Detailed Background information for Assignment 2 Group Assignment

The United Nations established the Sustainable Development Goals (SDGs), consisting of 17 goals and 169 targets, to end poverty, inequality and climate change by 2030. These goals were set up in 2015 by the United Nations General Assembly and are intended to address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. Business operations (the focus of ICT394) can align with multiple SDGs in various ways, integrating sustainability into core business strategies and practices. Aligning business operations with the SDGs not only contributes to global sustainability and social well-being but can also drive innovation, open up new markets and build corporate reputation. Companies increasingly recognize that sustainable business practices are critical to long-term success, resilience and competitiveness. Here's how some of the SDGs align with business operations.

Section 1, Assignment Scenario

Company Name, GreenStride Innovations Inc.

The Scenario

GreenStride operates within the green technology and sustainability sector, with a focus on industries that impact urban development, environmental conservation and economic sustainability. Their operations cover multiple sectors but are driven by a commitment to innovation, sustainability and responsible growth.

GreenStride Innovations Inc. specializes in developing sustainable technology solutions tailored for various industries, including energy, construction, transportation and manufacturing. Their mission is to lead the transition to a sustainable future by providing eco-friendly products

and intelligent infrastructure solutions that meet present needs while safeguarding the planet for future generations.

The company seeks to align its operations more closely with the United Nations' Sustainable Development Goals (SDGs), focusing on SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure) and SDG 11 (Sustainable Cities and Communities). The leadership team plans to use publicly available data to determine how GreenStride can contribute to these goals, enhance its practices, foster economic growth, drive innovation and support the creation of sustainable communities.

GreenStride Innovations Inc., a company known for its commitment to sustainable business practices and innovation, aims to align its operations more closely with the United Nations' Sustainable Development Goals (SDGs), specifically focusing on SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure)and SDG 11 (Sustainable Cities and Communities). The leadership team is determined to analyze publicly available data to understand how GreenStride can contribute to these goals, improve its business practices, foster economic growth, enhance innovation and support the development of sustainable communities.

Intended Business Outcomes

This section outlines the business challenge GreenStride is facing and intended business outcomes that GreenStride Innovations Inc. aims to achieve in alignment with SDGs 8, 9 and 11. GreenStride's goals include improving its business practices, fostering economic growth, enhancing innovation and supporting sustainable communities.

For the teams that select SDG 8

(Decent Work and Economic Growth) – provide insight that will help GreenStride align with improving business practices and fostering economic growth.

Business challenge – GreenStride has employed a Business Intelligence (BI) Team to analyze global and regional datasets related to employment rates, industry growth and economic indicators. The goal is to identify areas where GreenStride can create jobs and contribute to sustainable economic growth. Using Power BI, visualize trends, disparities and potential areas for business expansion or community investment.

Use this BI question as your starting point - What trends in employment rates and industry growth can be observed in sectors relevant to GreenStride and how do these trends compare across different regions?

The role of data (the right data) – this assignment emphasizes the importance of data-driven decision-making in achieving this SDGs and how you can use Power BI to uncovering actionable insights to help GreenStride address this business challenge. **Examples of data you may consider include** – See Section 3 of this document.

For the teams that select SDG 9

(Industry, Innovation and Infrastructure) – provide insight that will help GreenStride enhancing innovation.

Business challenge – GreenStride has hired you, a BI Team, to use publicly available datasets from sources like the World Bank, OECD and WIPO to compare innovation levels across the green technology sector and compare with other sectors. Employ Power BI to create visual comparisons and identify correlations between innovation metrics and sustainable infrastructure developments, suggesting

where GreenStride could enhance its innovative efforts or infrastructure investments.

Use this BI question as your starting point - How do innovation levels, measured by R&D expenditure and patent applications, vary across industries and countries in which GreenStride is active or planning to expand?

The role of data (the right data) – this assignment emphasizes the importance of data-driven decision-making in achieving this SDGs and how you can use Power BI to uncovering actionable insights to help GreenStride address this business challenge. **Examples of data you may consider include** – See Section 3 of this document.

For the teams that select SDG 11

(Sustainable Cities and Communities) – provide insight that will help GreenStride supporting the development of sustainable communities.

Business challenge – GreenStride has hired you, a BI Team, to leverage urban development and sustainability indicators from global databases (e.g., UN-Habitat, CDP Cities) to assess the sustainability practices of cities. With Power BI, visualize the data to identify gaps and opportunities where GreenStride's solutions can support the development of more sustainable, resilient and inclusive urban areas.

Use this BI question as your starting point - In cities where GreenStride operates (the team will decide which cities), what are the patterns in sustainable urban practices, such as green spaces, sustainable transport and affordable housing?

The role of data (the right data) – this assignment emphasizes the importance of data-driven decision-making in achieving this SDGs and how you can use Power BI to uncovering actionable insights to help GreenStride address this business challenge. **Examples of data you may consider include** – See Section 3 of this document.

Select your Group Task

Each group has the freedom to **select <u>one</u>** of the three SDGs (SDG 8, SDG 9 <u>or</u> SDG 11). Your group's choice will determine the type of data you will need to collect and the insights you will seek to extract for GreenStride Innovations Inc. Where analysis required regional comparisons, each team has the freedom to decide what regions or cities they would like to focus on or based on what data you can find.

Important Assignment Resources

- Assignment 2 Background Information and Questions 2024.docx (Start with this document)
- Group Project Assignment 2024.docx (Main Assignment instructions e.g. deadlines etc.)
- Assignment 2 Report Template.docx (download from LMS)
- *How to Formulate BI Questions*.pptx (download from LMS)
- How to select the right Data (Measurable Indicators).pptx (download from LMS0
- *Review of Dimensional Modelling, Business Analytics and Visualization Best Practices.pptx* (download from LMS)
- Section 2 of this document, *Examples of Business Intelligence Questions and analysis types*.
- Section 3 of this document, *Examples of data you can use to get started* for each SDG Goals related to this assignment.

Important Data Resources

- United Nations Statistics Division/ Global SDG Indicators https://unstats.un.org/sdgs/indicators/database -   official repository for global SDG indicators
- World Bank Open Data https://data.worldbank.org - data sets on global economic indicators, including employment rates, GDP growth rates, R&D expenditure as a percentage of GDP and access to electricity etc.

- OECD Data https://data.oecd.org - a variety of economic indicators across OECD countries, including GDP growth, employment statistics
- International Monetary Fund (IMF) Data https://www.imf.org/en/Data - global financial data, including GDP, economic outlooks
- World Intellectual Property Organization (WIPO) Statistics Database https://www.wipo.int/ipstats/en/ - data on patent applications, this is a key indicator of innovation
- United Nations Industrial Development Organization (UNIDO) https://stat.unido.org/ - statistics related to industrial development
- International Telecommunication Union (ITU) https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx - data on ICT infrastructure, including internet access and mobile broadband subscriptions.
- Global Infrastructure Basel Foundation https://gib.foundation/ - data and insights on sustainable infrastructure projects around the world
- United Nations Human Settlements Programme (UN-Habitat) https://unhabitat.org/knowledge/data-and-analytics - data on urban development, including slum prevalence, access to safe housing and public transport.
- C40 Cities https://www.c40.org/researches insights and data on how major cities worldwide are addressing climate change and sustainability.
- OECD Urban Studies https://www.oecd.org/urban - data and analyses on urban policies and sustainable development in cities
- The Global Covenant of Mayors for Climate & Energy https://www.globalcovenantofmayors.org/ - international alliance of cities and local governments sharing data on climate action plans, including sustainable urban mobility and infrastructure resilience.
- For this assignment, using data from platforms **such as Kaggle is prohibited**. Please use the examples listed above as your primary data sources.

Assignment Task

What are you required to do and submit for the assignment?

TASK 1.   A Brief Executive Summary and Introduction to the Assignment Problem

TASK 2.   Data Procurement

Your team must locate, access and procure publicly available datasets that provide metrics and indicators relevant to your chosen SDG. For example, if your team has chosen SDG 8, data on employment rates, industry growth and workplace conditions might be worth looking at.

TASK 3.   Dimensional Model Design (required)

Your team will **design a <u>single</u> dimensional model** discussed in this class. This means your team will submit a single Power BI file, which will contain a single dimensional model with all dimensions and fact table(s) linked together. Zero marks will be awarded for this task if the dimensions and fact table(s) are not linked or if there are any floating dimensions and fact table(s). In Power BI, dimensional modeling involves designing a data model that includes creating and linking fact and dimension tables appropriately. This design supports the development of interactive reports (required for this Assignment) that provide actionable business insights.

It is up to the team to make a judgement about what is the right dimension model for your team, **based on your selected SDG** data and **the BI questions you have formulated**. For this task, you will submit the following. **See Section 5** for an example of a fully linked dimensional model and an Interactive Power BI Report you are required to design for this assignment.

a. Implement Dimensional Modeling in Power BI. At the minimum, you are required to

- o Use Power BI's Query Editor to import data from various sources and transform it into a structured dimensional model.

- o Establish relationships between fact and dimension tables within Power BI to enable comprehensive data analysis across different dimensions and to support interactive visualizations which is required for this assessment.

- o Make sure the marker can interact with your Reports in Power BI – how? using dimensional modelling, appropriate relationship between fact and dimensions.

- o To make the visualizations interactive – include but not limited to Slicers, Drill-downs, Tooltips, Cross-filtering, Buttons, Bookmarks etc.

b. **Identify the dimension model** you have designed for your analysis (For example, "The model we have designed is a XYZ type for dimensional model") <u>and</u> **explain** in a few sentences, why this is the most appropriate dimension model. (For example, "We have used a XYZ dimensional model because… ")

c. Describe how the relationships between the fact and dimension tables were specifically designed to support the analytical requirements of your formulated BI questions. *(Note: This question is asking you to explain why you set up the relationships in your model the way you did. Specifically, discuss how these relationships help to answer the BI questions effectively, support the analysis you intend to*

perform and ensure that the data is connected in a way that enables meaningful exploration and insight extraction.)

d. List all Dimensions and Fact table(s) included in your dimension model.

e. A screenshot of your dimension model with the appropriate relationships.

NOTE/ As part of the assignment you are expected to figure out 1) which of the provided data is required, 2) which fact table and the content of the fact table and 3) what dimensions tables are appropriate in order to provide the insights your will be providing in TASK 4, see below.

See *Review of Dimensional Modelling, Business Analytics and Visualization Best Practices*.pptx (download from LMS) for a review of the topics.

TASK 4.   Power BI Insights and Visualizations using Interactive reports.

Using only Power BI, your team will analyze the data you have procured and present the following insights, accompanied by meaningful visualizations that follow the Gestalt principles discussed in this class. All visualizations must be organized accordingly and must be interactive – meaning the marker can interact with the reports/data you will submit via the Power BI file.

* **See Section 2 for examples** of BI questions that can be answered using Descriptive, Diagnostic, Predictive, Analytics and Insights. Section 2 also provides the definition and examples of Descriptive, Diagnostic, Predictive Analytics and Visualization you can use in Power BI.

A. **Descriptive Analytics and Insights** – In this section, your team will perform Descriptive Analytics and provide Descriptive Insights. To accomplish this task, your team will

   a. **Formulate one Business Intelligence question** to gain insights through descriptive analysis. The BI question must

align with GreenStride's Intended Business Outcomes (see Intended Business Outcomes for your chosen SDG).

b. **Provide meaningful visualizations** (minimum 4) to answer the BI question formulated.

c. **Provide an interpretation** of each visualization in a short paragraph, explaining the descriptive insights derived.

d. **Identify the specific data modeling choices** used, such as aggregations, filtering, normalization, or the selection of dimensions and measures. Discuss why these choices were suitable for descriptive analysis.

e. **Identify the level of granularity** in the data used for each visualization and explain why this level of granularity is appropriate for deriving meaningful insights in line with GreenStride's Intended Business Outcomes.

B. **Diagnostic Analytics and Insights** - In this section, your team will perform **Diagnostic Analytics** and provide **Diagnostic Insights.**

a. **Formulate one Business Intelligence question** to gain insights through diagnostic analysis. The BI question must align with GreenStride's Intended Business Outcomes (see Intended Business Outcomes for your chosen SDG)

b. **Provide meaningful visualizations** (minimum 4) to answer the BI question formulated.

c. **Provide an interpretation** of each visualization in a short paragraph, explaining the diagnostic insights derived, including the relationships or correlations identified.

d. **Identify the specific data modeling choices** used, such as aggregations, filtering, normalization, or the selection of dimensions and measures. Discuss why these choices were suitable for diagnostic analysis and how they helped reveal the underlying patterns or relationships in the data.

e. **Assess the level of granularity** in the data used for each visualization and discuss whether this granularity was adequate to uncover meaningful insights that GreenStride needs to address.

C. **Predictive Analytics and Insights** - In this section, your team will perform **Predictive Analytics** and provide **Predictive Insights**.
   a. **Formulate one Business Intelligence question** to gain insights through predictive analysis. The BI question must align with GreenStride's Intended Business Outcomes (see Intended Business Outcomes for your chosen SDG).
   b. **Provide meaningful visualizations** (minimum 3) to answer the BI question formulated.
   c. **Provide an interpretation** of each visualization in a short paragraph, explaining the predictive insights derived and what trends or future outcomes can be anticipated.
   d. **Identify the specific data modeling choices** used, such as aggregations, transformations, normalization, or the selection of features for predictive analysis. Discuss why these choices were suitable for predictive analysis and how they helped ensure accuracy and reliability in forecasting.
   e. **Evaluate the level of granularity** in the data used for each visualization and explain how this level of granularity impacts the predictive model's effectiveness in generating accurate forecasts. Discuss whether finer or broader granularity would improve the reliability of future predictions for GreenStride's intended business outcomes.

TASK 5.   Appendix and References

Include an appendix a Sub Section for the Data Dictionary that lists all data sources. Your team will create a comprehensive data dictionary detailing all the datasets you have procured. This should include metadata, source descriptions, data types and any transformations or cleaning steps applied to the datasets. This should be organized in a table.

A Sub Section for references, detailing where the data was obtained and a Sub Section for all other requirement and additional information your team see fit e.g. screenshots of all modeling done within Power BI, including the relationships, custom DAX measures you created and any additional advanced analytics components used in the assignment.

To complete the assignment, follow the steps below.

1. First, carefully read through this document titled *Assignment 2 Background Information and Questions.pdf* for detailed background information.

2. Review each choice carefully and discuss with your group which one your team would like to work on.

3. **Choose one** SDG goal among the provided choices (**SDG 8, SDG 9 or SDG 11)** and work on it as a group.

4. Email your chosen SDG goal plus your Team formation details to your lecturer.

5. Once you have chosen the SDG goal of your interest, start searching for data. Keep in mind that data availability may vary for each goal, so choose accordingly.

6. Resources to get you started with the assignment include.

    1. Complete Pre-Session 04 Quiz

2. For each choice, I have provided substantial examples of data you can use to get started (see the Section 3 below). All questions can be answered with publicly available data. Consider data availability when selecting your SDG goal.

7. Note, you can perform data transformation using any tool of your choice, however all **Data Modelling**, **Analysis and Visualizations MUST be completed in Power BI**.

8. Submission – you are to submit **two files**, **a single Power BI file (.pbix) saved in a .zip file** and the **Assignment Report in .docx format**. These two files must be submitted separately. The Power BI report file (.pbix) will contain all visualizations, analyses and the designed dimensional model.

8.

Section 2, Examples of Business Intelligence Questions and analysis types

BI questions that can be answered using.

Descriptive Analytics and Insights (examples from SDG8)

- **What is Descriptive analysis?** Descriptive analysis in the context of Business Intelligence (BI) involves summarizing and understanding the current state of data. It provides a snapshot of historical data through metrics, averages, frequencies and other statistical summaries to depict what has happened within a specific period.
- **Example Descriptive BI Question** – What has been the trend in global employment rates and GDP growth over the last decade?
- **Example of data and SDG indicators that answer this BI Question** - Annual employment rates by country, annual GDP growth rates by country etc. Unemployment rate, eg by gender, annual growth rate of real GDP per capital etc
- **Example BI Descriptive Analysis in Power BI** – A line chart showing the trend of global employment rates over the last decade, with each line representing a different country or region. Using Power BI to calculate average annual GDP growth rates for the same period, displaying this in a complementary line chart or bar chart for a clear, visual comparison.
- **Example BI Descriptive Insight in Power BI** – Over the last decade, the global employment rate has shown a gradual increase with minor fluctuations, whereas GDP growth rates have experienced more significant variances year over year. This indicates that while employment is steadily rising, economic growth rates are more sensitive to global economic conditions.

Diagnostic Insights (examples from SDG9)

- **What is Diagnostic analysis?** Diagnostic analysis seeks to understand the reasons behind particular trends, patterns, or

anomalies identified in descriptive analysis. It involves drilling down into the data, exploring relationships between variables and identifying causes or contributing factors to observed outcomes. In BI, diagnostic analysis often uses advanced data exploration, filtering and statistical techniques to pinpoint the underlying reasons for performance results.

- **Example BI Question** – Why do some regions show significantly higher rates of innovation and infrastructure development compared to other regions?
- **Example of data and SDG indicators that answer this BI Question** - Number of patents filed per capita by region, investments in R&D as a percentage of GDP by region, access to high-speed internet and mobile broadband subscriptions by region. Indicators can include, research and development expenditure as a proportion of GDP, total official international support (official development assistance plus other official flows) to infrastructure etc.
- **Example BI Diagnostic Analysis in Power BI** – A scatter plot comparing R&D expenditure as a percentage of GDP against the number of patents filed per capita by region, highlighting outliers or regions with high innovation rates. Using Power BI to calculate correlations between investments in R&D and the number of patents filed. Employing slicers to filter data by specific infrastructure metrics like internet access rates.
- **Example BI Diagnostic Insight in Power BI** – Regions with higher R&D expenditure as a percentage of GDP consistently show higher rates of patent filings, suggesting a strong correlation between investment in research and development and innovation outcomes. Additionally, access to high-speed internet emerges as a key infrastructure factor that correlates with the innovation index across regions, indicating that digital infrastructure is a critical enabler of innovation.

Predictive Insights (example from SDG11)

- **What is Predictive analysis?** Predictive analysis in BI involves using historical data, statistical algorithms and machine learning techniques to identify the likelihood of future outcomes. This type of analysis is forward-looking, as it attempts to forecast or predict future trends, behaviors and events based on current and past data. Predictive analysis helps businesses make informed decisions by anticipating changes and planning strategies to address those changes effectively.
- **Example BI Question** – Based on current urban development trends, what will be the state of air quality and green space availability in major cities by 2030?
- **Example of data and SDG indicators that answer this BI** Question - Historical air quality indices (AQI) for major cities, data on green space (parks and recreational areas) per capita in urban areas over time, population growth rates and urbanization rates in major cities. Indicators can include 11.6.2 annual mean levels of fine particulate matter (e.g., PM2.5 and PM10) in cities (population weighted), 11.7.1 average share of the built-up area of cities that is open space for public use for all, by gender, age and persons with disabilities.
- **Example BI Predictive Analysis in Power BI** – A line chart forecasting the trend of air quality indices (AQI) in major cities up to 2030, using Power BI's built-in forecasting features.
- **Example BI Predictive Insight in Power BI** – The predictive analysis indicates a concerning trend of deteriorating air quality in rapidly urbanizing cities by 2030, with AQI levels projected to rise beyond safe limits. Simultaneously, green space availability per capita is expected to decrease due to urban sprawl, posing challenges to sustainable urban living. These trends underscore the urgent need for proactive urban planning and sustainability initiatives to combat pollution and ensure sufficient green spaces for future populations.

Section 3, Examples of data you can use to get started for each SDG Goals related to this assignment

Note that, you may have to create custom measures in Power BI especially for summaries etc.

SDG 8, Decent Work and Economic Growth

Businesses play a crucial role in promoting sustained, inclusive and sustainable economic growth by creating jobs, ensuring decent work conditions and investing in employee development. They can align with SDG 8 by

- Implementing fair labor practices and ensuring safe working conditions.
- Supporting local economies through job creation and apprenticeship opportunities.
- Innovating in products and services that contribute to economic growth without harming the environment.

Examples of data you can use to get started.

- **Data to consider (these are just examples to get you started, you may consider other data as long as they related to this SDG goal)**

  - Employment rates by industry and region.
  - Gross Domestic Product (GDP) growth rates.
  - Labor productivity measures.
  - Unemployment rates, including youth unemployment.
  - Rates of informal employment.

- **SDG Indicators to consider.**

  - 8.1.1 - Annual growth rate of real GDP per capita.
  - 8.5.1 - Average hourly earnings of employees, by gender, age and persons with disabilities, or other demographics.

- 8.5.2 - Unemployment rate, by gender, age and persons with disabilities, or other demographics.

SDG 9, Industry, Innovation and Infrastructure

Companies can contribute to sustainable industrialization, innovation and infrastructure development by.

- Investing in sustainable infrastructure and adopting renewable energy sources.
- Fostering innovation through research and development, especially in technologies that address sustainability challenges.
- Enhancing efficient and sustainable resource use in manufacturing processes.

Examples of data you can use to get started.

Data to consider (these are just examples to get you started, you may consider other data as long as they related to this SDG goal)

- Research and Development (R&D) expenditure as a percentage of GDP.
- Number of patent applications filed.
- Percentage of rural population with access to all-season roads.
- Investments in sustainable infrastructure projects.
- Internet penetration rates and mobile broadband subscriptions.

SDG Indicators to consider.
- 9.1.1 - Proportion of the rural population who live within 2 km of an all-season road.
- 9.5.1 - Research and development expenditure as a proportion of GDP.
- 9.5.2 - Researchers (in full-time equivalent) per million inhabitants.

SDG 11, Sustainable Cities and Communities.

Companies can invest in sustainable infrastructure and innovate in urban solutions to support sustainable cities. Businesses contribute to making cities and communities more sustainable by

- Developing Sustainable Infrastructure. Investing in green buildings and infrastructure that minimize energy consumption and environmental impact.
- Promoting Sustainable Urban Mobility. Offering solutions for public transport, electric vehicles and non-motorized mobility to reduce carbon footprints and alleviate congestion.
- Enhancing Urban Resilience. Implementing projects that enhance resilience to environmental hazards, such as climate change and natural disasters and contribute to sustainable urban development.

Examples of data you can use to get started.

- **Data to consider (these are just examples to get you started, you may consider other data as long as they related to this SDG goal)**

    - Percentage of urban population living in slums or informal settlements.
    - Levels of fine particulate matter (PM2.5) in cities.
    - Access to public transport, with a focus on low-income residents.
    - Green space (square meters) per capita in urban areas.
    - Investments (e.g., in $) in sustainable urban infrastructure projects.
- **SDG Indicators to consider.**

- 11.1.1 - Proportion of urban population living in slums, informal settlements or inadequate housing.
- 11.2.1 - Proportion of the population that has convenient access to public transport, by gender, age and persons with disabilities, or other demographics.
- 11.6.2 - Annual mean levels of fine particulate matter (e.g., PM2.5 and PM10) in cities (population weighted). You may have to create custom measures in Power BI.
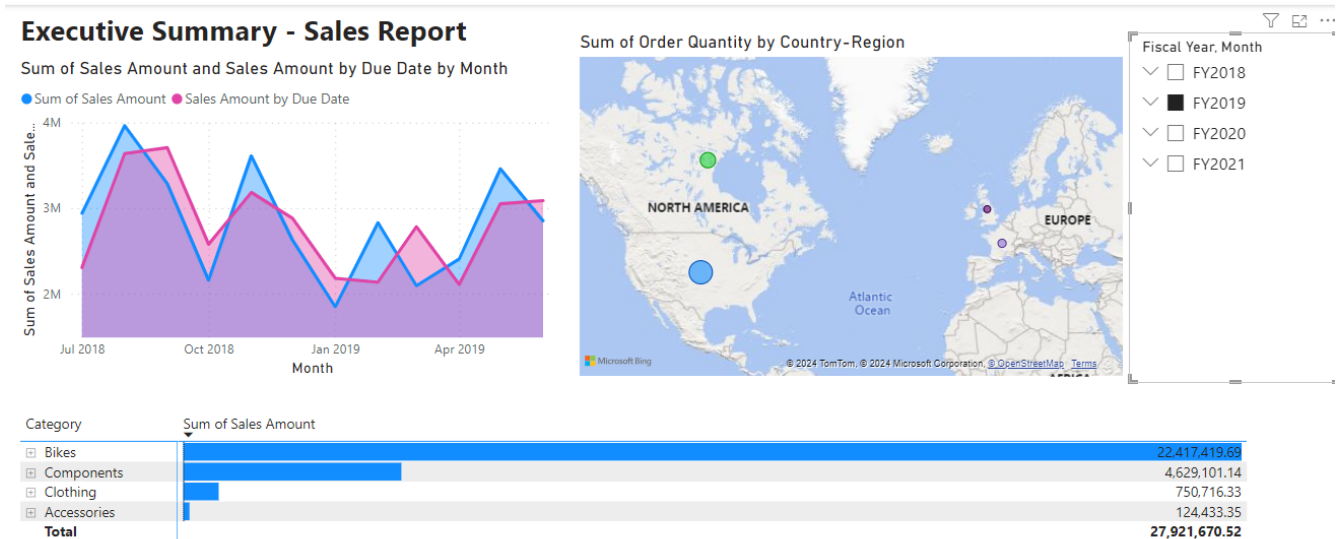
Section 4, Screenshot Submission Policy

ALL screenshots MUST show your username (the username of just the one team member in charge of this task) together with the team member's computer's timestamp (zero marks will be awarded for the entire team if the screenshots do not include the username and timestamp).

Section 5, Example of a fully linked dimensional model and an Interactive Power BI Report.

Example of a fully linked dimensional model you are expected to design for this assignment.
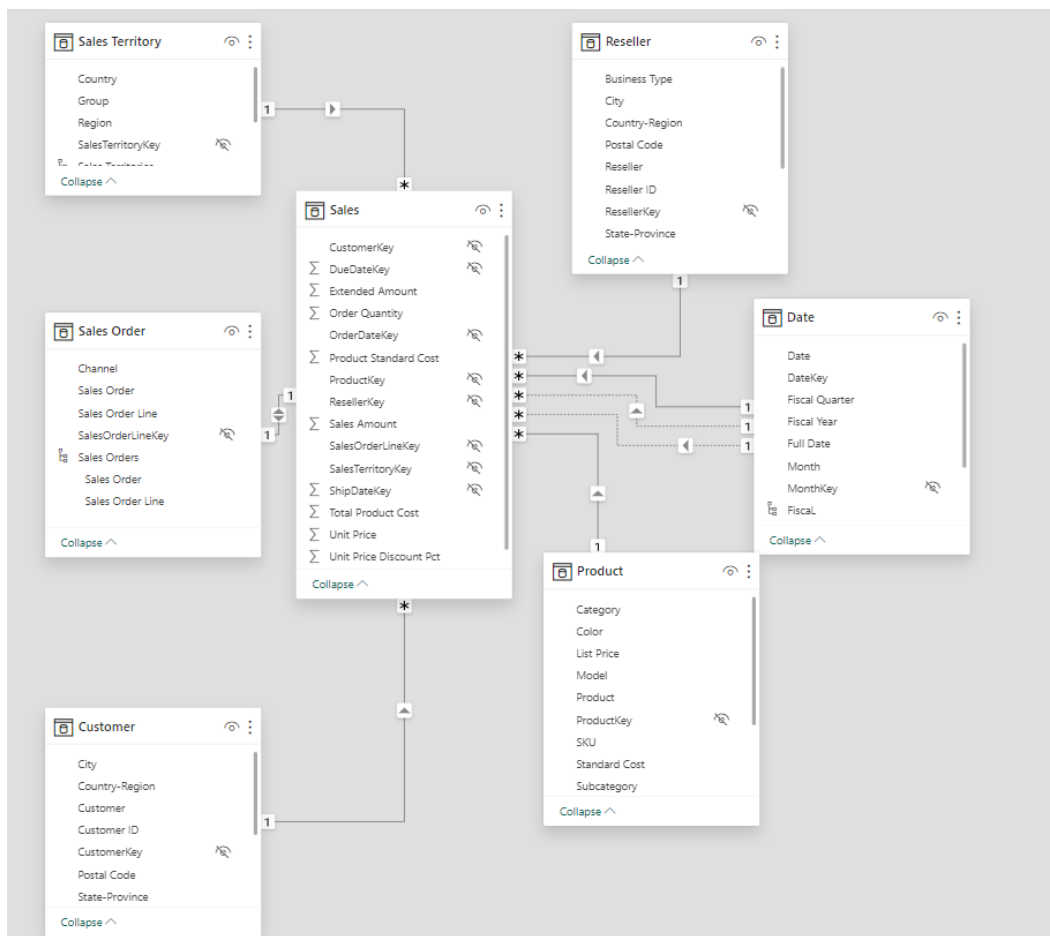
Example of an Interactive Power BI Report you are expected to design for this assignment. For example clicking of the FY2019 slicer allows the user to view of the data based on the user's selection. Here the user can allow users to filter data across various **dimensions** such as time periods, geographical locations or product categories.

Executive Summary - Sales Report

Sum of Sales Amount and Sales Amount by Due Date by Month

Sum of Order Quantity by Country-Region

Category	Sum of Sales Amount
⊞ Bikes	22,417,419.69
⊞ Components	4,629,101.14
⊞ Clothing	750,716.33
⊞ Accessories	124,433.35
Total	**27,921,670.52**

Section 6, Generative AI Policy for this Assignment

The use of any Generative AI to write any part of your written report is **strictly prohibited**. Each team member should ensure that your team adheres to this policy. Any use of Generative AI to write any part of your written report will lead to Zero for the entire assignment and Zero marks for all team members, no exceptions.

Different units will have different requirements. Please check the policy of each individual unit and assignment. If you are in any way unsure, please ask!