

**A COMPREHENSIVE APPROACH TO ANALYZE THE VISION OF  
COUNTRIES FOR DEVELOPMENT**

**A COMPREHENSIVE APPROACH TO ANALYZE THE VISION OF  
COUNTRIES FOR DEVELOPMENT**

A project report submitted as a part of Honor's Degree subject: Data Analytics

By

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## **ABSTRACT**

This is a comprehensive assessment of various countries across the globe based on key metrics related to talent, infrastructure, operating environment, research, development, government strategy, and commercial factors. Each country has been evaluated and assigned scores in these categories, reflecting their relative strengths and weaknesses in terms of competitiveness and innovation capacity. The data covers a wide range of countries from different regions and income groups, offering insights into the global landscape of innovation and development. Notable findings include the high scores achieved by countries like the United States and China, indicating their leadership positions in innovation and infrastructure. However, disparities exist, with some nations lagging behind in critical areas such as research and commercial activities. This analysis serves as a valuable resource for policymakers, researchers, and analysts interested in understanding the dynamics of innovation ecosystems worldwide and identifying areas for improvement and collaboration among nations. It underscores the importance of fostering talent, promoting research and development, and creating conducive operating environments to drive sustainable growth and competitiveness on a global scale.

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# 1. INTRODUCTION

In an increasingly interconnected world driven by innovation and technological advancement, the evaluation of a country's competitive strengths and weaknesses across various domains is paramount for informed decision-making and strategic planning. This dataset presents a comprehensive analysis of countries spanning diverse regions and income groups, shedding light on their relative positions in the global landscape of talent, infrastructure, research, development, government strategy, and commercial activities.

As nations vie for economic supremacy and technological leadership, understanding the factors that contribute to their competitiveness becomes imperative. The metrics provided in this dataset offer a nuanced perspective on the multifaceted nature of innovation ecosystems, encompassing human capital, physical infrastructure, regulatory environments, and policy frameworks.

From established power players like the United States to emerging rising stars such as Singapore and South Korea, each country's profile is dissected based on its performance across key dimensions of innovation and development. The dataset delves into not only the strengths that propel certain nations to the forefront of global innovation but also the challenges and disparities that hinder progress in others.

Against the backdrop of rapid technological change and geopolitical shifts, the findings presented in this dataset underscore the importance of fostering conducive environments for innovation, promoting research and development initiatives, and nurturing skilled talent pools. Moreover, they highlight the imperative for collaborative efforts and knowledge sharing among nations to address common challenges and capitalize on emerging opportunities in the global innovation ecosystem.

## 1.1 Problem

Countries worldwide have experienced diverse trajectories of development over the years. While some nations have undergone remarkable economic growth, technological advancements, and improved living standards, others continue to grapple with persistent challenges. Factors such as political stability, effective governance, investment in education and healthcare, and access to resources play pivotal roles in shaping a country's development.

Disparities persist, with developed nations showcasing robust infrastructure, innovation, and social welfare systems, while developing countries strive to overcome hurdles like poverty, inequality, and inadequate healthcare. The global landscape is marked by ongoing efforts to bridge these gaps through international collaborations, sustainable development goals, and initiatives aimed at fostering inclusive progress...

## **1.2 Project Statement**

In this project, graphs of different countries around the world and their analysis in different sectors have been displayed along with a dashboard menu that displays the same. The graphs along with the countries include the government strategies and talents economic position and the vision to the development in upcoming years. For displaying the above, graphs/plots such as pie charts, bubble charts, 3D charts, scatter plots, box plots, histograms and water fall plot has been used.

## **1.3 Approach**

For this project, I began by collecting the data from the website, Kaggle. The dataset I chose contains 13 columns and 62 rows which means that the dataset contains 806 data items.

Certain data preparations methods were applied to the given dataset. Some of them were sorting the data, checking for null values and dropping or deleting the unnecessary columns.

Libraries such as Pandas, Numpy, Matplotlib have been used. The library used for plotting the graphs is majorly Plotly. Plotly Express which is an easy to use, high level interface to Plotly, which operates on a variety of types of data and produces easy to style figures, has also been used. Graph Objects provides a high-level interface and allows one to specify the data, layout, and style of their plots using Python objects, making it easy to customize the visualizations. Different types of visual representations such as pie chart, histogram, 3D graphs, contour chart, scatter and box plots have been used to depict the figures of positioning of the countries according to the analysis across the world.

Additionally, a dashboard has been created by importing the Dash library. The dashboard effectively displays the different diagrammatic representations.

## **1.4 Organization of the Project**

In Chapter 2, the project's key ideas, such as the methodologies employed for data visualization are examined. We understand how these techniques explain the project's objective.

In Chapter 3, all the graphs that have been curated throughout this project are displayed. Then the dashboard that has been made for this project is also displayed.

In Chapter 4, the results, methods and system performance are explained.

In Chapter 5, the document provides a conclusive remark along with future aspirations I intend to pursue.



## **2. BACKGROUND**

### **2.1 Key Concepts**

The project's primary objective is to visually represent the statistics of the countries that have been developing across the world from 2009 to 2019. The initial step involves data preparation, that is identifying the missing values, sorting the data, and eliminating those columns that may not contribute to the project's objectives. Subsequently, the graphical illustrations of the figures are made using various plots provided by the Python library, Plotly.

#### **2.1.1 Development Prediction Of Different Countries**

Predicting the countries development and economical positioning across the world and the government strategies to become the developed nation with the good economy and talent, infrastructure, and many other sectors across the world around the year 2009-2019.

Global growth remains subdued. Since the April World Economic Outlook (WEO) report, the United States further increased tariffs on certain Chinese imports and China retaliated by raising tariffs on a subset of US imports. Additional escalation was averted following the June G20 summit. Global technology supply chains were threatened by the prospect of US sanctions, Brexit-related uncertainty continued, and rising geopolitical tensions roiled energy prices.

Against this backdrop, global growth is forecast at 3.2 percent in 2019, picking up to 3.5 percent in 2020 (0.1 percentage point lower than in the April WEO projections for both years). GDP releases so far this year, together with generally softening inflation, point to weaker-than-anticipated global activity. Investment and demand for consumer durables have been subdued across advanced and emerging market economies as firms and households continue to hold back on long-range spending. Accordingly, global trade, which is intensive in machinery and consumer durables, remains sluggish. The projected growth pickup in 2020 is precarious, presuming stabilization in currently stressed emerging market and developing economies and progress toward resolving trade policy differences.

	Country	Talent	Infrastructure	Operating Environment	Research	Development	Government Strategy	Commercial	Total score	Region	Cluster	Income group	Political regime
0	United States of America	100.00	94.02	64.96	100.00	100.00	77.39	100.00	100.00	Americas	Power players	High	Liberal democracy
1	China	16.51	100.00	91.57	71.42	79.97	94.87	44.02	62.92	Asia-Pacific	Power players	Upper middle	Closed autocracy
2	United Kingdom	39.65	71.43	74.65	36.50	25.03	82.82	18.91	40.93	Europe	Traditional champions	High	Liberal democracy
3	Canada	31.28	77.05	93.94	30.67	25.78	100.00	14.88	40.19	Americas	Traditional champions	High	Liberal democracy
4	Israel	35.76	67.58	82.44	32.63	27.96	43.91	27.33	39.89	Middle East	Rising stars	High	Liberal democracy
...	...	...	...	...	...	...	...	...	...	...	...	...	...
57	Sri Lanka	6.27	34.64	35.79	0.12	0.95	35.57	0.09	6.62	Asia-Pacific	Nascent	Lower middle	Electoral democracy
58	Egypt	1.11	38.84	0.00	2.08	1.54	68.72	0.31	4.83	Middle East	Nascent	Lower middle	Electoral autocracy
59	Kenya	0.75	14.11	29.84	0.07	12.15	7.75	0.31	2.30	Africa	Nascent	Lower middle	Electoral autocracy
60	Nigeria	2.74	0.00	50.10	0.45	2.06	7.75	0.33	1.38	Africa	Nascent	Lower middle	Electoral autocracy
61	Pakistan	8.00	2.43	12.48	2.17	1.09	13.92	0.27	0.00	Asia-Pacific	Nascent	Lower middle	Electoral autocracy

This data set is taken from the Kaggle website and by observing. I constructed over 10 graphs.

The project aims to analyze and evaluate the competitiveness of countries across various dimensions including talent, infrastructure, operating environment, research, development, government strategy, and commercial viability. The dataset provides quantitative measures of these dimensions for a diverse set of countries spanning different regions, income groups, and political regimes.

## 2.2 Related Work or Literature Review

### 2.2.1 Development in Different Countries

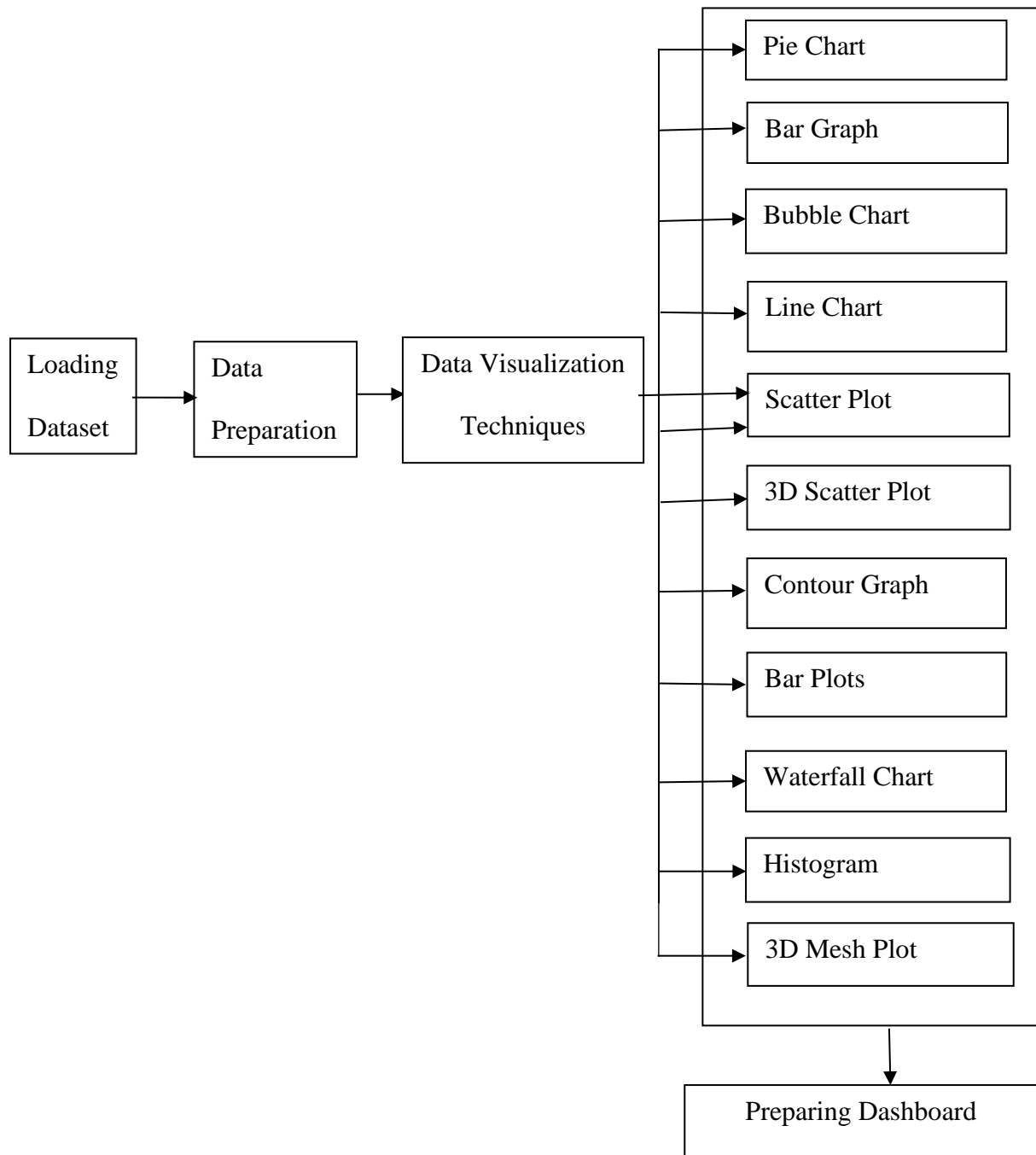
Development is a complex and multifaceted concept that defies simple categorization. It encompasses not only economic indicators such as GDP per capita and industrialization levels but also social indicators such as education, healthcare, poverty rates, and gender equality. Moreover, development extends beyond material progress to encompass political institutions, democratic governance, human rights, and environmental sustainability. In recent decades, the capability approach has gained prominence as a framework for understanding development as the expansion of people's freedoms and capabilities. Amartya Sen and Martha Nussbaum have argued that development should be measured not only in terms of income or GDP but also in terms of individuals' ability to lead fulfilling lives and participate in social, political, and cultural activities.

### **2.2.2 Development of Countries during 2009-2019**

The aftermath of the 2008 global financial crisis shaped much of the economic landscape during the 2009-2019 period. Many countries faced sluggish growth, high unemployment rates, and financial instability in the aftermath of the crisis. Emerging economies, particularly in Asia, continued to experience robust growth, driven by factors such as rapid industrialization, urbanization, and export-oriented manufacturing. China's economic rise remained a defining feature of the global economy during this period, with the country becoming the world's second-largest economy and a major driver of global trade and investment. In contrast, several advanced economies in Europe and North America struggled with sluggish growth, sovereign debt crises, and austerity measures aimed at restoring fiscal sustainability. The emergence of new technologies and industries, such as digital innovation, renewable energy, and biotechnology, reshaped global supply chains and spurred innovation and entrepreneurship in many countries. Social progress varied widely across countries, reflecting disparities in income, education, healthcare, and social protection systems. Many developing countries made significant strides in reducing poverty, expanding access to education and healthcare, and improving living standards for millions of people.

### 3. ARCHITECTURE

#### 3.1 High Level Design



**Fig 3.1: Architecture of the Data Visualization Techniques**

The visualization design for the statistics of development of various countries from 2009-2019. The project begins with loading of the dataset, followed by data preparation steps such as removing the null values, dropping unnecessary columns, and sorting the dataset. Using the Plotly Library, various graphs are created. Each of these graphs depict the number of countries is being developed through different sectors. Finally, a dashboard is created which provides a menu of all the curated graphs.

### 3.2 Visualization Methods

#### a) **Pie Chart:** Representing the Total Infrastructure of Most Countries

A pie chart is a circular statistical graph that is divided into slices to demonstrate the numeric proportions. Pie Charts help show proportions and percentages between categories, by dividing a circle into proportional segments. Each arc length represents a proportion of each category, while the full circle represents the total sum of all the data, equal to 100%. In this project, pie chart is used to show the percentage of total rape cases that have been reported in India's states and Union Territories.

#### b) **Bar Graph:** Representing the Development of Top 20 Countries

A Bar graph is is a graphical representation of data where the length of bars represents the frequency or intensity of the variable being measured. It is widely used to compare categories or to track changes over time. Bar charts are straightforward and effective in conveying information, making them a fundamental tool in data visualization for summarizing categorical data.

c) **Bubble Plot:** A bubble plot is a variation of a scatter plot where a third dimension is represented by the size of the markers (bubbles). This plot is particularly useful for visualizing relationships between three variables simultaneously. The size of each bubble corresponds to the magnitude of the variable being represented, making it easy to identify patterns and trends within the data.

d) **Line Chart:** A line chart, also known as a line graph, displays data points connected by straight lines. It is commonly used to show trends over time or to represent continuous data. Line plots are invaluable in depicting changes in variables over a continuous interval, making them indispensable in fields such as economics, finance, and science.

**e) Scatter Plot:** A scatter plot is a type of plot that displays the relationship between two variables as individual data points. It is commonly used to identify patterns, trends, and correlations between variables. Scatter plots are essential tools in exploratory data analysis helping researchers and analysts understand the nature of the relationship between variables and detect potential outliers or clusters.

**f) 3D Scatter Plot:** A 3D scatter plot is an extension of a traditional scatter plot, where data points are represented using three axes instead of two. This plot allows for the visualization of relationships between three variables in three-dimensional space. While 3D scatter plots provide a more comprehensive view of the data, they can also be more challenging to interpret accurately.

**g) HeatMap:** A heatmap is a graphical representation of data where values in a matrix are represented as colors. It is a way of visualizing data in which values in a matrix are represented as colors. Heatmaps are useful for understanding the distribution and relationships of values within a matrix.

**h) Bar Plot:** A bar plot for multiple data columns, also known as a grouped bar plot, is a type of visualization that allows you to compare the values of multiple categories across different groups. In this type of plot, each group is represented by a cluster of bars, and each bar within the cluster corresponds to a specific category.

**i) Waterfall Chart:** A waterfall chart is a type of data visualization that represents the cumulative effect of sequentially introduced positive or negative values. It is often used in finance and accounting to illustrate the cumulative effect of starting values, positive and negative additions, and the resulting total.

**j) Histogram:** A histogram is a graphical representation of the distribution of numerical data. It consists of a series of contiguous rectangles or bars, where the area of each bar corresponds to the frequency of data values within a specific interval or bin.

**k) 3D Mesh Plot:** A 3D mesh plot is a type of visualization that represents a surface in three-dimensional space. It is often used to visualize mathematical functions, parametric equations, or data that can be represented as a surface.

### 3.3 Implementation

One of the main aims of this project is to build a dashboard that displays all the diagrammatical representations that have been made in this project. To visualize the graphs and the dashboard several libraries and packages were used. After the packages were aptly installed, the dataset is prepared and assessed. The different libraries that have been employed to handle and visualize the data are Pandas, Numpy, Matplotlib and Plotly. Along with these high-level interfaces of Plotly such as Plotly Express and Graph Objects has also been used. Using these libraries helped in accelerating the data preparation and visualization process. To create the dashboard, the Dash library of Python has been used. Although it was easy to implement the graphs the difficulty arose when it came to making the dashboard. If the number of graphs is too many then it may become challenging to list out all the graphs. It is also likely that one may get confused at times regarding the syntax. Nonetheless leveraging these libraries has helped in making informative figures and an efficient dashboard.

#### Final Code

```
import dash
from dash import html #to need to code html components
import dash_core_components as dcc
import plotly.graph_objects as go
import plotly.express as px
from dash.dependencies import Input, Output
from plotly.subplots import make_subplots

external_stylesheets = ['https://codepen.io/chriddyp/pen/bWLwgP.css']

app = dash.Dash(__name__, external_stylesheets=external_stylesheets)

colors = {
    'background': '#111111',
    'text': '#7FDBFF'
}

app.layout = html.Div(style={'backgroundColor': colors['background']}, children=[
    html.H1(
        children='Country Development',
        style={
            'textAlign': 'center',
            'color': colors['text']
        }
    ),
    html.Div(children='By Rakesh', style={
        'textAlign': 'center',
        'color': colors['text']
    }),
    dcc.Graph(id='firstgraph13', figure=PIE, style={'width': '80%', 'display': 'inline-block', 'backgroundColor': colors['background']}),
```

```

dcc.Graph(id='firstgraph1',figure=BAR,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph2',figure=Bub,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph3',figure=LINE,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph4',figure=SCTR,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph5',figure=sctr,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph6',figure=CNTR,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph7',figure=plot,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph9',figure=water,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph10',figure=HIST,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']}),
dcc.Graph(id='firstgraph12',figure=fig1,style={'width':'80%','display':'inline-block','backgroundColor': colors['background']})
])
@app.callback(
    Output('firstgraph1','figure'),
    [Input('dropdown_1','value')])

def update_figure(graphtype):
    global fig
    if graphtype=='CC':
        fig=go.Figure(px.bar(statistics.head(10), y='Government Strategy',x='Country',color='Talent',height=400))
        fig.update_layout(title="Comparison of Government Strategy of 20 most Countries",template="plotly_dark")
    if graphtype=='D':
        fig=go.Figure(px.bar(statistics.head(10), y='Infrastructure',x='Country',color='Talent',height=400))
        fig.update_layout(title="Comparison of Infrastructure of 10 Most Countries",template="plotly_dark")
    if graphtype=='DC':
        fig=go.Figure(px.bar(statistics.head(10), y='Research',x='Country',color='Talent',height=400))
        fig.update_layout(title="Comparison Research of 10 Most Countries",template="plotly_dark")
    return fig

if __name__ == '__main__':
    app.run_server()

```



## **4.METHODOLOGY, RESULTS AND ANALYSIS**

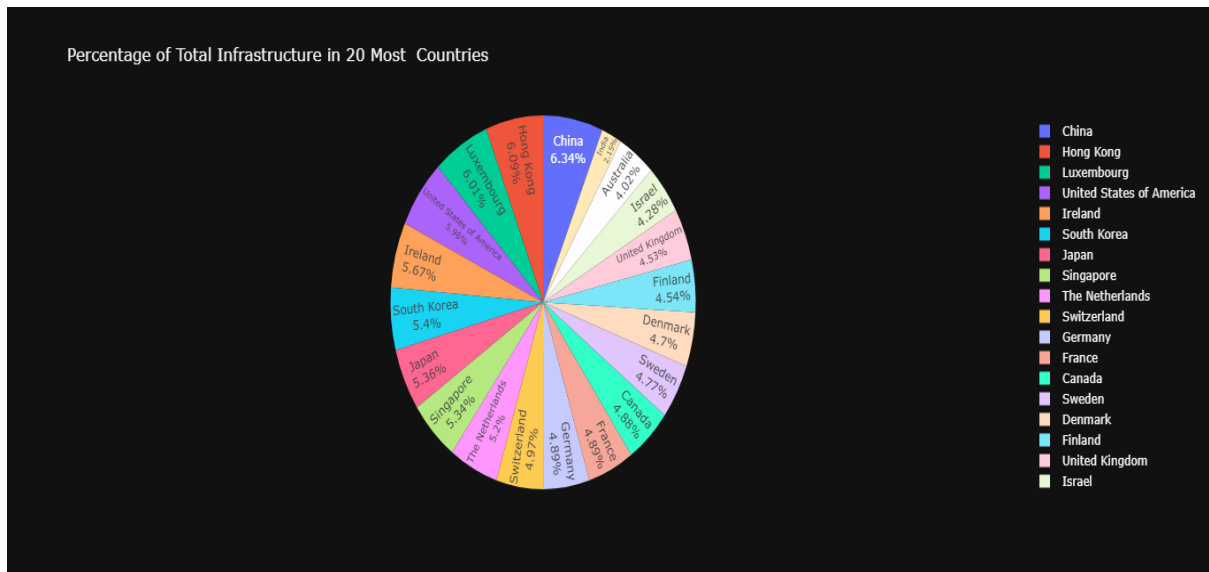
The initial phase of any data visualization begins with collecting the data from a trustworthy source. Then the data preprocessing steps must be performed, and one should be aware of the dimensions of the dataset. Then the graphs and dashboard are created by using the required modules. The result of this project is that all the graphs are displayed, and the dashboard contains a menu of all the figures that have been made. The objective is to display all graphs in a dashboard.

### **4.1 Methodology**

- a) The dataset is sourced from Kaggle. The dataset contains 62 rows and 13 columns. It contains dimensions such as Country, Talent, Infrastructure, Operating Environment, Research, Development, Government Strategy, Commercial, Total score, Region, Cluster, Income group, Political regime. These are the columns which corresponding values of particular field.
- b) Once the data is collected, data is handled by removing the null values and eliminating the unnecessary columns. After that the data is sorted. All these help in creating more informative graphs.
- c) With the help of the modules of Python diagrammatic representations of various kinds have been made. Each of these graphs convey the statistics of number of countries development across the world. Graphs such as pie chart, 2D histogram, bar charts, waterfall chart, line chart, bar plot for multimedia, scatter plot, bubble plot and various kinds of 3D charts have been used to illustrate the figures.
- d) The dashboard has been made by importing the Dash module of Python. A dropdown list is made which contains all the graphs that have been made. Clicking on any one of the items in the list results in a graph that was made earlier.

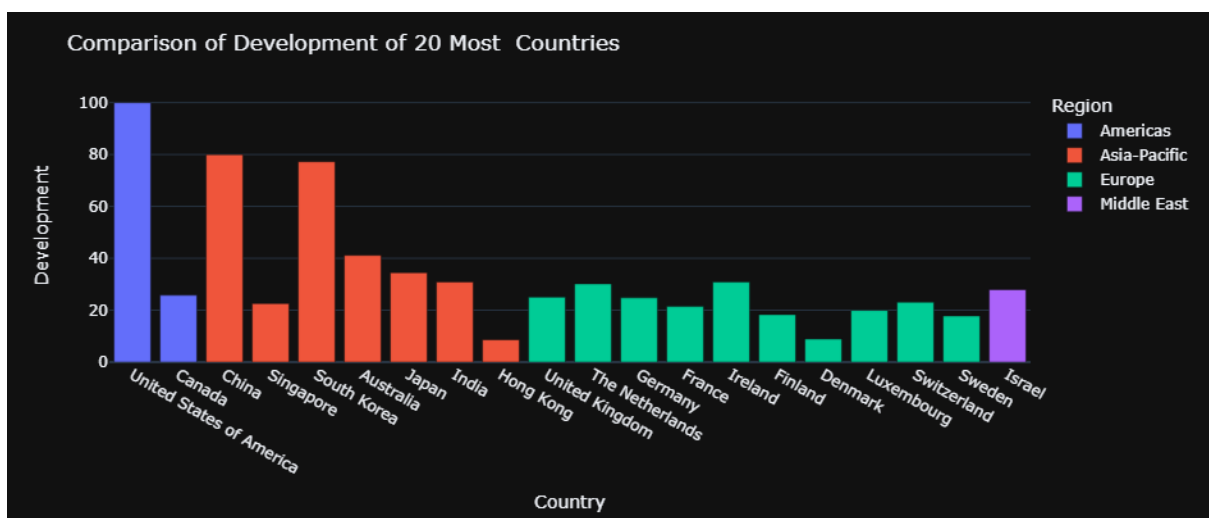
### **4.2. Results**

All the graphs that have been made are displayed here. As mentioned earlier, these figures effectively display the different age groups of victims who have been subjected to rape across the country during 2001-2010. These visual representations serve as a powerful tool for depicting the severity and prevalence of rape in the country. To represent all this in a single platform dashboard has been used, and this dashboard contains list of all the graphs. One can access this comprehensive list of all the graphs. This dashboard provides an easily navigable interface for exploring the data.



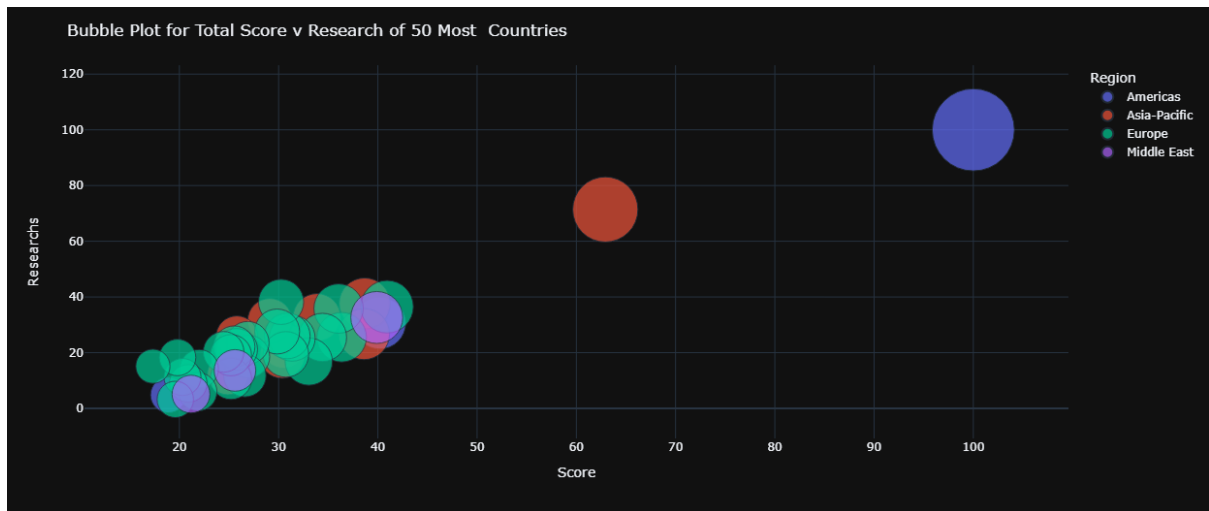
**Figure 4.1: Pie Chart Showing the Percentage of Infrastructure of countries**

The above graph is a pie chart. This pie chart shows the total percentage of total infrastructure in topmost 20 countries. The percentages have been calculated by using the values in the column, 'Infrastructure'. The size of each slice corresponds to the measure of infrastructure that were reported in the respective countries during the years 2009-2019.



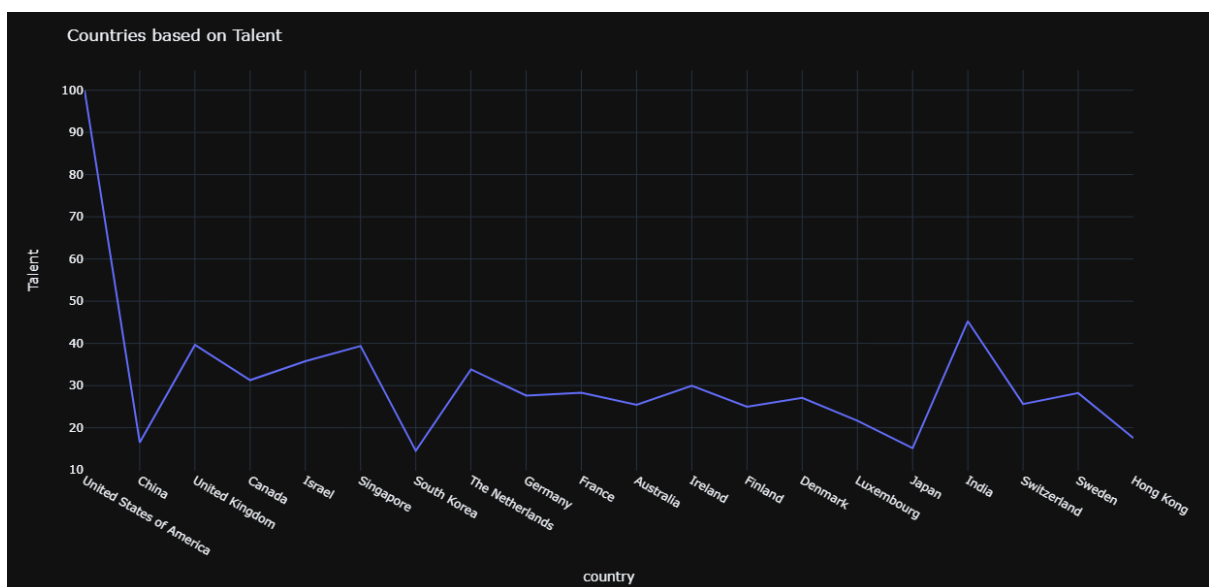
**Figure 4.2: Bar Graph Showing Development of 20 Most Countries**

This bar graph displays the development of 20 most countries across the world. The x-axis states the names of the countries, and the y-axis contains the count of development in the countries. The color corresponds to the measure of the values of the column.



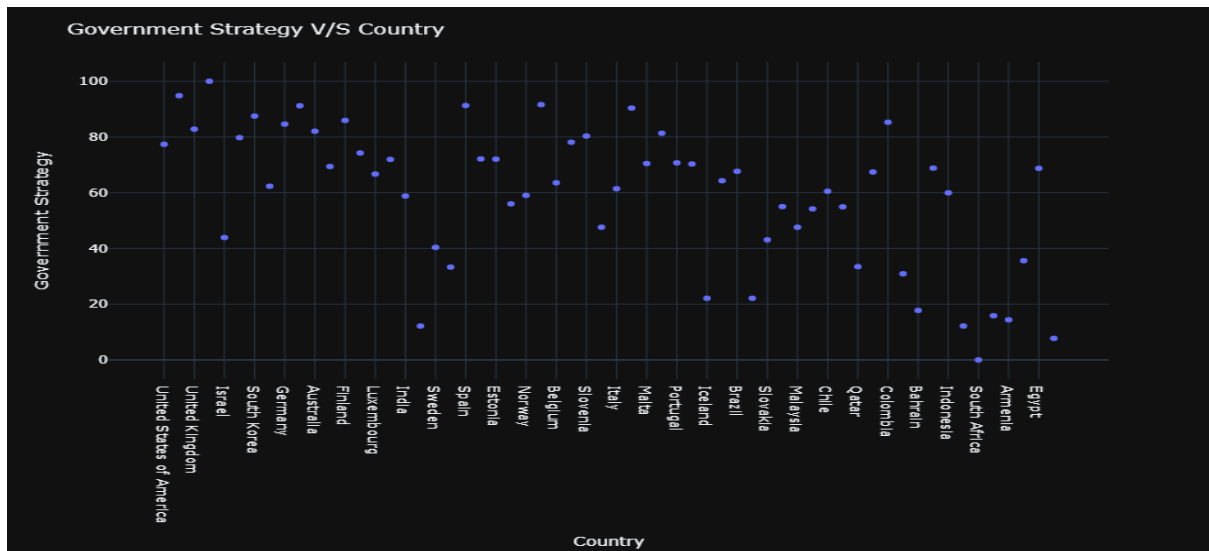
**Figure 4.3: Bubble Plot- Total Score vs Research**

In the bubble plot, each data point represents a country, with the x-axis showing the countries total score and the y-axis representing the countries research. The size of the bubble corresponds to the frequency of country. This visualization allows for the identification of trends and patterns.



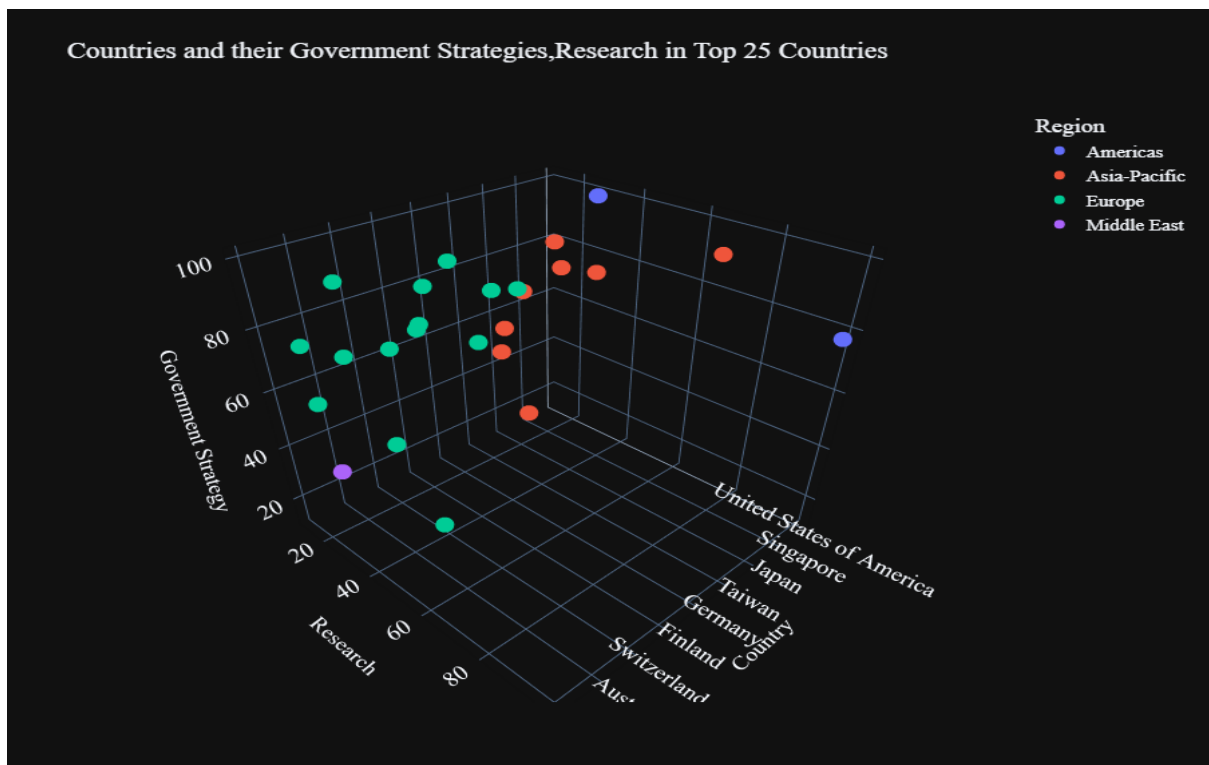
**Figure 4.4: Line Chart Showing Talent vs Country**

This line chart shows the total talent of country in various regions and various sectors. In this line chart the x-axis shows the names countries across the world and the y-axis represents the total talent of the corresponding country.



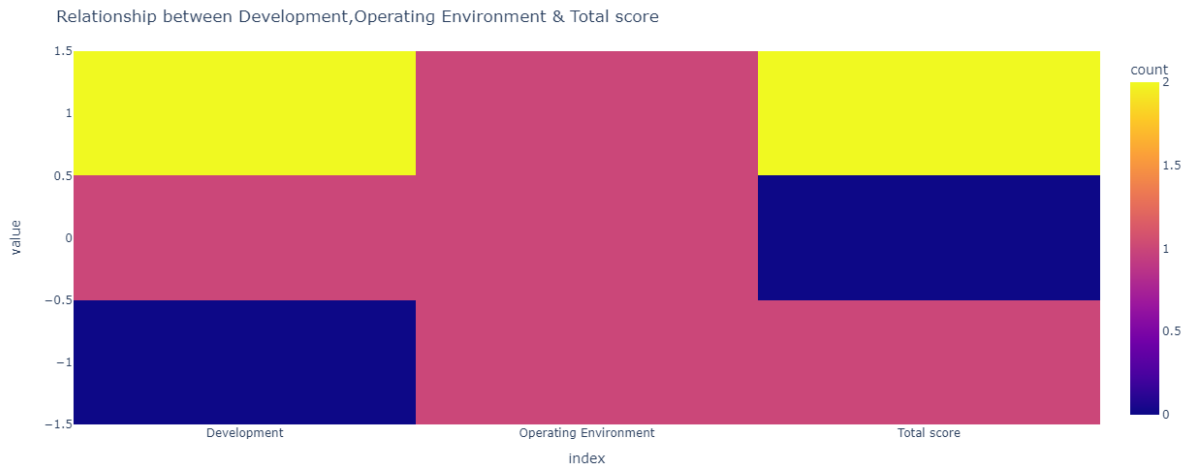
**Figure 4.5: Scatter Plot- Government strategy vs country**

The scatter plot represents the government's strategies of different countries across the world. And the x-axis represents the different countries around the world and the y-axis represents the government strategies of the country for the development.



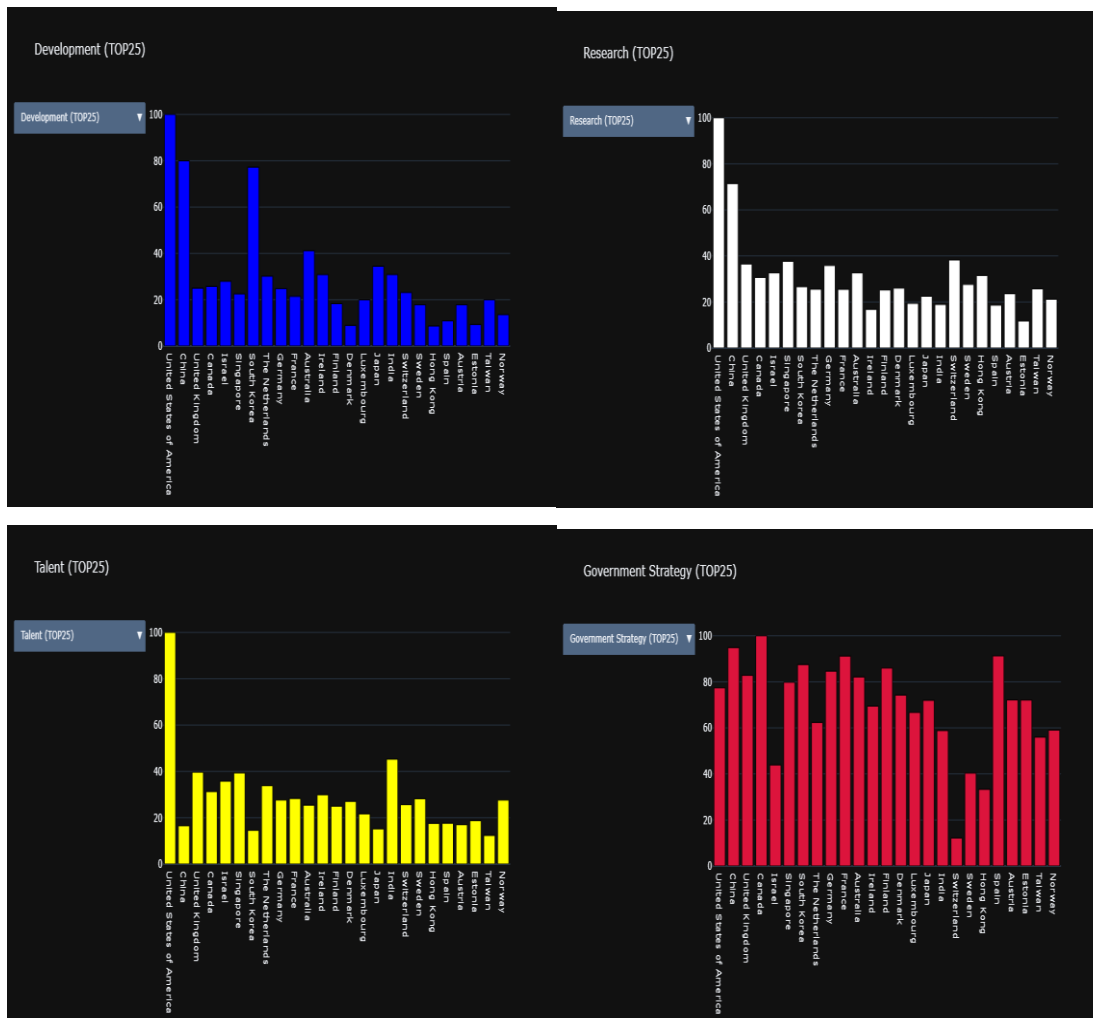
**Figure 0.6: 3D Scatter Plot Showing the Country, Government Strategy, Research**

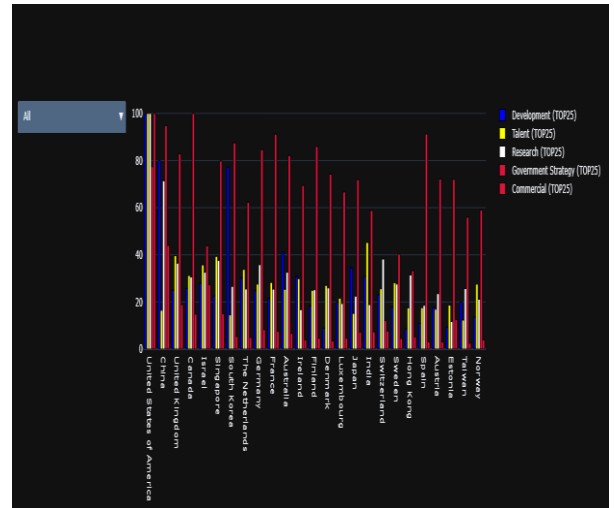
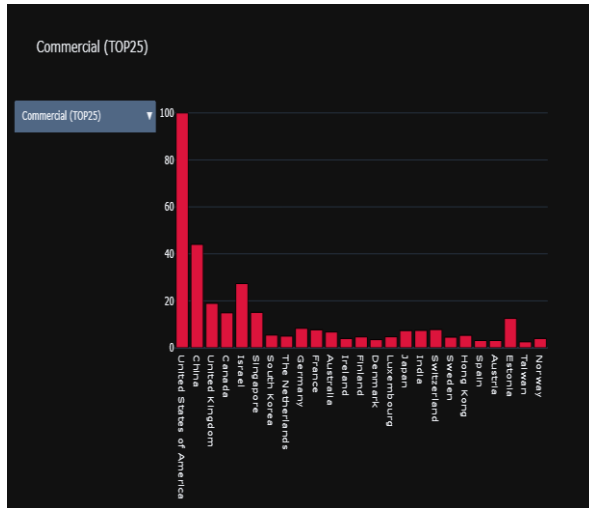
The 3D scatter plot represents the relation of the country with the country's government strategy and their researches. The x-axis represents the name of the country and y-axis represents the government strategy and z-axis represents the research ratio.



**Figure 4.7: Heat Map – relation between Development, Operating Environment, Total Score.**

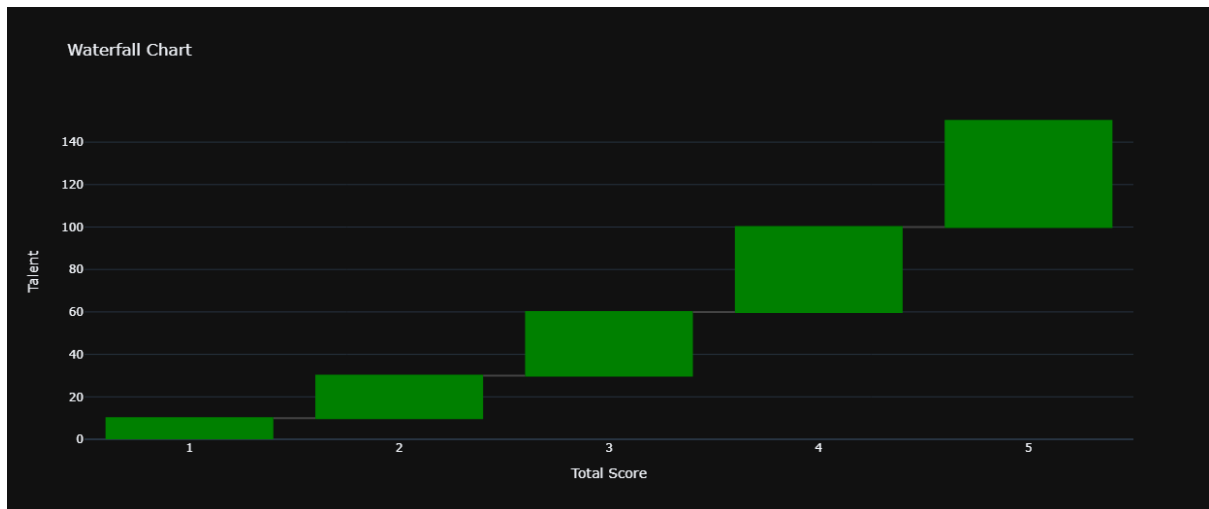
The heat map is representing the relationship between the development and the operating environment, total score.





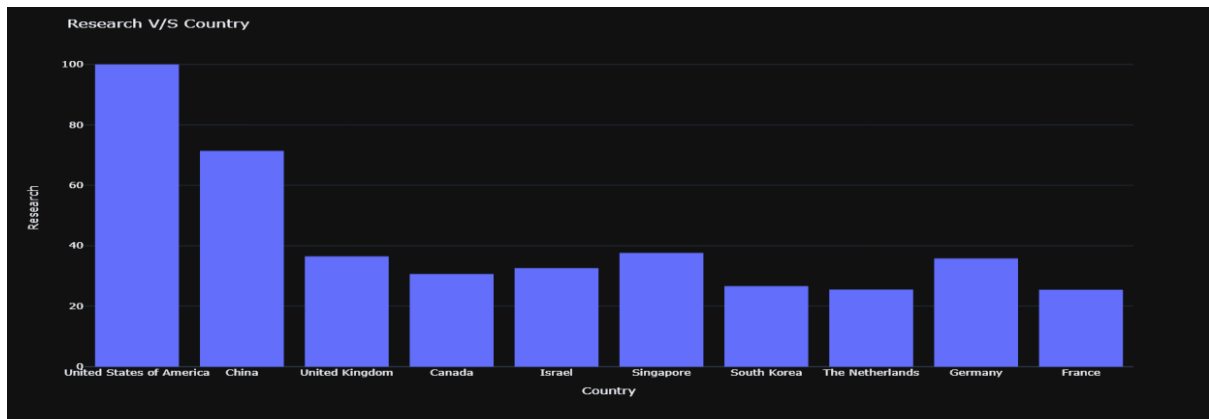
**Figure 4.8: Bar Chart of Ratio of Countries in various sectors.**

These bar charts representing the country's development ratio's in various sectors and each sector is independently represented and all the sectors in one bar graph is also represented.



**Fig 4.9: Waterfall Chart- Talent vs Total Score**

The waterfall chart is representing the relation between the talent and the total score. On the x-axis total score of a country is represented and on the y-axis talent of the country is taken. The waterfall chart is shown like an incremental model.



**Figure 4 .10: Histogram – Country vs Research**

The above histogram representing the country and their research. The x-axis is representing the country name and y-axis represents the researches.



**Fig 4.11: 3D Mesh Plot -Country vs Talent vs Infrastructure**

The above 3d mesh plot represents the relation between the country, talent and infrastructure. On the x-axis we have country names and on y-axis we have talents of different countries, and on z-axis we have infrastructure of the countries

### 4.3 Analysis

With the help of a dashboard, we can streamline our data analysis and data visualization. It offers a centralized platform that enables us to view and analyze trends and patterns. One must first install the module, Dash and then they can proceed with the creation of the dashboard.

To enhance the appearance of the dashboard, I have made use of external stylesheets. The layout of the dashboard is designed using HTML components from Dash. The title, A

COMPREHENSIVE APPROACH TO ANALYZE THE VISION OF COUNTRIES FOR DEVELOPMENT, the author, Uradi Rakesh, and dropdown menu to select the diverse types of graph, is specified.

Every graph that I have made in this project have been assigned a specific value. For example, for Pie Chart I have assigned the value 'A.' Using Plotly functions, each graph is generated based on what selection the user makes from the dropdown list. The callback function, `update_figure`, updates the graph based on the selected option. Inside this function, I have defined conditional statements i.e. if-else statements that will check the value selected by the user from the dropdown menu. Each conditional statement corresponds to a specific option in the dropdown list. So, if viewer selects "Pie Chart Representation of Total Percentages of Infrastructure," the corresponding conditional statement that has the value 'A' will be executed resulting in the creation of pie chart. So, upon selecting any one of these options in the dropdown list, a specific conditional statement is executed and it will handle the generation of the appropriate diagrammatic representation.



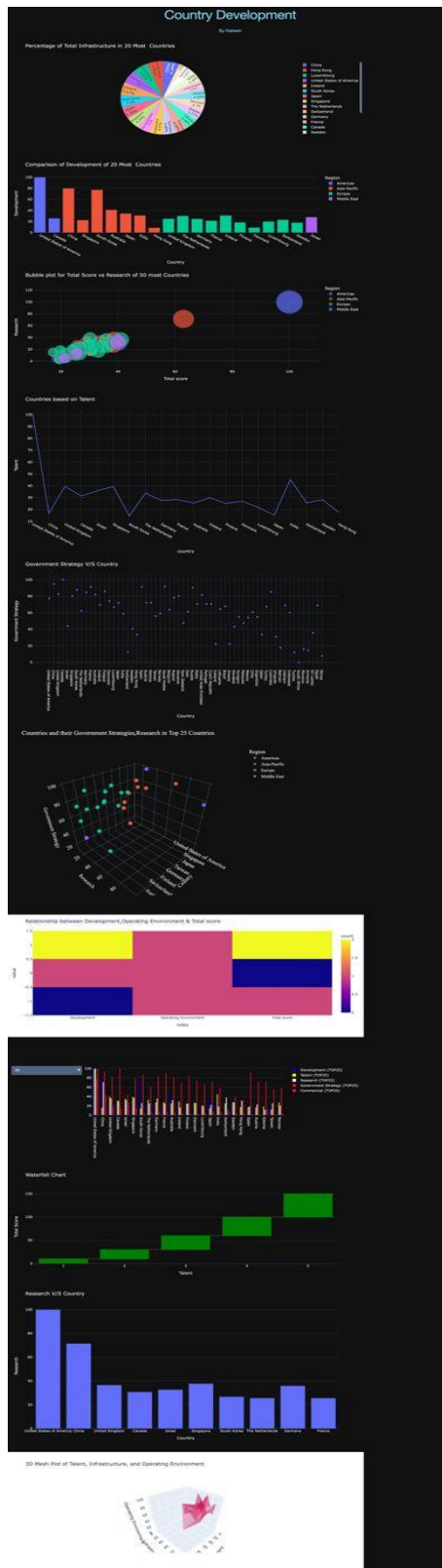


Figure 4.3.1: Dashboard displaying created graphs

## **5.CONCLUSION**

### **5.1 Summary**

From 2009 to 2019, many countries experienced significant development across various sectors, reflecting shifts in economic, social, and political landscapes. Economically, emerging economies such as China, India, and Brazil demonstrated remarkable growth trajectories, contributing to the reshaping of the global economic order. China's rapid industrialization and export-oriented growth propelled it to become the world's second-largest economy, while India's burgeoning technology sector and demographic dividend fueled its economic expansion. Brazil emerged as a key player in global markets, leveraging its natural resources and agricultural sector for growth. Technological advancements played a pivotal role in driving development during this period. Countries like South Korea, Japan, and the United States continued to lead in innovation, particularly in the fields of information technology, electronics, and biotechnology. This innovation-led growth fostered job creation, increased productivity, and enhanced competitiveness on the global stage. Socially, many countries made strides in improving living standards, healthcare, and education. Nordic countries like Norway, Sweden, and Denmark maintained high levels of human development, characterized by robust social welfare systems, universal healthcare, and quality education. Additionally, efforts to reduce poverty and improve access to basic services were observed in various regions, contributing to improvements in overall well-being and social equity. Economic disparities widened in some regions, exacerbating inequalities and posing challenges to sustainable development and social cohesion. Environmental sustainability emerged as a pressing concern during this period, with increased awareness of climate change and its adverse effects. Countries began prioritizing environmental protection, renewable energy initiatives, and sustainable development practices to mitigate the impacts of climate change and ensure the well-being of future generations. Overall, the period from 2009 to 2019 witnessed dynamic changes in the global development landscape, characterized by economic growth, technological advancements, social progress, and environmental challenges. As countries navigate the complexities of the 21st century, collaboration, innovation, and sustainable practices will be essential to address emerging issues and build a more inclusive and resilient world.

### **5.2 Potential Impact**

This project, as mentioned the countries are mainly focusing on the development. By depicting in various sectors building their economy through the years of 2009-2019, this project does not only raise awareness but also provides a platform for decision making. This project

can be used by the necessary bodies to make informed decisions and for policymaking. This project contributes to know about the strategy of various nations on the development.

### **5.3 Future Work**

In the future, we intend to make use of data science to be able to make predictions and to forecast future trends in development of countries. We also intend to integrate real-time data so that the visualizations depict the latest numbers. Another future enhancement is to consider other parameters such as socio-economic factors or law enforcement to offer a better visualization of this issue.

## 6. REFERENCES

- [1] Jeffrey Sachs Blogpost on “The Age of Sustainable Development”, posted on International Growth Centre on February 10, 2015 , <https://www.theigc.org/blog/the-age-of-sustainable-development/> (accessed October 29, 2020).
- [2] NITI Aayog, SDG India – Index and Dashboard 2019-20, New Delhi, NITI Aayog, 2019 <https://niti.gov.in/sdg-india-index-dashboard-2019-20>
- [3] Social Progress Imperative, Progress against the Sustainable Development Goals, WashingtonDC,2018,<https://www.socialprogress.org/assets/downloads/resources/2018/Progress-Against-the-SDGs.pdf>.
- [4] Social Watch, What is Sustainable Development? The Evolution of the Idea, Uruguay, 2011,  
<http://www.socialwatch.org/node/12477#:~:text=Over%20these%20decades%2C%20the%20definition,to%20meet%20their%20own%20needs.>
- [5] United Nations Development Programme (UNDP), Strategy for Inclusive and Sustainable Growth 2017, New York, 2017, <https://www.undp.org/content/dam/undp/library/Poverty%20Reduction/UNDPs%20Inclusive%20and%20Sustainable%20Growth-final.pdf>
- [6] United Nations, Report of the World Commission on Environment and Development (WCED): Our Common Future, New York, 1987, <http://www.un-documents.net/our-common-future.pdf>.