

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

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# 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

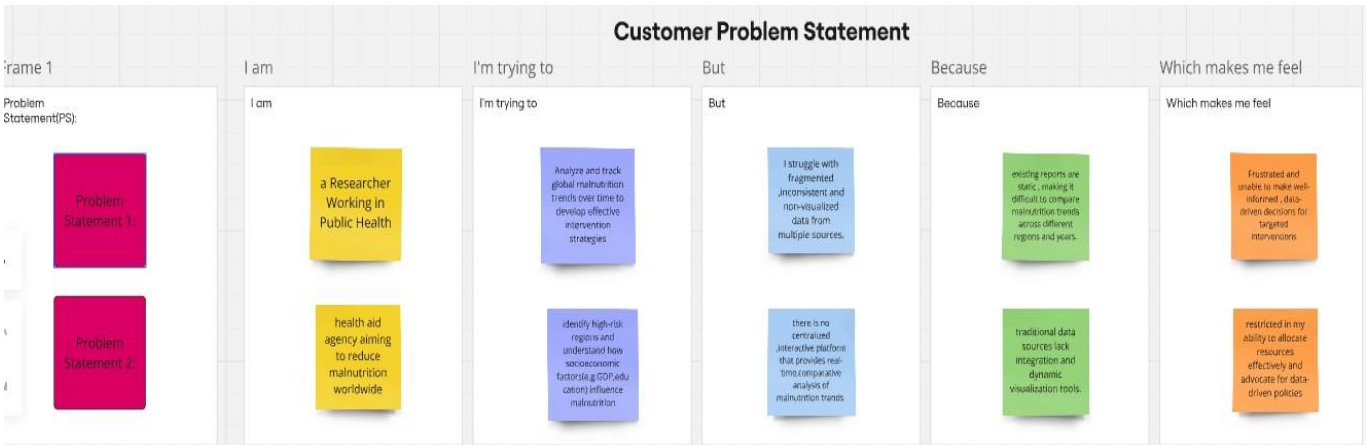
The primary purpose of this project is to offer a visual and analytical representation of the global malnutrition situation, focusing on trends from 1983 to 2019. By utilizing Power BI, this project will:

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

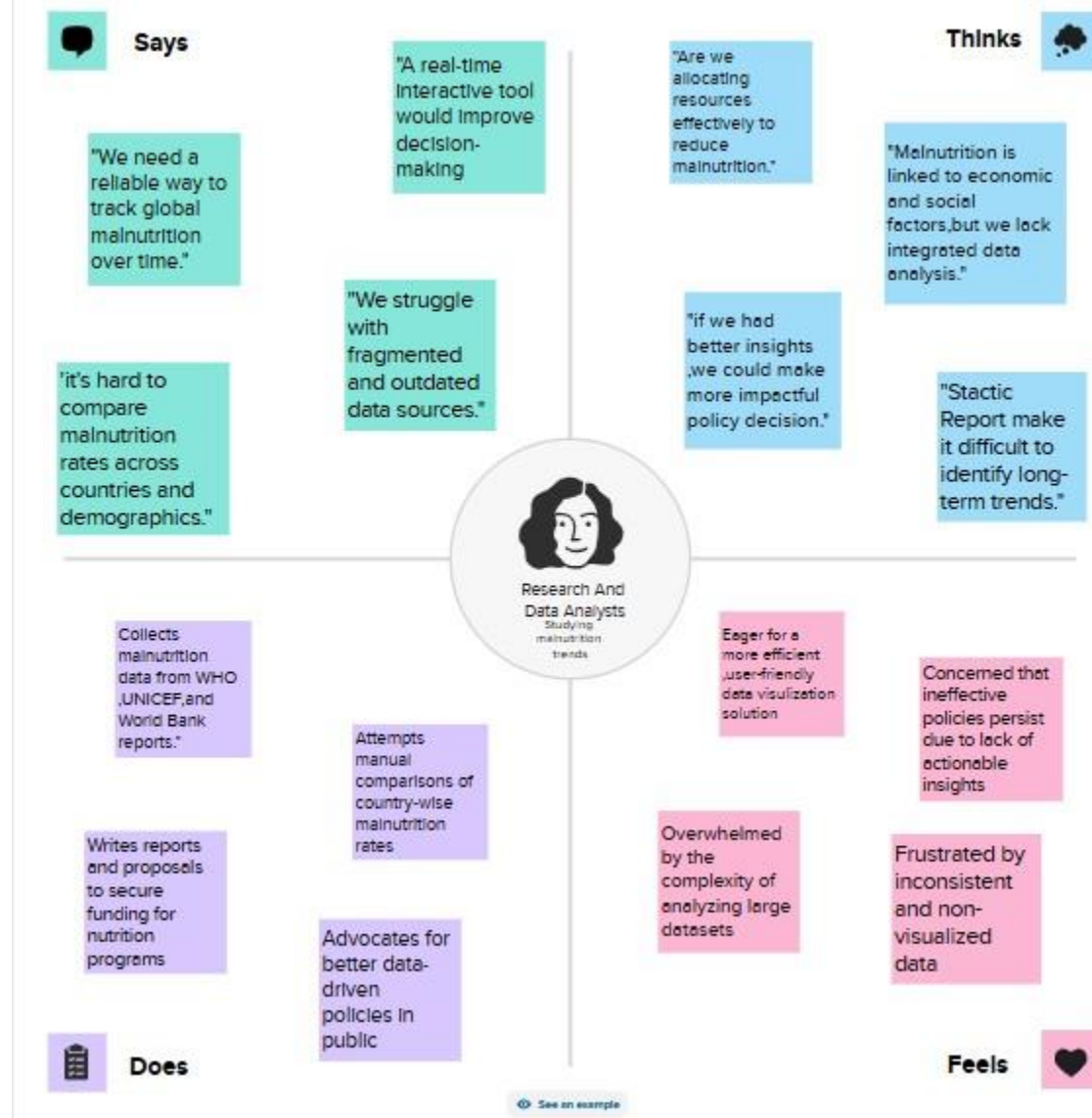
### 2.1 Problem Statement

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

### Global malnutrition trends A power BI Analysis of 1983 to 2019

By using this templet we can introduce our global food production trends brainstorming concepts

10 minutes to prepare  
1 hour to collaborate  
2-8 people recommended

**Before you collaborate**

1. Gather historical malnutrition data (1983-2019) from sources like WHO, UNICEF World Bank, or FAO.
2. Ensure data is cleaned and structured properly for Power BI integration.
3. We have to learn Power BI functionalities required for time-series analysis,geospatial mapping, and trend forecasting.

10 minutes

**Team gathering**

There are three members in a team, where one is going to lead the project, another one is going to design and develop suitable visualization and third one is going to provide insights into data sources and trends.

**Set the goal**

The primary goal of this project is to develop a Power BI solution that accurately predicts global malnutrition trends analysis of 1983 to 2019.

To achieve a primary objectives by integrating, cleaning, preprocessing the data.

**Learn how to use the facilitation tools**

Ensure every team member contributes ideas and insights. Structure the session with clear steps: ideas generation, grouping, and prioritization.

[Open article](#)

**Define your problem statement**

How might we visualize and analyze global malnutrition trends from 1983 to 2019 to identify key insights and policy implications?

5 minutes

**PROBLEM**

How might we develop a Power BI solution to accurately predict Global malnutrition trends analysis of 1983 to 2019 data?

**Key rules of brainstorming**

To run an smooth and productive session

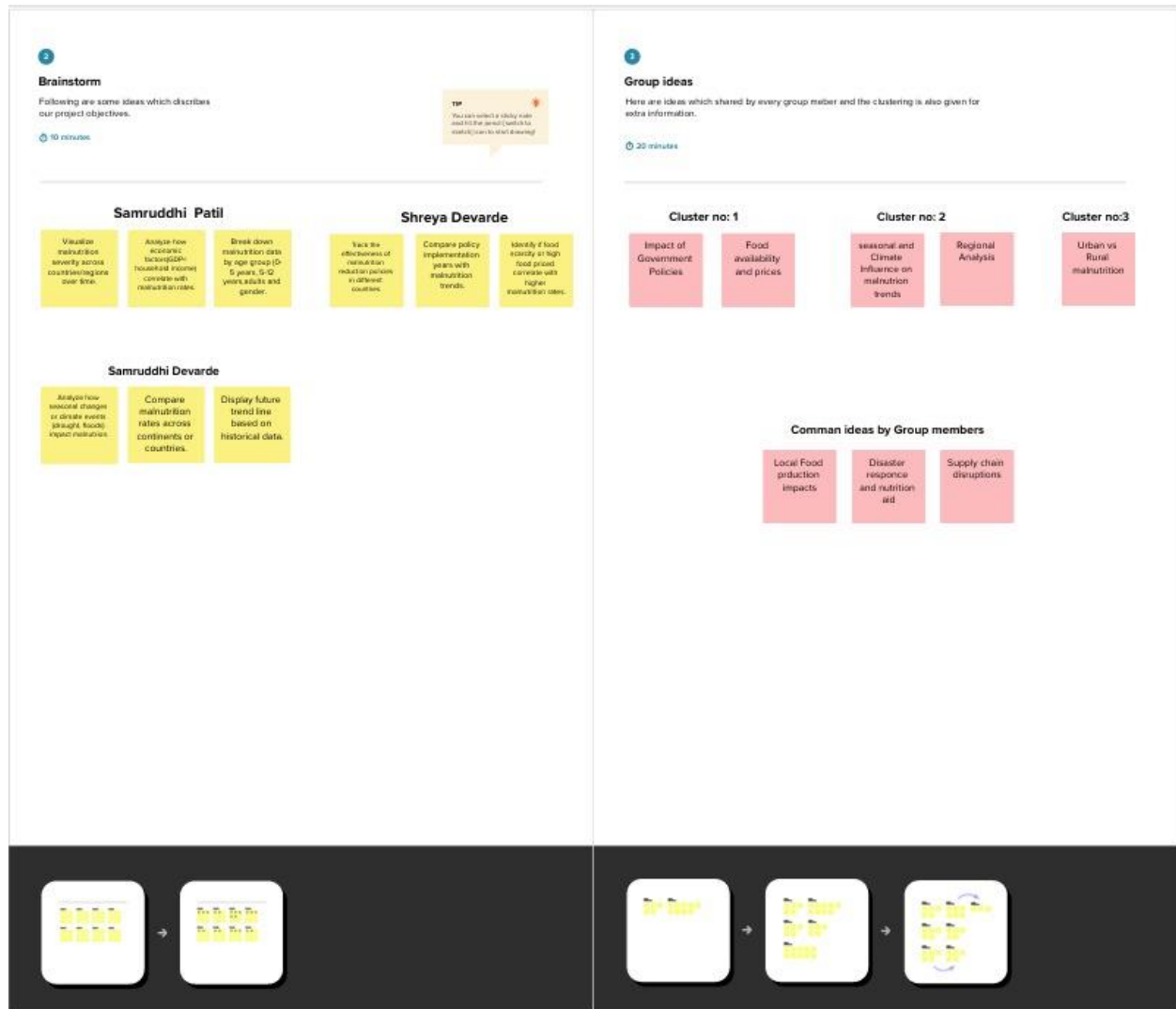
- Stay in topic.
- Defier judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

**Need some inspiration?**

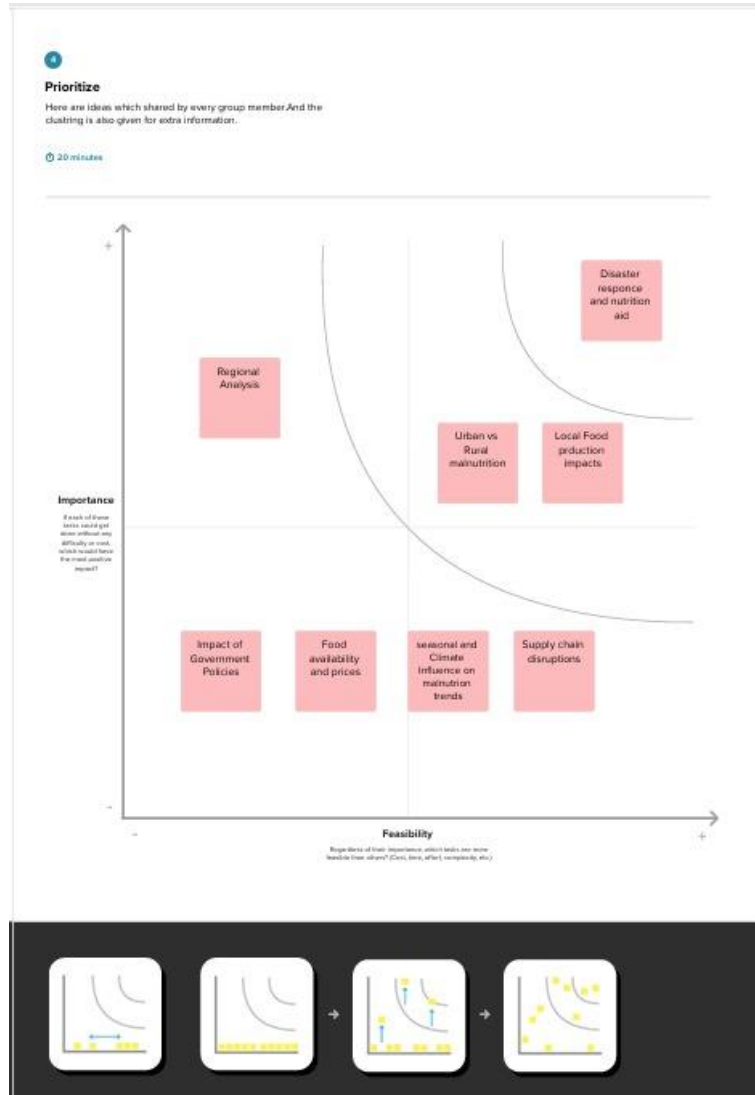
Use a feedback session of brainstorming to refresh your work.

[Open example](#)

## 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<br>Standardizing data formats<br>Data transformation (Normalization, Aggregation)                  |
| FR-3   | Data Storage                  | Storing raw and processed data in a database<br>Ensuring efficient indexing for retrieval                                  |
| FR-4   | Data Analysis                 | Generating statistical insights<br>Performing trend analysis   |
| FR-5   | Power BI Dashboard            | Creating interactive visualizations<br>User-defined filters and drill-down options<br>Exporting reports in various formats |
| FR-6   | User Access & Authentication  | Login through Email & Password<br>Social media authentication (Google, LinkedIn)   |
| FR-7   | System Notifications          | Email notifications for updates<br>Alerts for data inconsistencies   |
| FR-8   | Report Generation             | Generating country-wise malnutrition reports<br>Comparative analysis over different years                                  |
| FR-9   | User Feedback Collection      | Collecting user suggestions<br>Storing and analysing feedback  |

**Non-functional Requirements:**

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

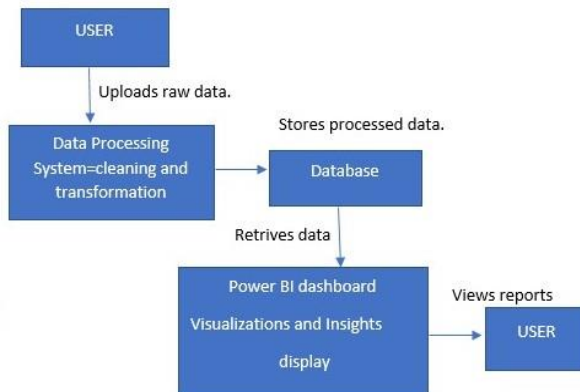
| FR No. | Non-Functional Requirement | Description   |
|--------|----------------------------|---|
| NFR-1  | Usability                  | User-friendly interface with intuitive navigation     |
| NFR-2  | Security                   | Secure authentication, encrypted data storage         |
| NFR-3  | 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

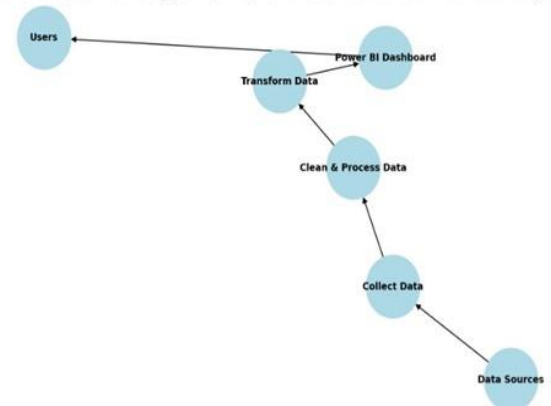
A Data Flow Diagram (DFD) for the project:

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:**



**Level 0 Data Flow Diagram (DFD) for Global Malnutrition Trends Analysis**



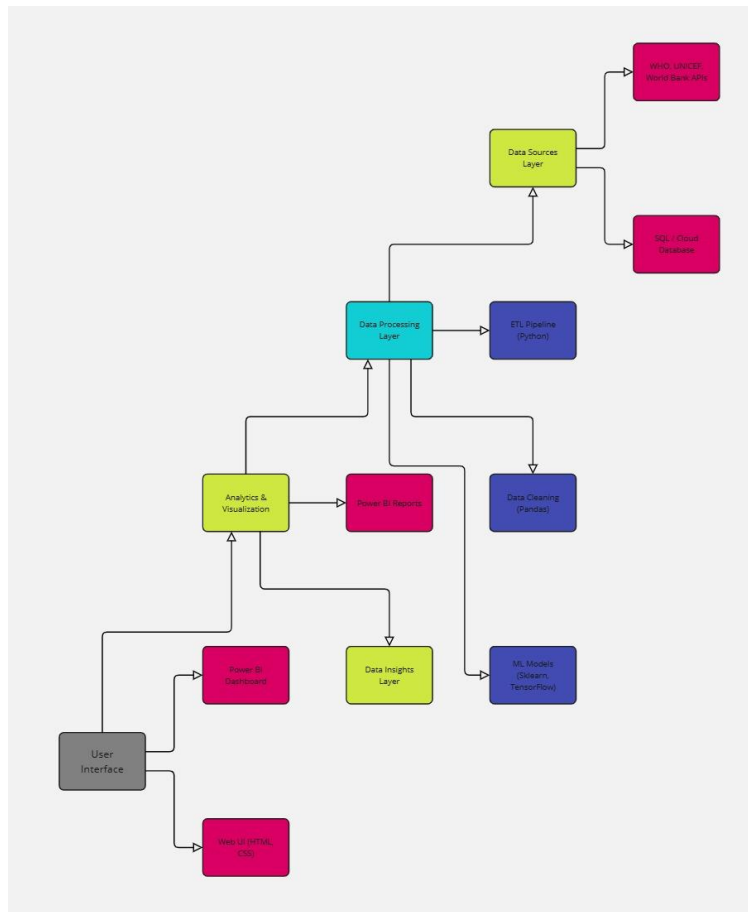
**User Stories :**

| 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.

**Problem-Solution fit canvas 2.0**

Business Value: Visualize global malnutrition trends (1983-2019) using data-driven insights, enabling effective policies and interventions to combat hunger and improve health.

|  |  |   |
|--|--|---|
| <b>1. CUSTOMER SEGMENT(S)</b><br>Who is your customer?<br>i.e. working parents of 0-5 y.o. kids  | <b>6. CUSTOMER CONSTRAINTS</b><br>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.   | <b>5. AVAILABLE SOLUTIONS</b><br>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking.         |
| <b>2. JOBS-TO-BE-DONE / PROBLEMS</b><br>Which jobs-to-be-done (or problems) do you address for your customers?<br>There could be more than one; explore different sides.                                       | <b>9. PROBLEM ROOT CAUSE</b><br>What is the real reason that this problem exists?<br>What is the back story behind the need to do this job?<br>i.e. customers have to do it because of the change in regulations.  | <b>7. BEHAVIOUR</b><br>What does your customer do to address the problem and get the job done?<br>i.e. directly related: find the right solar panel installer, calculate usage and benefits;<br>indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) |
| <b>3. TRIGGERS</b><br>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.  | <b>10. YOUR SOLUTION</b><br>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.<br>If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. | <b>8. CHANNELS of BEHAVIOUR</b><br>8.1 ONLINE<br>What kind of actions do customers take online? Extract online channels from #7   |
| <b>4. EMOTIONS: BEFORE / AFTER</b><br>How do customers feel when they face a problem or a job and afterwards?<br>i.e. lost, insecure > confident, in control - use it in your communication strategy & design. |  | 8.2 OFFLINE<br>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.  |

### 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.

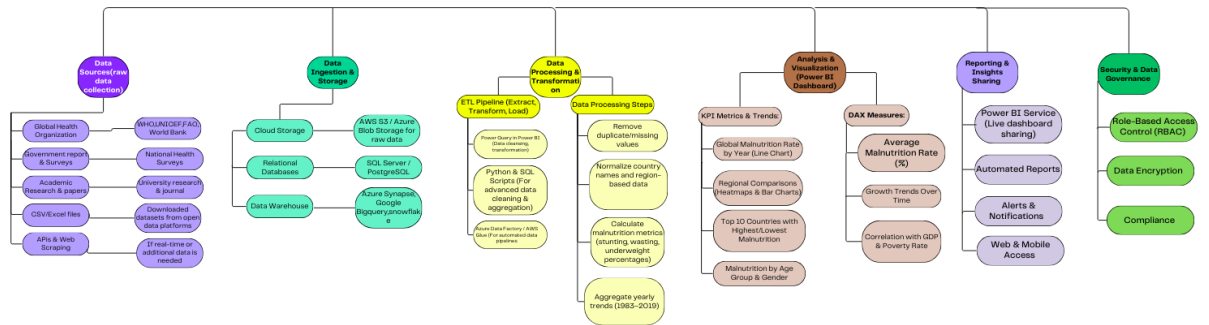
| S.No. | Parameter                                | Description   |
|-------|--|---|
| 1.    | Problem Statement (Problem to be solved) | Malnutrition remains a persistent global challenge affecting millions of people, especially children. Tracking malnutrition trends over time and across regions is 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    | <p>The solution aims to support global health organizations, policymakers, and non-profits in combating malnutrition. By providing clear visual insights, it helps in:</p> <ul style="list-style-type: none"> <li>Identifying high-risk regions.</li> <li>Understanding the impact of economic and policy changes.</li> <li>Promoting effective resource distribution.</li> </ul>   |
|       |  | <ul style="list-style-type: none"> <li>This will ultimately contribute to reducing malnutrition rates globally, improving quality of life, and ensuring better policy decisions.</li> </ul>   |
| 5.    | Business Model (Revenue Model)           | <p>The project can generate revenue through:</p> <ul style="list-style-type: none"> <li>Subscription-based model for global health organizations to access advanced predictive analytics.</li> <li>Collaborations with government bodies for customized malnutrition reports.</li> <li>Data licensing model for research institutes and universities.</li> <li>Offering consulting services for policy planning and intervention strategies.</li> </ul>   |
| 6.    | Scalability of the Solution              | <p>The solution is highly scalable and can be:</p> <ul style="list-style-type: none"> <li>Expanded to include new datasets (e.g., food supply chain, climate change impact).</li> <li>Integrated with real-time data sources for up-to-date analysis.</li> <li>Extended to other health-related challenges like child mortality, maternal health, and poverty analysis.</li> <li>Scaled globally, benefiting multiple countries, government organizations, and non-profits in decision-making processes.</li> </ul> |

## 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.

### Global Malnutrition Trends Analysis(1983-2019)Architecture Diagram



## 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

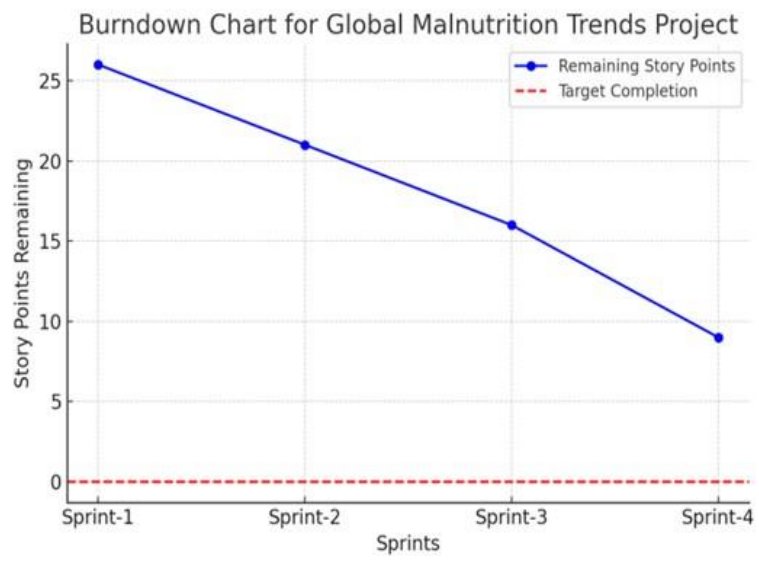
Average Velocity per Iteration Unit:

AV= Total Story Points / Sprint Duration

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

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







## **6. FUNCTIONAL AND PERFORMANCE TESTING**

### **6.1 Performance Testing**

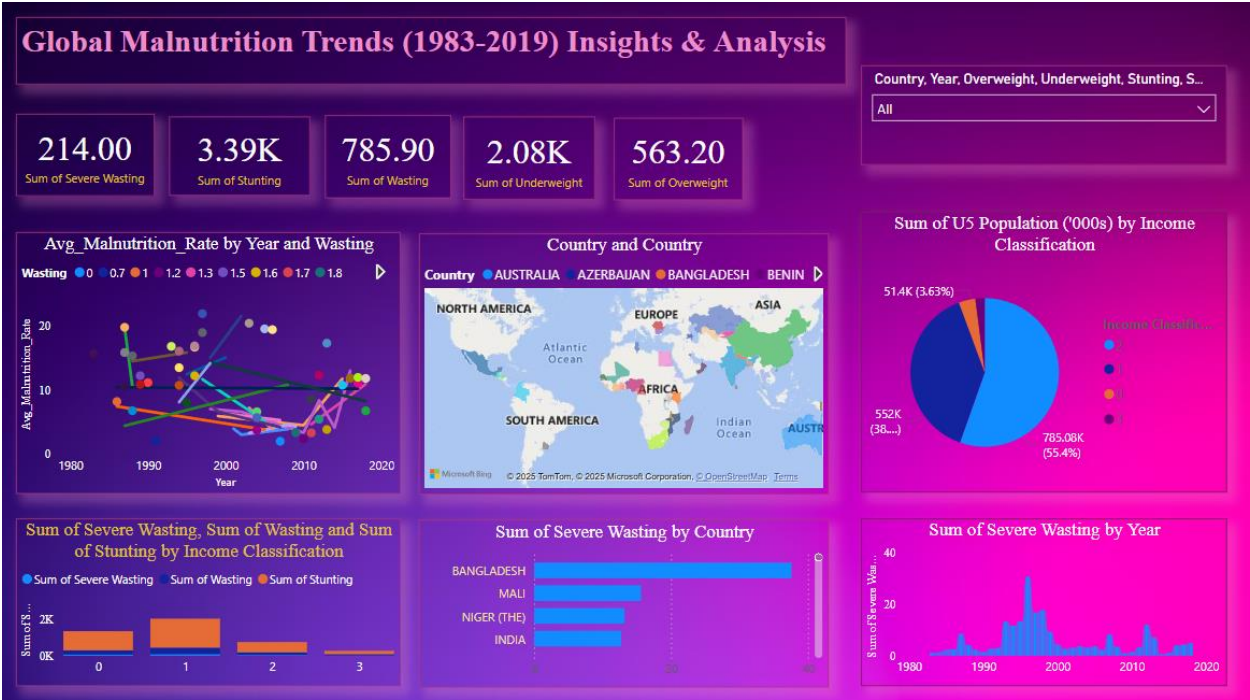
Performance testing will include:

- 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:



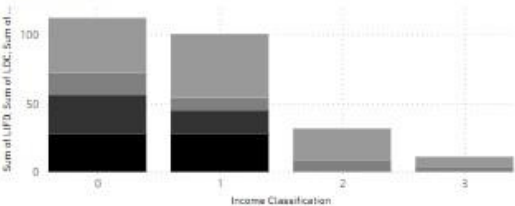
Report:



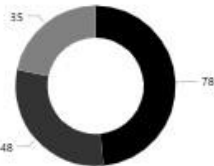
Global Malnutrition  
Trends: A Power BI  
Analysis (1983-2019)



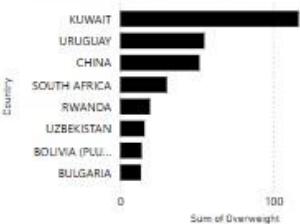
LIFD, LDC, LLDC or SID2 & Average of Stunting by Income Classification



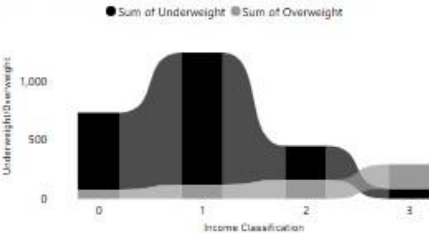
Income Classification by Income Classification



Sum of Overweight by Country



Underweight/Overweight by Income Classification



## 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 Stunting 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/>