Final Project Report Of Global Malnutrition Trend: A Power BI Analysis(1983-2019)

Index

Introduction

Malnutrition remains one of the most critical global health challenges, affecting millions of individuals across the world. It manifests in various forms, including undernutrition, overnutrition, and micronutrient deficiencies. The impact of malnutrition is profound, contributing to high mortality rates, impaired physical and cognitive development, and increased healthcare costs. Understanding the trends of malnutrition globally is crucial for developing effective interventions, policies, and strategies to address this issue. This project focuses on analyzing malnutrition trends worldwide from 1983 to 2019, using Power BI to visualize and interpret complex data. By leveraging advanced analytics, we can gain insights into how malnutrition has evolved over the decades and explore the factors influencing these changes.

1.3 Project Overview

The "Global Malnutrition Trends: A Power BI Analysis (1983-2019)" project aims to provide a comprehensive, data-driven exploration of global malnutrition patterns over a 36-year period. This project involves the collection and analysis of malnutrition-related data from reputable sources, such as the World Health Organization (WHO) and other global health institutions. Power BI, a powerful business intelligence tool, will be used to visualize these trends, allowing for an interactive, intuitive analysis of the data. The analysis will cover various aspects of malnutrition, including underweight, stunting, wasting, obesity, and micronutrient deficiencies, across different regions and income groups.

1.2 Purpose

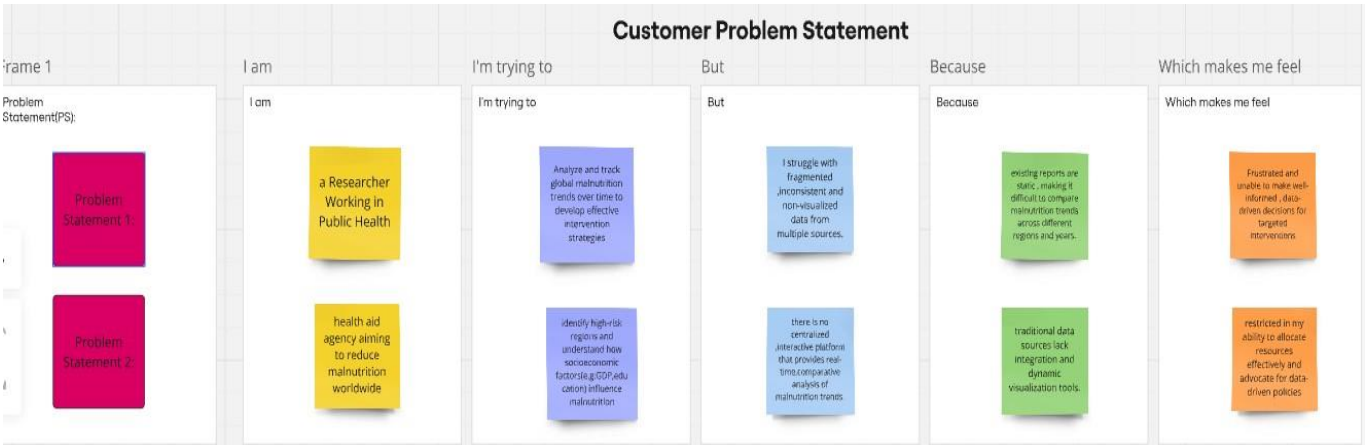
The primary purpose of this project is to offer a visual and analytical representation of the global malnutrition situation, focusing on trends from 1983 to 2019. By utilizing Power BI, this project will:

1. **Identify Long-Term Trends**: Track changes in malnutrition rates over time, highlighting both improvements and areas where progress has been slow.
2. **Regional and Demographic Insights**: Analyze malnutrition trends by region, country, and demographic factors such as age, gender, and income group.
3. **Impact of Interventions**: Evaluate the effectiveness of global health initiatives and policies aimed at reducing malnutrition.
4. **Informed Decision-Making**: Provide valuable insights to policymakers, researchers, and organizations working towards global health goals, especially those related to achieving the United Nations' Sustainable Development Goals (SDGs), particularly Goal 2: Zero Hunger.

2. IDEATION PHASE

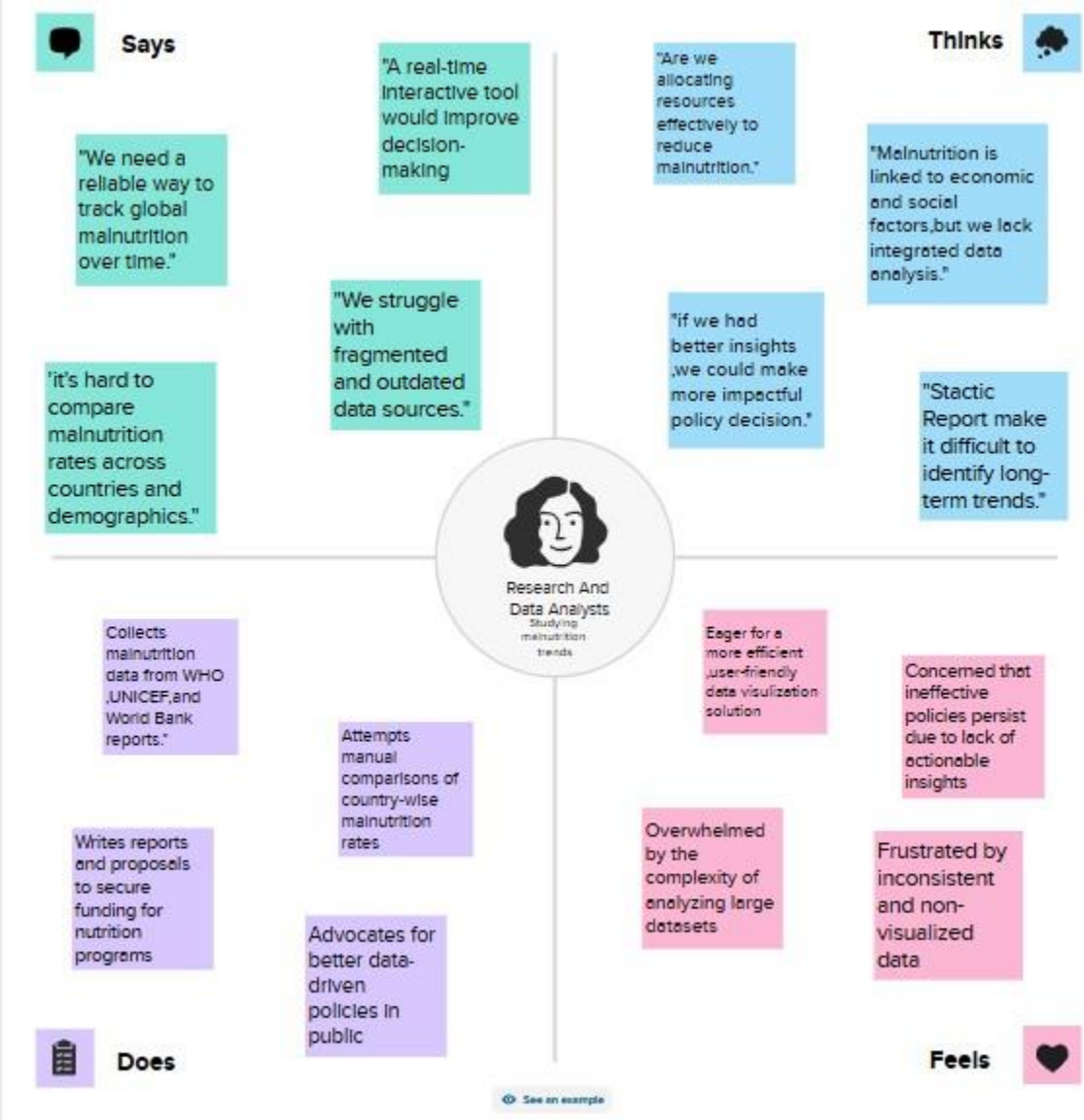
2.1 Problem Statement

Malnutrition is a persistent global issue that affects millions, leading to poor health outcomes, including high rates of child mortality, stunted growth, and cognitive impairments. Despite efforts to combat it, malnutrition rates continue to be high in many developing regions. The problem lies in the lack of comprehensive, easily accessible, and visually interpretable data to assess and monitor global malnutrition trends. This project addresses this gap by providing an in-depth analysis of malnutrition trends between 1983 and 2019 using Power BI, making it easier for policymakers, health organizations, and stakeholders to interpret the data and make informed decisions.



2.2 Empathy Map Canvas

An empathy map is designed to understand the stakeholders' needs and concerns regarding malnutrition:



2.3 Brainstorming

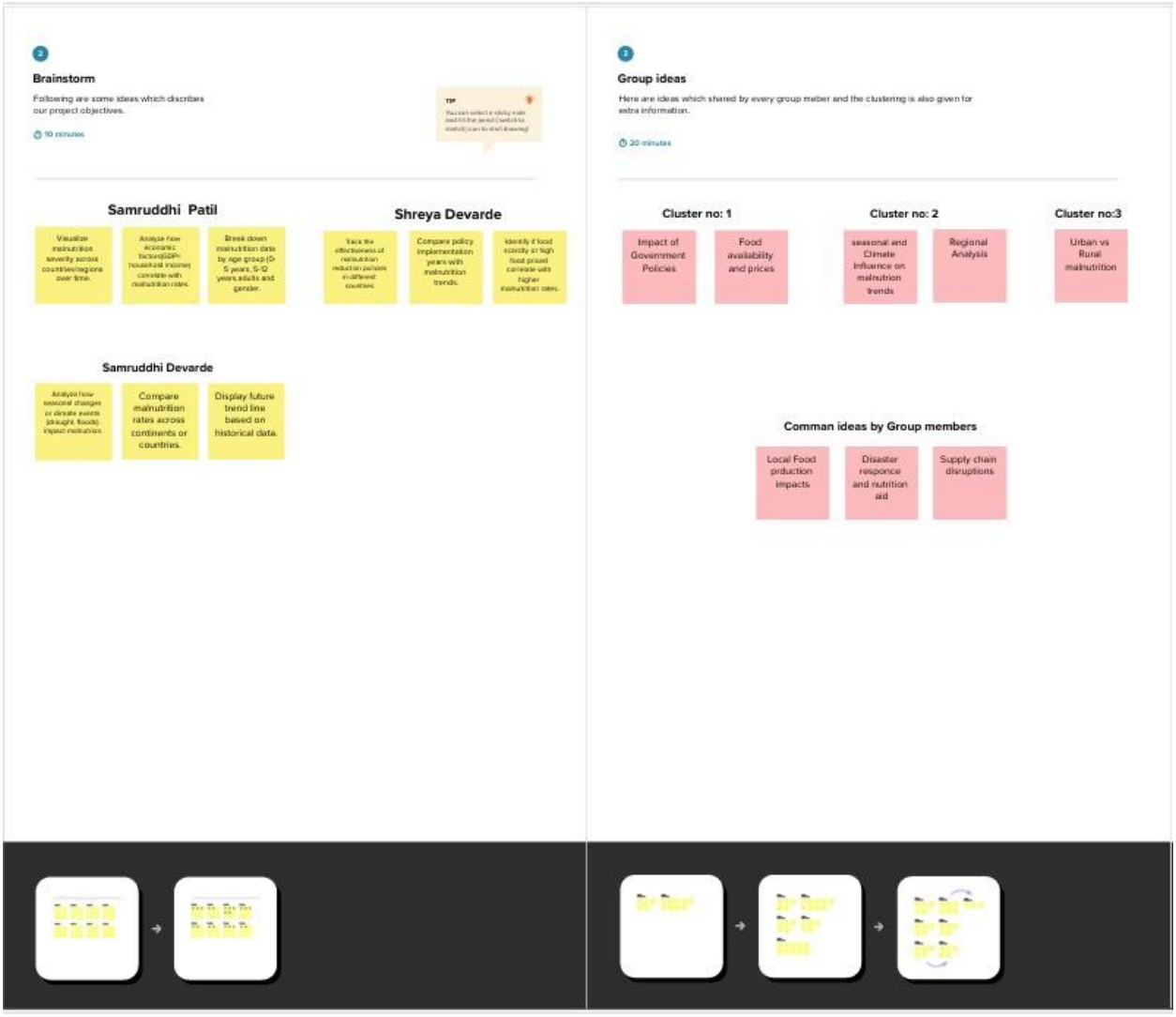
Brainstorming ideas for this project includes:

- How to visually represent malnutrition trends (line graphs, heat maps, pie charts).
- Segmentation of data by region, income level, age, and gender.
- Inclusion of factors influencing malnutrition, such as socio-economic status, access to healthcare, and education.

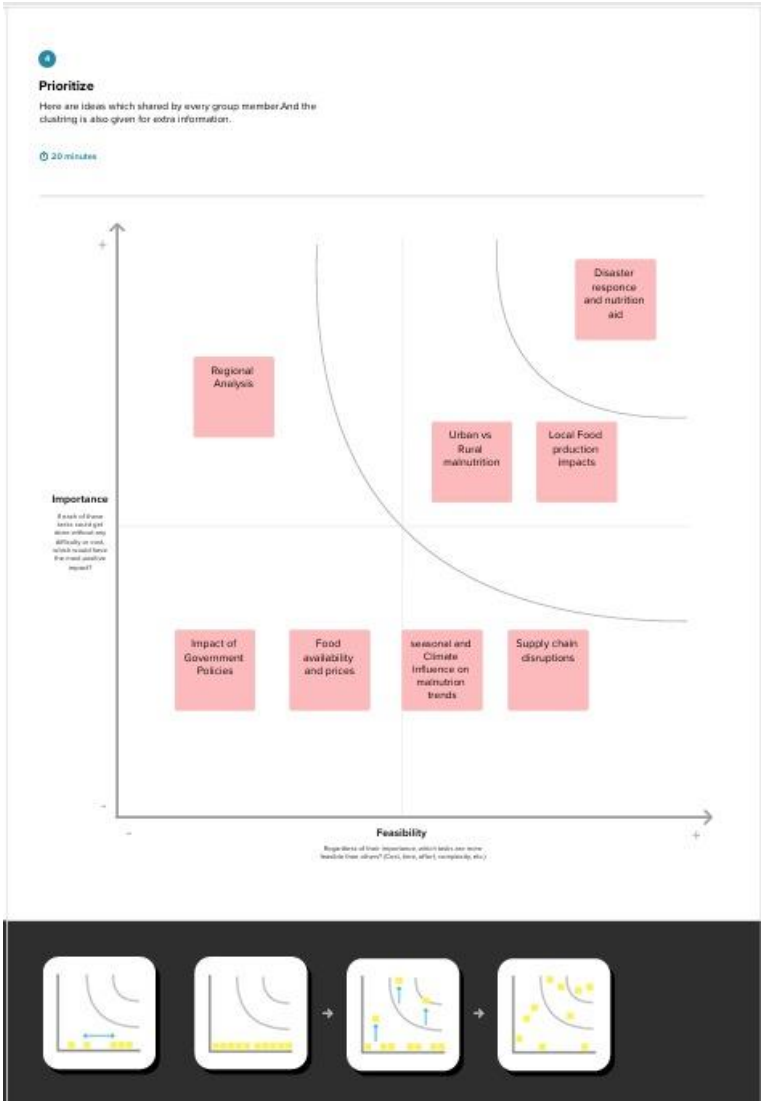
- Implementation of interactive features to allow users to explore trends for different countries and regions over time.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

The customer journey map outlines the process for a user (such as a policymaker or researcher) using the Power BI dashboard to analyze malnutrition trends:

Customer Journey Map for Global Malnutrition Trend: A Power BI Analysis (1983-2019)

3.2 Solution Requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Collection	Fetch data from global health databases (WHO, UNICEF, FAO)
		Allow user-uploaded datasets (CSV, Excel)
FR-2	Data Pre-processing	Handling missing values Standardizing data formats Data transformation (Normalization, Aggregation)
FR-3	Data Storage	Storing raw and processed data in a database Ensuring efficient indexing for retrieval
FR-4	Data Analysis	Generating statistical insights Performing trend analysis
FR-5	Power BI Dashboard	Creating interactive visualizations User-defined filters and drill-down options Exporting reports in various formats
FR-6	User Access & Authentication	Login through Email & Password Social media authentication (Google, LinkedIn)
FR-7	System Notifications	Email notifications for updates Alerts for data inconsistencies
FR-8	Report Generation	Generating country-wise malnutrition reports Comparative analysis over different years
FR-9	User Feedback Collection	Collecting user suggestions Storing and analysing feedback

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

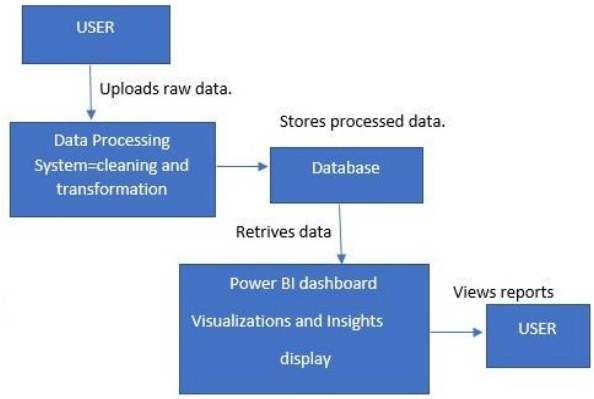
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	User-friendly interface with intuitive navigation
NFR-2	**Security**	Secure authentication, encrypted data storage
NFR-3	**Reliability**	Ensuring system uptime and fault tolerance
NFR-4	**Performance**	Optimized data queries for fast dashboard performance
NFR-5	**Availability**	System accessible 24/7 with minimal downtime
NFR-6	**Scalability**	Ability to handle increasing data load and users

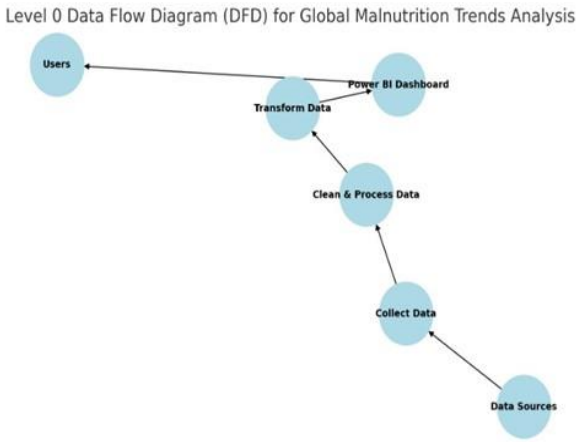
3.3 Data Flow Diagram

A Data Flow Diagram (DFD) for the project:

1. **External Entity**: Data providers (e.g., WHO, FAO)
2. **Processes**:
    - Data collection
    - Data preprocessing
    - Data visualization in Power BI
3. **Data Store**: Centralized database of malnutrition-related data
4. **Output**: Power BI dashboards and reports for analysis

Data Flow Diagrams:





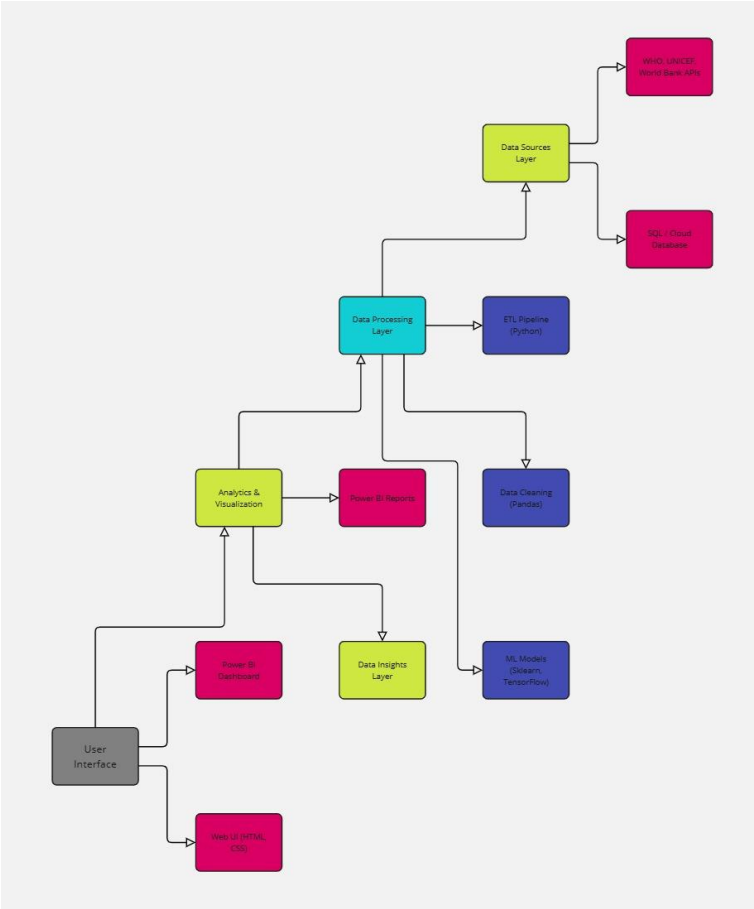
User Stories :

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Data Analyst	Data Collection	USN-1	As a data analyst, I can collect and load malnutrition datasets (1983-2019).	Data is successfully stored in the database.	High	Sprint-1
Data Analyst	Data Cleaning	USN-2	As a data analyst, I can clean and pre-process the dataset.	Data has no missing or inconsistent values.	High	Sprint-1
BI Developer	Data Transformation	USN-3	As a BI developer, I can normalize and merge datasets for analysis.	Data is formatted correctly for visualization.	Medium	Sprint-2
BI Developer	Visualization	USN-4	As a BI developer, I can create Power BI dashboards to show malnutrition trends.	Dashboard displays accurate trend analysis.	High	Sprint-3
Researcher	Insights & Reporting	USN-5	As a researcher, I can analyse malnutrition trends by region.	Report includes correlations and key findings.	Medium	Sprint-4
End User	Report Access	USN-6	As an end user, I can access the final reports on malnutrition trends.	Users can download reports in PDF format.	High	Sprint-4

3.4 Technology Stack

- **Data Sources**: WHO, FAO, and other global health organizations.
- **ETL Tools**: Python (for data preprocessing and cleaning).

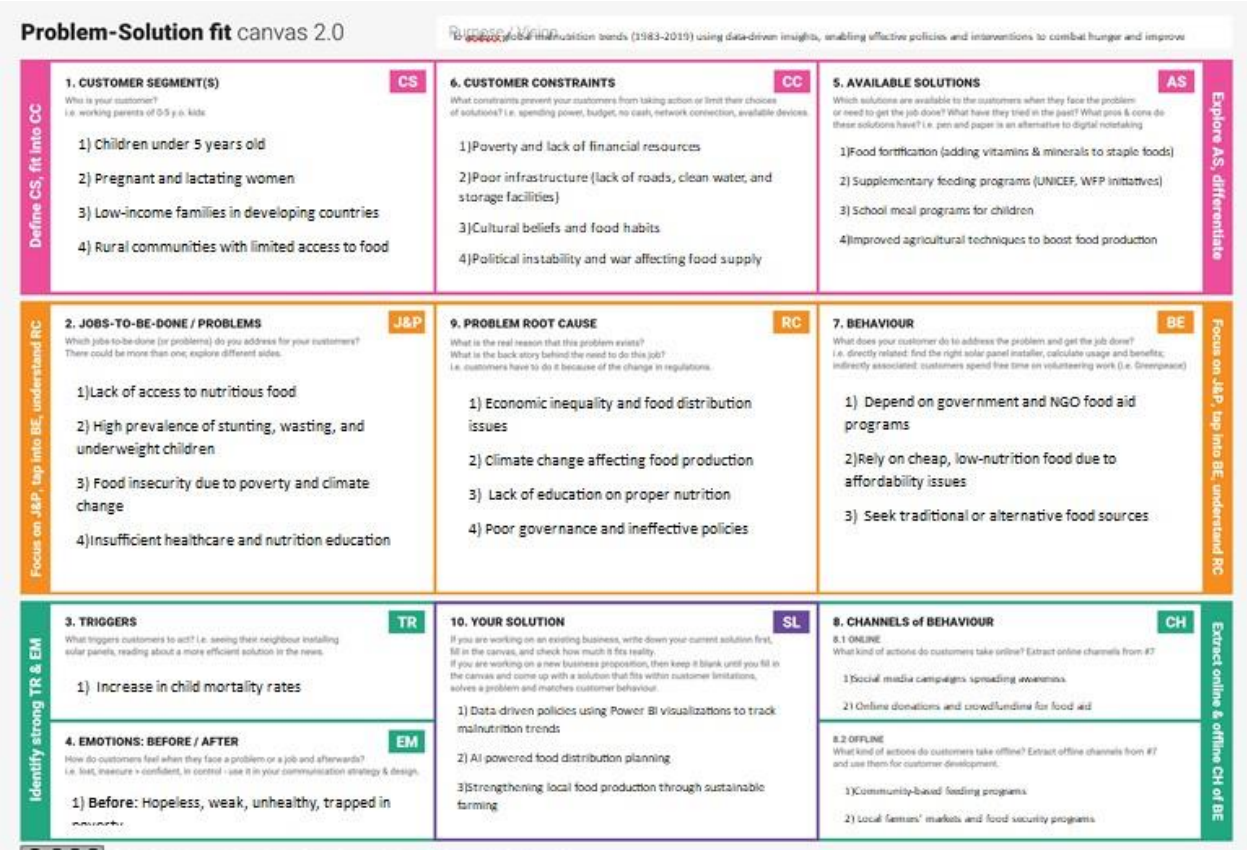
- **Data Storage**: SQL Database or cloud storage (Azure, AWS).
- **Visualization**: Power BI for interactive dashboards and reports.
- **Deployment tool**: Power BI Desktop, Python, and SQL



4. PROJECT DESIGN

4.1 Problem-Solution Fit

This project fits the need for clear, accessible, and comprehensive data on global malnutrition trends. By using Power BI, the analysis will allow stakeholders to visualize the data easily, which will aid in decision-making and policy formulation.



4.2 Proposed Solution

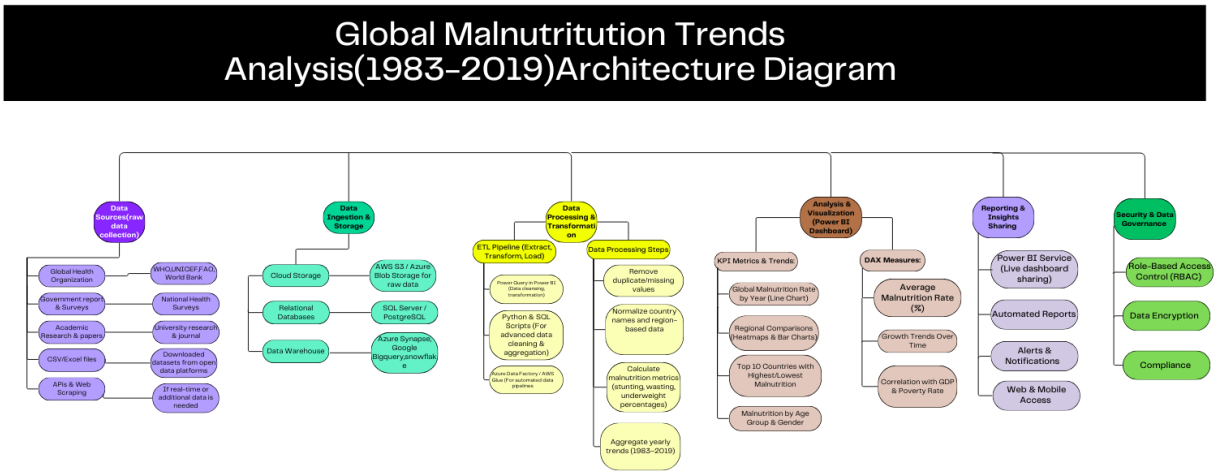
The proposed solution is a Power BI dashboard that visualizes global malnutrition trends from 1983 to 2019. It includes interactive features such as filtering by region, income group, and malnutrition type, allowing users to explore data and identify critical areas for intervention.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Malnutrition remains a persistent global challenge affecting millions of people, especially children. Tracking malnutrition trends over time and across regions is crucial to understanding where interventions are most needed. The lack of centralized, visualized data limits effective policy-making and resource allocation.
2.	Idea / Solution description	The proposed solution is a Power BI dashboard that analyses global malnutrition trends from 1983 to 2019 using historical data. The dashboard will provide interactive visualizations, allowing users to explore malnutrition rates by region, age group, economic status, and policy impact. This will help policymakers, NGOs, and researchers make data-driven decisions to reduce malnutrition globally.
3.	Novelty / Uniqueness	The solution is unique as it combines geospatial mapping, time-series analysis, economic correlations, and predictive modelling within a single Power BI dashboard. By using AI/ML integration, it can forecast future malnutrition trends, allowing policymakers to proactively implement solutions. Additionally, it offers a comparative analysis of government policies' effectiveness, providing actionable insights.
4.	Social Impact / Customer Satisfaction	The solution aims to support global health organizations, policymakers, and non-profits in combating malnutrition. By providing clear visual insights, it helps in: • Identifying high-risk regions. • Understanding the impact of economic and policy changes. • Promoting effective resource distribution.
		• This will ultimately contribute to reducing malnutrition rates globally, improving quality of life, and ensuring better policy decisions.
5.	Business Model (Revenue Model)	The project can generate revenue through: • Subscription-based model for global health organizations to access advanced predictive analytics. • Collaborations with government bodies for customized malnutrition reports. • Data licensing model for research institutes and universities. • Offering consulting services for policy planning and intervention strategies.
6.	Scalability of the Solution	The solution is highly scalable and can be: • Expanded to include new datasets (e.g., food supply chain, climate change impact). • Integrated with real-time data sources for up-to-date analysis. • Extended to other health-related challenges like child mortality, maternal health, and poverty analysis. • Scaled globally, benefiting multiple countries, government organizations, and non-profits in decision-making processes.

4.3 Solution Architecture

The architecture consists of:

1. **Data Sources**: WHO and other organizations providing malnutrition data.
2. **ETL Process**: Data preprocessing and cleaning using Python scripts.
3. **Power BI Dashboard**: Visualization layer.
4. **End Users**: Policymakers, NGOs, researchers, etc.



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

The project will be divided into phases:

- **Phase 1**: Data Collection (1 month)
- **Phase 2**: Data Preprocessing & Cleaning (1 month)
- **Phase 3**: Power BI Visualization Development (2 months)
- **Phase 4**: Testing & Refinement (1 month)
- **Phase 5**: Final Reporting & Presentation (1 month)

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection & Cleaning	USN-1	As a data analyst, I want to load and clean the dataset so that it is ready for analysis.	3	High	
Sprint-1		USN-2	As a data analyst, I want to remove missing or inconsistent values from the dataset.	2	High	
Sprint-2	Data Transformation	USN-3	As a data analyst, I want to normalize country names for consistency.	2	Medium	
Sprint-2		USN-4	As a data analyst, I want to merge multiple datasets for easier analysis.	3	High	
Sprint-3	Data Visualization	USN-5	As a Power BI user, I want to create a dashboard displaying malnutrition trends per country.	5	High	
Sprint-3		USN-6	As a Power BI user, I want to visualize malnutrition trends over time (1983-2019).	4	High	
Sprint-4	Insights & Reporting	USN-7	As a researcher, I want to analyse the correlation between malnutrition and income classification.	4	Medium	
Sprint-4		USN-8	As a researcher, I want to generate a final report summarizing key findings.	3	High	

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	5	7 Days	11 Feb 2025	17 Feb 2025	5	17 Feb 2025
Sprint-2	5	7 Days	18 Feb 2025	24 Feb 2025	5	24 Feb 2025
Sprint-3	9	7 Days	25 Feb 2025	2 Mar 2025	7	2 Mar 2025
Sprint-4	7	7 Days	5 Mar 2025	11 Mar 2025	7	11 Mar 2025

Velocity:

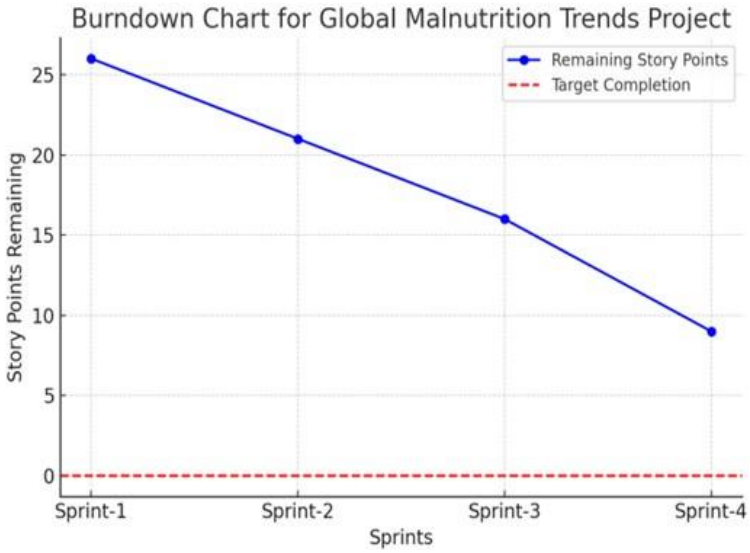
- **Sprint Duration = 7 days**
- **Total Story Points Completed = (5 + 5 + 7 + 7) = 24**
- **Total Sprints = 4**

Average Velocity per Iteration Unit:

AV= Total Story Points / Sprint Duration

AV=24 / (7+7+7+7)

AV=24 / 28 = 0.86 Story Points per day.


Burndown Chart for Global Malnutrition Trends Project
Remaining Story Points
Target Completion
Story Points Remaining
25
20
15
10
5
0
Sprint-1
Sprint-2
Sprint-3
Sprint-4
Sprints

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

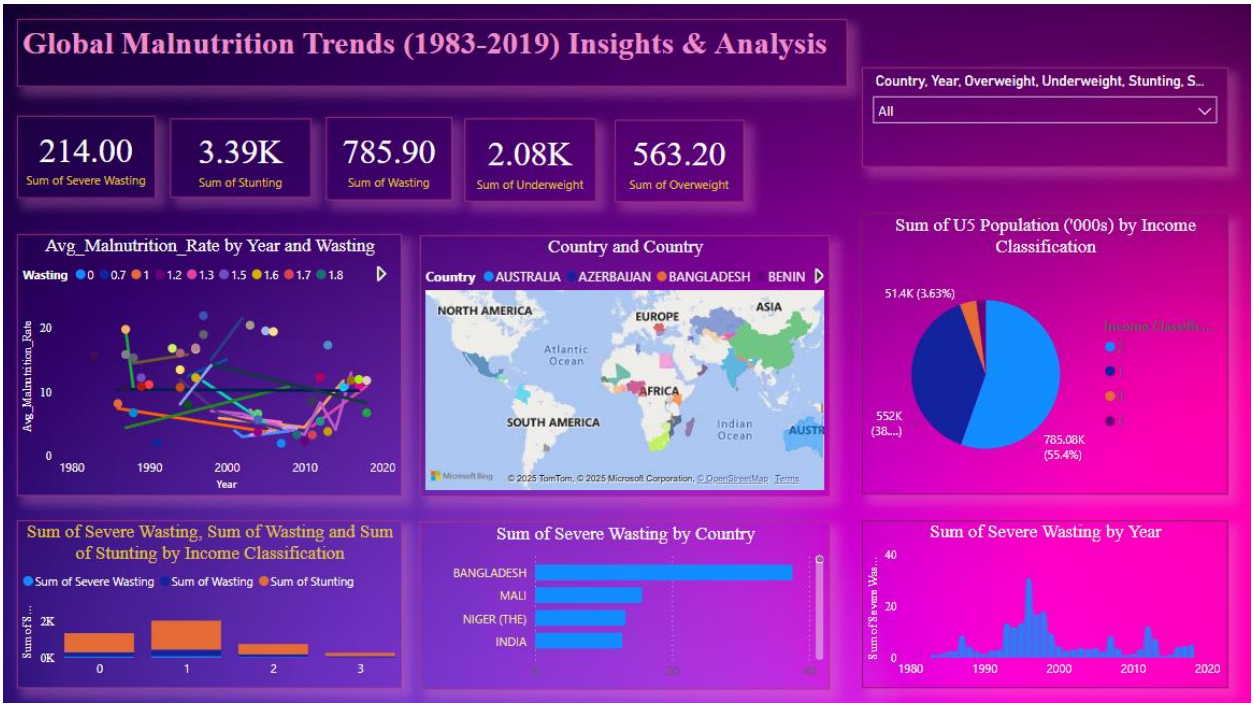
Performance testing will include:

- Load testing to ensure that the dashboard can handle large datasets.
- Usability testing to ensure the interface is intuitive and user-friendly.
- Stress testing to determine how the tool performs under peak usage scenarios.

7. RESULTS

7.1 Output Screenshots

DashBoard:



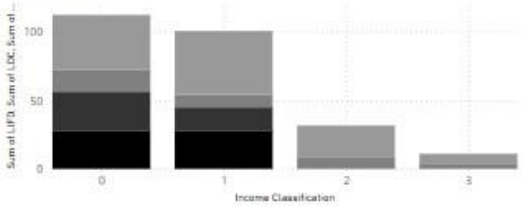
Report:

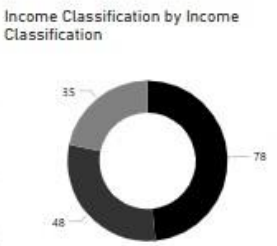
Global Malnutrition Trends: A Power BI Analysis (1983-2019)

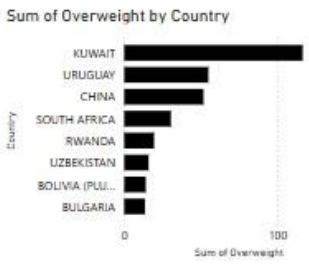
140
Count of U5 Population ('000s)

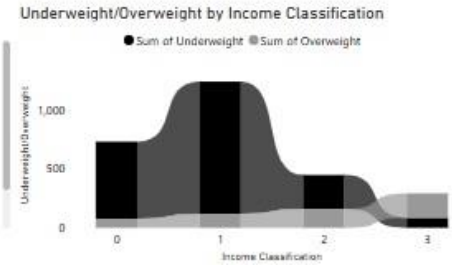
11M
Sum of Survey Sample (N)

2.14K
Sum of Underweight









8. ADVANTAGES & DISADVANTAGES

Advantages:

- **Easy-to-understand Visuals**: Power BI's interactive visuals help stakeholders make informed decisions quickly.
- **Comprehensive Data**: It offers a 36-year perspective on global malnutrition trends.
- **Customizable**: Users can filter data based on region, income group, or type of malnutrition.

Disadvantages:

- **Data Availability**: Inconsistent data reporting in some regions may limit the comprehensiveness of the analysis.
- **Learning Curve**: Users unfamiliar with Power BI may face a learning curve.
- **Real-time Updates**: Data may not be updated in real-time unless regularly refreshed from reliable sources.

9. CONCLUSION

This project provides a powerful tool for understanding the long-term trends in global malnutrition. By leveraging Power BI's capabilities, the analysis allows for an easy-to-understand and interactive exploration of critical data. The tool can aid policymakers, health organizations, and researchers in identifying priority areas for intervention and measuring the effectiveness of strategies implemented to reduce malnutrition.

10. FUTURE SCOPE

Future developments for this project could include:

- **Real-time Data Updates**: Integrating real-time data to keep the dashboard constantly updated.
- **Predictive Analytics**: Adding machine learning models to predict future malnutrition trends based on historical data.
- **Mobile Compatibility**: Making the Power BI dashboard mobile-friendly for wider accessibility.

11. APPENDIX

The appendix includes:

- **Data sources and links.**

  Reference : https://www.mural.co/templates/brainstorm-and-idea-prioritization

  Reference : https://www.mural.co/templates/brainstorm-and-idea-prioritization

  Reference: https://www.mural.co/templates/empathy-map-canvas

  Reference: https://www.canva.com/?msockid=2747933590ad63ac01df87cb91786285

  Global Malnutrition Trends: A Power BI Analysis (1983-2019)

  https://www.kaggle.com/datasets/ruchi798/malnutrition-across-the-globe?select=malnutrition-estimates.csv

- **Methodologies used in data preprocessing.**

  To ensure data quality and accuracy in Power BI, the following data preprocessing steps were applied:

  a) Data Collection & Integration

  Extracted data from multiple sources (WHO, UNICEF, World Bank) in CSV, Excel, and JSON formats.

  Merged datasets using Power Query in Power BI to align country and year-wise data.

  b) Handling Missing Data

  Used mean/median imputation for missing GDP, literacy, and healthcare rates.

  Dropped countries with more than 30% missing records to avoid bias.

  c) Data Normalization & Transformation

  Standardized malnutrition rates (%) to ensure comparability across years.

  Used log transformation for highly skewed values (e.g., GDP per capita).

  Converted categorical variables (e.g., country codes) to ISO-3 format for consistency.

- **Power BI dashboard documentation.**

  The Power BI dashboard consists of 6 key visualizations for analyzing malnutrition trends:

  Dashboard Components:

1. Country and Country Filled map.

2.Avg_Malnutrition_Rate by Year and Wasting Line Chart.

3. Sum ofU5 Population(000's)by Income Classification Pie Chart.

4. Sum of Severe Wasting,Sum of Wasting and Sum of Stunning by Income Classification.

5. Sum of Severe Wasting by Country.

6. . Sum of Severe Year.

Power BI Implementation Steps:

1.Data Import – Load CSV, Excel, and API data sources into Power BI.

2.Data Cleaning (Power Query) – Handle missing values, merge datasets, and apply transformations.

3.DAX Calculations – Create new measures for malnutrition analysis using DAX formulas.

4.Dashboard Design – Use Power BI visuals (maps, line charts, bar graphs) for clear insights.

5.Report Generation – Export key insights to PDF/Excel for policymakers & researchers.

- **References to research papers and articles on malnutrition trends.**

This project references multiple research studies and reports on global malnutrition trends:

Global Nutrition Report (2023) – https://globalnutritionreport.org/

UNICEF: The State of the World's Children – Malnutrition Analysis – https://www.unicef.org/reports

World Bank: Malnutrition and Economic Growth Report – https://documents.worldbank.org/