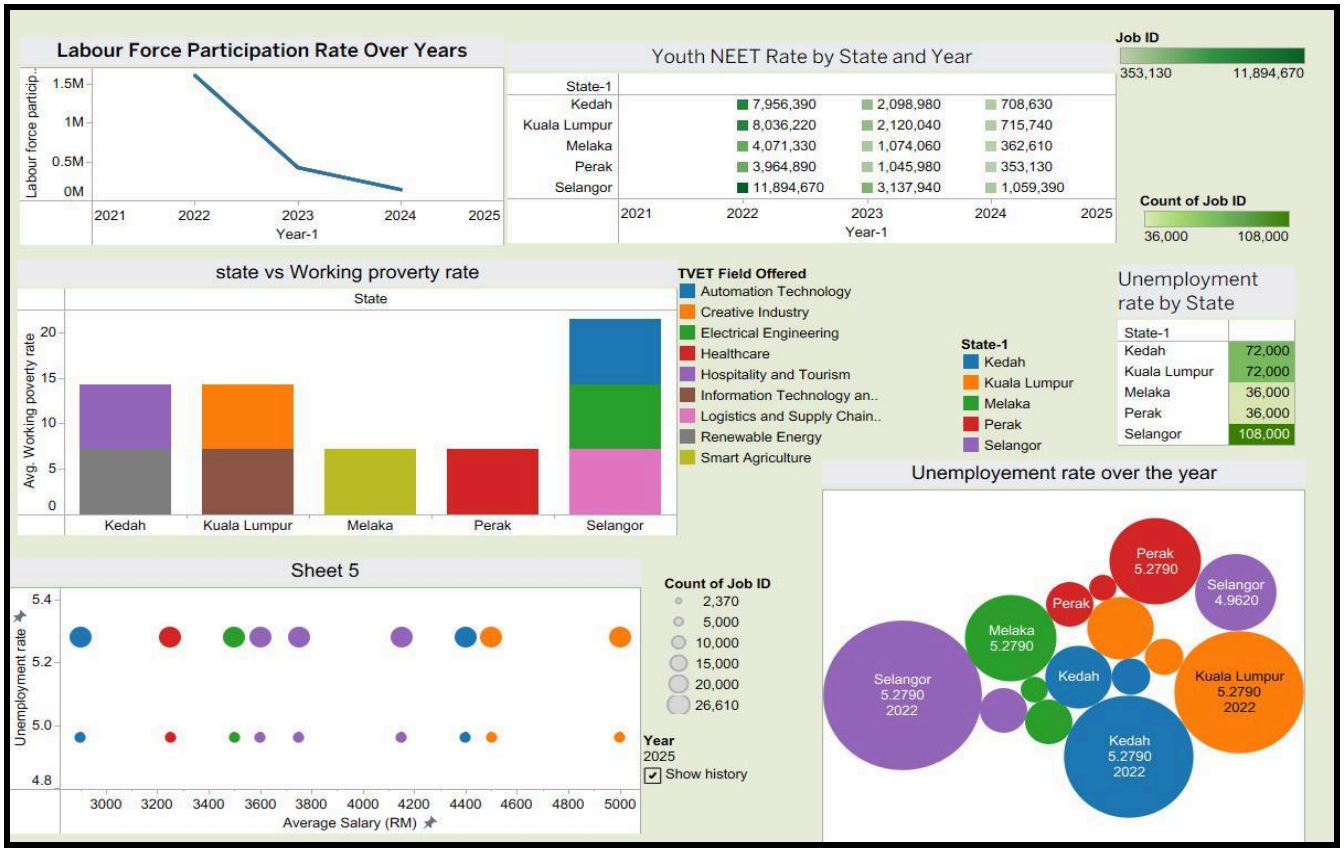
State	Automation Techn..	Creative Industry	Healthca..	Hospitality and To..	Information Techn..	Logistics and Sup..	Renewable Energy	Smart Agriculture
Kedah	10	10	10	10	10	10	10	10
Kuala Lumpur	82	82	82	82	82	82	82	82
Melaka	42	42	42	42	42	42	42	42
Perak	22	22	22	22	22	22	22	22
Pulau Pinang	50	50	50	50	50	50	50	50
Selangor	92	92	92	92	92	92	92	92

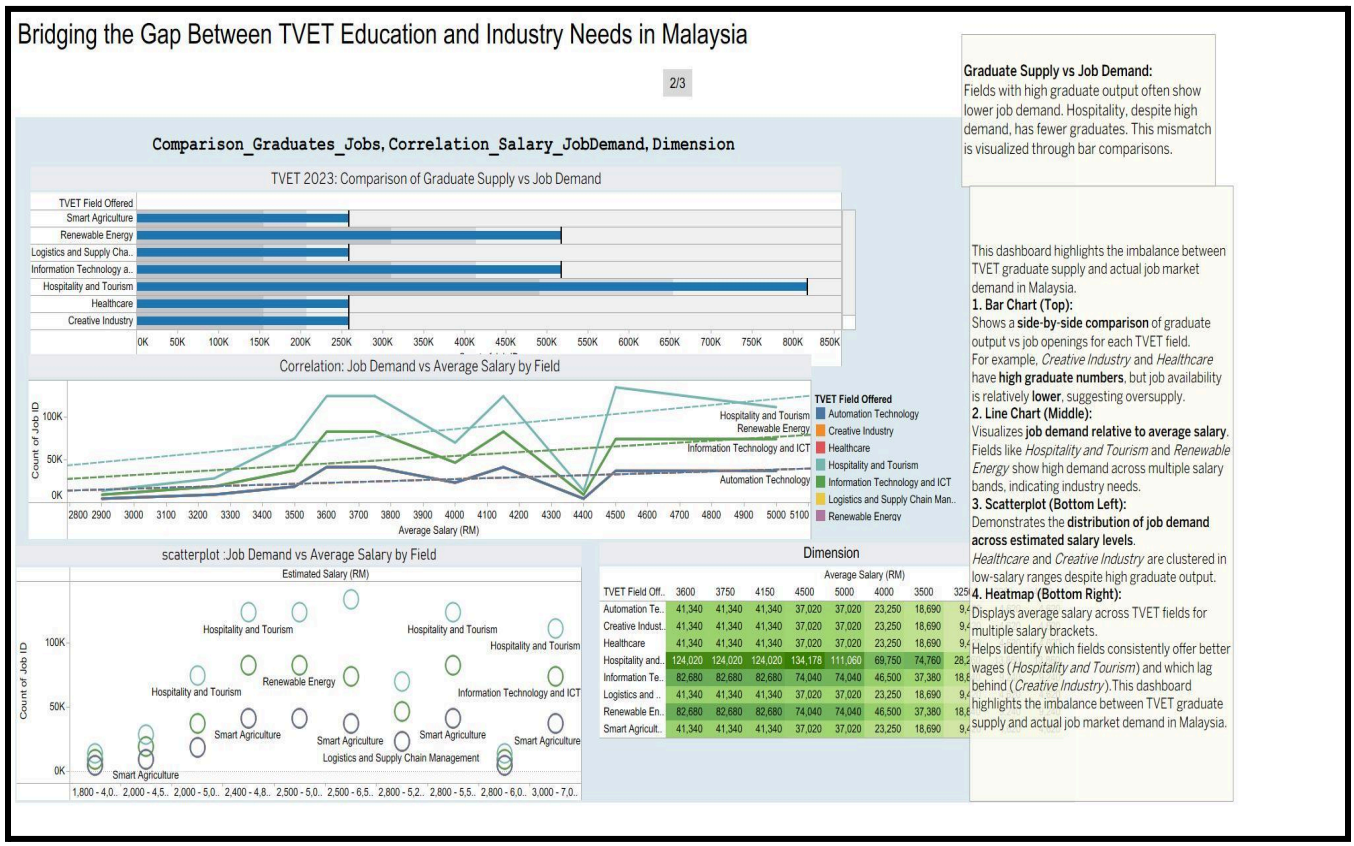
Distinct count of Stu..
10 92

Distinct count of Student ID (color) broken down by TVET Field Offered vs. State.

Dashboard and Story




Labour Force Participation Rate Over Years
Labour force particip..
1.5M
1M
0.5M
0M
2021
2022
2023
2024
2025
Year-1
Youth NEET Rate by State and Year
State-1
Kedah 7,956,390 2,098,980 708,630
Kuala Lumpur 8,036,220 2,120,040 715,740
Melaka 4,071,330 1,074,060 362,610
Perak 3,964,890 1,045,980 353,130
Selangor 11,894,670 3,137,940 1,059,390
2021 2022 2023 2024 2025
Year-1
Job ID
353,130 11,894,670
Count of Job ID
36,000 108,000
state vs Working proverty rate
State
Avg. Working poverty rate
20
15
10
5
0
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
TVET Field Offered
Automation Technology
Creative Industry
Electrical Engineering
Healthcare
Hospitality and Tourism
Information Technology an..
Logistics and Supply Chain..
Renewable Energy
Smart Agriculture
State-1
Kedah
Kuala Lumpur
Melaka
Perak
Selangor
Unemployment rate by State
State-1
Kedah 72,000
Kuala Lumpur 72,000
Melaka 36,000
Perak 36,000
Selangor 108,000
Sheet 5
Unemployment rate
5.4
5.2
5.0
4.8
3000 3200 3400 3600 3800 4000 4200 4400 4600 4800 5000
Average Salary (RM)
Count of Job ID
2,370
5,000
10,000
15,000
20,000
26,610
Year
2025
Show history
Unemployement rate over the year
Perak 5.2790
Selangor 4.9620
Perak
Melaka 5.2790
Kedah
Kuala Lumpur 5.2790 2022
Selangor 5.2790 2022
Kedah 5.2790 2022


Bridging the Gap Between TVET Education and Industry Needs in Malaysia
2/3
Graduate Supply vs Job Demand:
Fields with high graduate output often show lower job demand. Hospitality, despite high demand, has fewer graduates. This mismatch is visualized through bar comparisons.
Comparison_Graduates_Jobs, Correlation_Salary_JobDemand, Dimension
TVET 2023: Comparison of Graduate Supply vs Job Demand
TVET Field Offered
Smart Agriculture
Renewable Energy
Logistics and Supply Cha..
Information Technology a..
Hospitality and Tourism
Healthcare
Creative Industry
0K 50K 100K 150K 200K 250K 300K 350K 400K 450K 500K 550K 600K 650K 700K 750K 800K 850K
Correlation: Job Demand vs Average Salary by Field
Count of Job ID
100K
50K
0K
Hospitality and Tourism
Renewable Energy
Information Technology and ICT
Automation Technology
2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000 5100
Average Salary (RM)
TVET Field Offered
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology and ICT
Logistics and Supply Chain Man..
Renewable Energy
scatterplot :Job Demand vs Average Salary by Field
Estimated Salary (RM)
Count of Job ID
100K
50K
0K
Hospitality and Tourism
Renewable Energy
Information Technology and ICT
Smart Agriculture
Logistics and Supply Chain Management
1,800 - 4,0.. 2,000 - 4,5.. 2,000 - 5,0.. 2,400 - 4,8.. 2,500 - 5,0.. 2,500 - 6,5.. 2,800 - 5,2.. 2,800 - 5,5.. 2,800 - 6,0.. 3,000 - 7,0..
Dimension
Average Salary (RM)
TVET Field Off.. 3600 3750 4150 4500 5000 4000 3500 325
Automation Te.. 41,340 41,340 41,340 37,020 37,020 23,250 18,690 9.4
Creative Indust.. 41,340 41,340 41,340 37,020 37,020 23,250 18,690 9.4
Healthcare 41,340 41,340 41,340 37,020 37,020 23,250 18,690 9.4
Hospitality and.. 124,020 124,020 124,020 134,178 111,060 69,750 74,760 28.2
Information Te.. 82,680 82,680 82,680 74,040 74,040 46,500 37,380 18.8
Logistics and .. 41,340 41,340 41,340 37,020 37,020 23,250 18,690 9.4
Renewable En.. 82,680 82,680 82,680 74,040 74,040 46,500 37,380 18.8
Smart Agricult.. 41,340 41,340 41,340 37,020 37,020 23,250 18,690 9.4
This dashboard highlights the imbalance between TVET graduate supply and actual job market demand in Malaysia.
1. Bar Chart (Top):
Shows a side-by-side comparison of graduate output vs job openings for each TVET field.
For example, Creative Industry and Healthcare have high graduate numbers, but job availability is relatively lower, suggesting oversupply.
2. Line Chart (Middle):
Visualizes job demand relative to average salary.
Fields like Hospitality and Tourism and Renewable Energy show high demand across multiple salary bands, indicating industry needs.
3. Scatterplot (Bottom Left):
Demonstrates the distribution of job demand across estimated salary levels.
Healthcare and Creative Industry are clustered in low-salary ranges despite high graduate output.
4. Heatmap (Bottom Right):
Displays average salary across TVET fields for multiple salary brackets.
Helps identify which fields consistently offer better wages (Hospitality and Tourism) and which lag behind (Creative Industry).This dashboard highlights the imbalance between TVET graduate supply and actual job market demand in Malaysia.


CGPA vs Job Demand
Distinct count of Job ID
Final Grade (CGPA)
Distinct count of Student ID
10
92
Graduate Output by State & Field (High Demand Fields)
TVET Field Offered
State
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology
Logistics and Supply Chain
Renewable Energy
Smart Agriculture
Kedah 10 10 10 10 10 10 10 10
Kuala Lumpur 82 82 82 82 82 82 82 82
Melaka 42 42 42 42 42 42 42 42
Perak 22 22 22 22 22 22 22 22
Pulau Pinang 50 50 50 50 50 50 50 50
Selangor 92 92 92 92 92 92 92 92
Supply-Demand Ratio by State
State
Supply-Demand Ratio
1.667
1.400
1.367
1.022
0.733
0.167
Pulau Pinang
Melaka
Kuala Lumpur
Selangor
Perak
Kedah
Region Type
Rural
Urban
Distinct coun..
300
Job Demand by State.
300
© 2025 Mapbox © OpenStreetMap
Dropout Rate (%) by TVET Field
TVET Field Offered
Dropout Rate (%)
15.15890
15.08459
Automation Technology
Creative Industry
Healthcare
Hospitality and Tourism
Information Technology an..
Logistics and Supply Chai..
Renewable Energy
Smart Agriculture

Storyboard:

Bridging the Gap Between TVET Education and Industry Needs in Malaysia

1/3

Introduction:
This story explores the alignment between TVET education and job market demands in Malaysia, focusing on graduate supply, job mismatch, salary trends, and socioeconomic disparities. Using data from 2021 to 2025, we analyze how well the TVET system is preparing students for actual employment needs.

Business Understanding:
General: Malaysia is producing an increasing number of TVET graduates to boost workforce readiness.
Specific: However, some fields like *Creative Industry* are oversupplied while others like *Hospitality & ICT* face skill shortages, indicating a misalignment between education output and industry demand.

Type of Story:
This is a **"Contrary + Zoom-In"** story.
Contrary to public assumptions, not all high-supply fields lead to better employment. We zoom into specific fields and states (e.g., Selangor, Kelantan) to explore local gaps and salary differences.

Story Punchline:
There is a clear mismatch between graduate supply and job market demand across fields. Moreover, salary inequality across regions and low pay in critical fields may reduce the motivation of students to join high-need sectors.

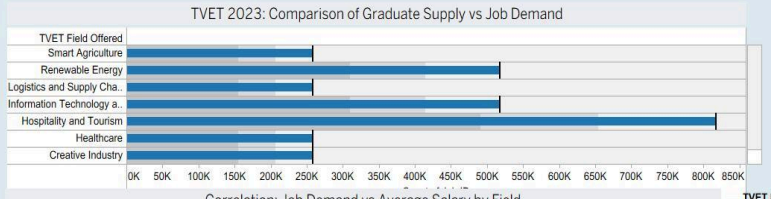
Conclusion & Recommendation:
TVET institutions should realign programs with real-time job demand
Government must invest in underperforming states
Salary incentives are needed to attract graduates to high-demand, low-paying sectors
Data dashboards should be used for ongoing curriculum planning and graduate tracking

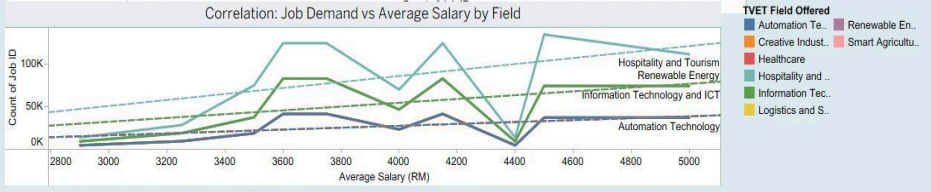
Bridging the Gap Between TVET Education and Industry Needs in Malaysia

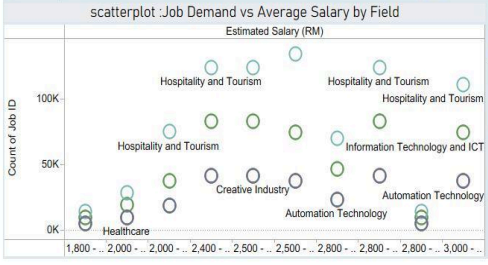
2/2

Graduate Supply vs Job Demand:
Fields with high graduate output often show lower job demand. Hospitality, despite high demand, has fewer graduates. This mismatch is visualized through bar comparisons.

Comparison_Graduates_Jobs, Correlation_Salary_JobDemand, Dimension



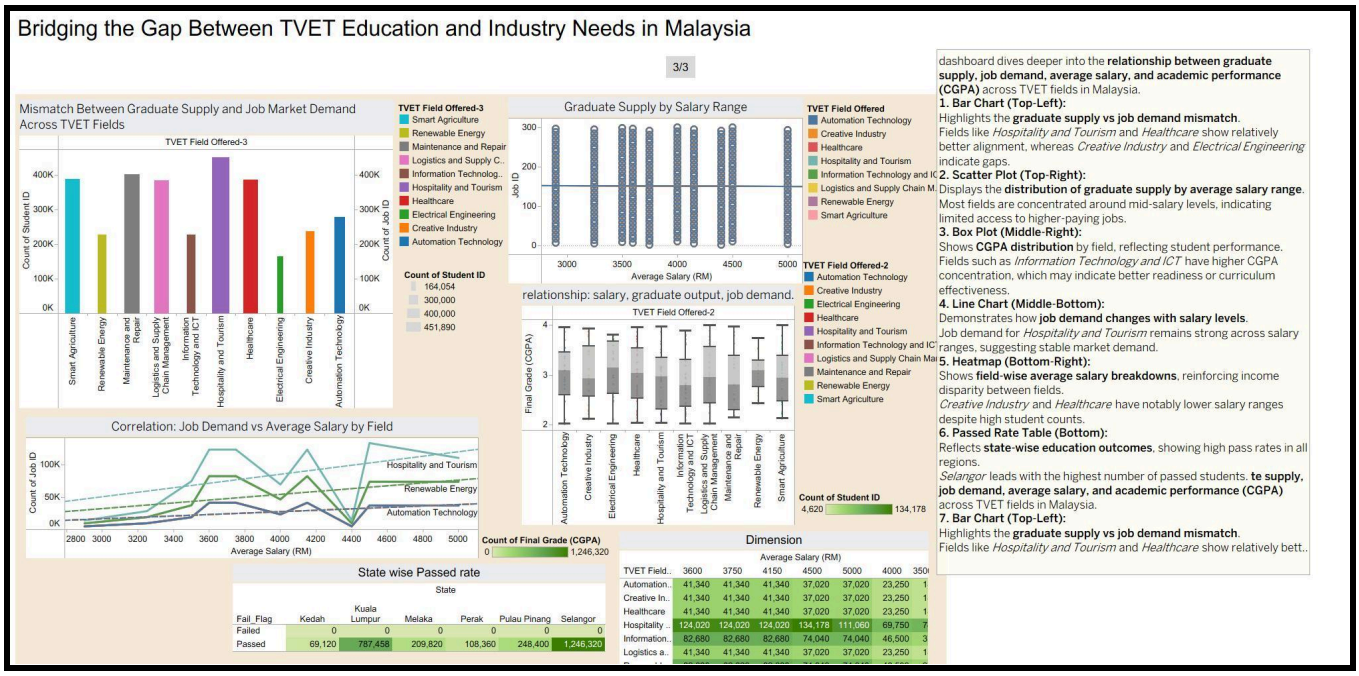


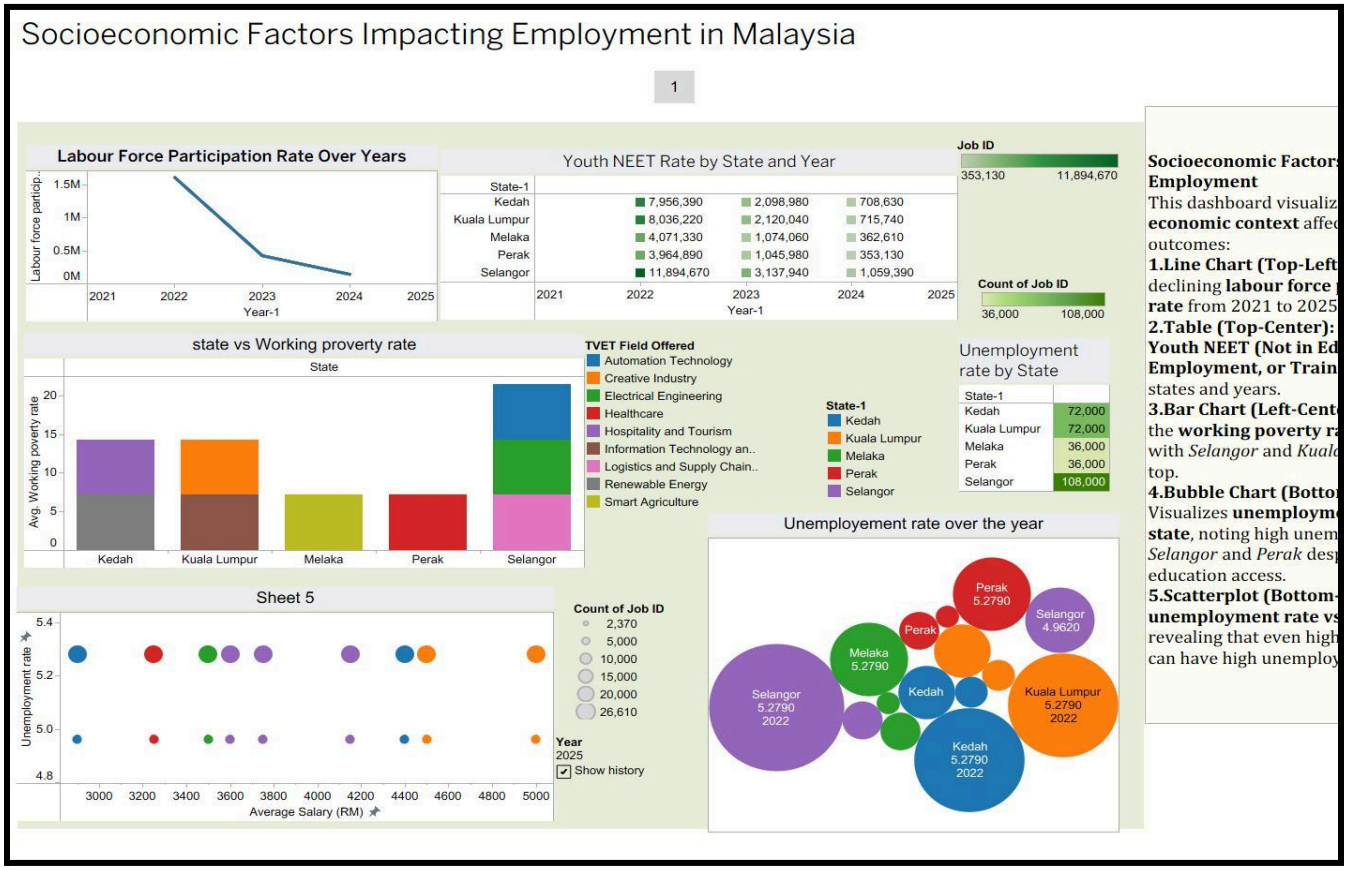


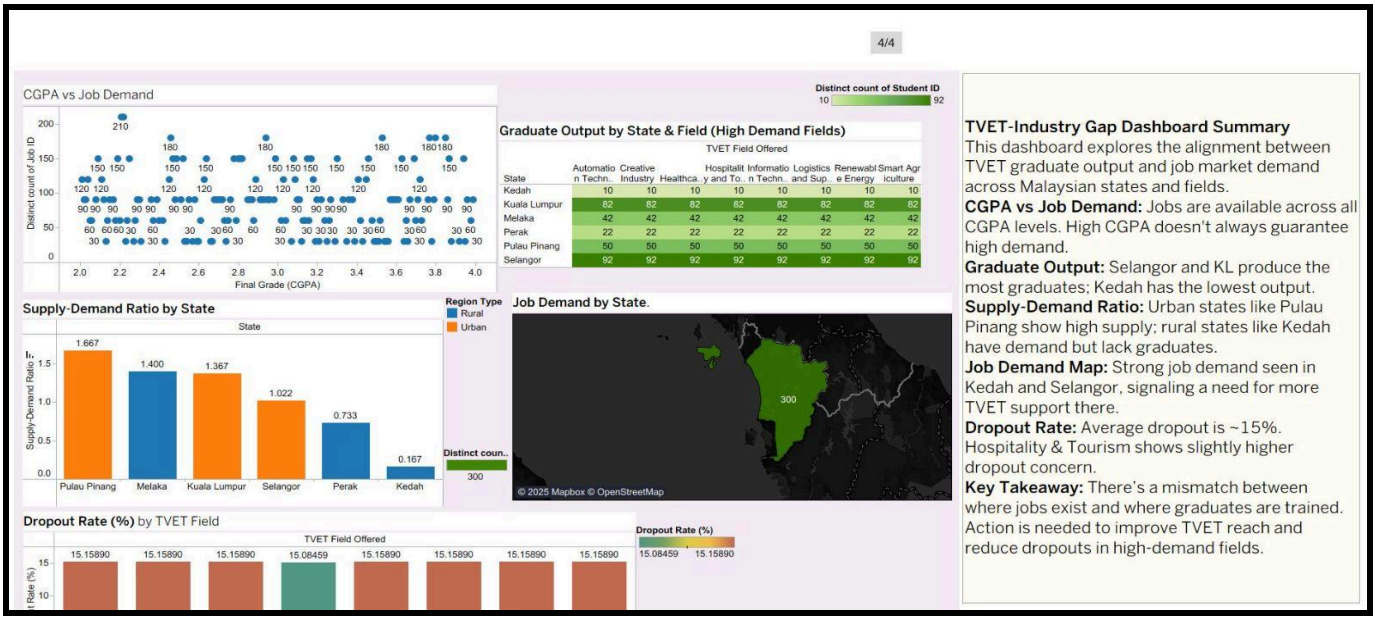
Dimension

TVET Field..	Average Salary (RM) 3600	3750	4150	4500	5000	4000	3500	3250	2900
Automation..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Creative In..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Healthcare	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Hospitality ..	124,020	124,020	124,020	134,178	111,060	69,750	74,760	28,260	13,(
Information..	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,2
Logistics a..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(
Renewable..	82,680	82,680	82,680	74,040	74,040	46,500	37,380	18,840	9,2
Smart Agri..	41,340	41,340	41,340	37,020	37,020	23,250	18,690	9,420	4,(

This dashboard highlights the imbalance between TVET graduate supply and actual job market demand in Malaysia.
1. Bar Chart (Top):
Shows a **side-by-side comparison** of graduate output vs job openings for each TVET field.
For example, *Creative Industry* and *Healthcare* have **high graduate numbers**, but job availability is relatively **lower**, suggesting oversupply.
2. Line Chart (Middle):
Visualizes **job demand relative to average salary**.
Fields like *Hospitality and Tourism* and *Renewable Energy* show high demand across multiple salary bands, indicating industry needs.
3. Scatterplot (Bottom Left):
Demonstrates the **distribution of job demand across estimated salary levels**.
Healthcare and *Creative Industry* are clustered in low-salary ranges despite high graduate output.
4. Heatmap (Bottom Right):
Displays average salary across TVET fields for multiple salary brackets.
Helps identify which fields consistently offer better wages (*Hospitality and Tourism*) and which lag behind (*Creative Industry*).This dashboard highlights the imbalance between TVET graduate supply and actual job market demand in Malaysia.


Bridging the Gap Between TVET Education and Industry Needs in Malaysia
3/3
Mismatch Between Graduate Supply and Job Market Demand Across TVET Fields
Graduate Supply by Salary Range
relationship: salary, graduate output, job demand.
Correlation: Job Demand vs Average Salary by Field
State wise Passed rate
Dimension
dashboard dives deeper into the relationship between graduate supply, job demand, average salary, and academic performance (CGPA) across TVET fields in Malaysia.
1. Bar Chart (Top-Left):
Highlights the graduate supply vs job demand mismatch.
Fields like Hospitality and Tourism and Healthcare show relatively better alignment, whereas Creative Industry and Electrical Engineering indicate gaps.
2. Scatter Plot (Top-Right):
Displays the distribution of graduate supply by average salary range.
Most fields are concentrated around mid-salary levels, indicating limited access to higher-paying jobs.
3. Box Plot (Middle-Right):
Shows CGPA distribution by field, reflecting student performance.
Fields such as Information Technology and ICT have higher CGPA concentration, which may indicate better readiness or curriculum effectiveness.
4. Line Chart (Middle-Bottom):
Demonstrates how job demand changes with salary levels.
Job demand for Hospitality and Tourism remains strong across salary ranges, suggesting stable market demand.
5. Heatmap (Bottom-Right):
Shows field-wise average salary breakdowns, reinforcing income disparity between fields.
Creative Industry and Healthcare have notably lower salary ranges despite high student counts.
6. Passed Rate Table (Bottom):
Reflects state-wise education outcomes, showing high pass rates in all regions.
Selangor leads with the highest number of passed students. te supply, job demand, average salary, and academic performance (CGPA) across TVET fields in Malaysia.
7. Bar Chart (Top-Left):
Highlights the graduate supply vs job demand mismatch.
Fields like Hospitality and Tourism and Healthcare show relatively bett..


Socioeconomic Factors Impacting Employment in Malaysia
1
Labour Force Participation Rate Over Years
Youth NEET Rate by State and Year
state vs Working proverty rate
Unemployment rate by State
Unemployement rate over the year
Sheet 5
Socioeconomic Factors Employment
This dashboard visualiz economic context affec outcomes:
1.Line Chart (Top-Left declining labour force rate from 2021 to 2025
2.Table (Top-Center): Youth NEET (Not in Ed Employment, or Train states and years.
3.Bar Chart (Left-Cent the working poverty ra with Selangor and Kuala top.
4.Bubble Chart (Botto Visualizes unemployme state, noting high unem Selangor and Perak desp education access.
5.Scatterplot (Bottom- unemployment rate vs revealing that even high can have high unemploy


4/4
CGPA vs Job Demand
Distinct count of Job ID
Final Grade (CGPA)
Distinct count of Student ID
10
92
Graduate Output by State & Field (High Demand Fields)
TVET Field Offered
State
Automatio n Techn..
Creative Industry
Healthca..
Hospitalit y and To..
Informatio n Techn..
Logistics and Sup..
Renewabl e Energy
Smart Agr iculture
Kedah 10 10 10 10 10 10 10 10
Kuala Lumpur 82 82 82 82 82 82 82 82
Melaka 42 42 42 42 42 42 42 42
Perak 22 22 22 22 22 22 22 22
Pulau Pinang 50 50 50 50 50 50 50 50
Selangor 92 92 92 92 92 92 92 92
Supply-Demand Ratio by State
State
Supply-Demand Ratio
1.667
1.400
1.367
1.022
0.733
0.167
Pulau Pinang
Melaka
Kuala Lumpur
Selangor
Perak
Kedah
Region Type
Rural
Urban
Distinct coun..
300
Job Demand by State.
300
© 2025 Mapbox © OpenStreetMap
Dropout Rate (%) by TVET Field
TVET Field Offered
Dropout Rate (%)
15.08459
15.15890
15.15890
15.15890
15.08459
15.15890
15.15890
15.15890
15.15890
TVET-Industry Gap Dashboard Summary
This dashboard explores the alignment between TVET graduate output and job market demand across Malaysian states and fields.
CGPA vs Job Demand: Jobs are available across all CGPA levels. High CGPA doesn't always guarantee high demand.
Graduate Output: Selangor and KL produce the most graduates; Kedah has the lowest output.
Supply-Demand Ratio: Urban states like Pulau Pinang show high supply; rural states like Kedah have demand but lack graduates.
Job Demand Map: Strong job demand seen in Kedah and Selangor, signaling a need for more TVET support there.
Dropout Rate: Average dropout is ~15%. Hospitality & Tourism shows slightly higher dropout concern.
Key Takeaway: There's a mismatch between where jobs exist and where graduates are trained. Action is needed to improve TVET reach and reduce dropouts in high-demand fields.

----- END -----