PROJECT REPORT

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

Team ID : PNT2025TMID06810

Team Size : 3

Team lead : SHAIK JAKIRUDDIN

Team member : VARRE SHYAM KUMAR

Team member : PEETA HEMANTH

INTRODUCTON:

1.1 ProjectOverview:

The **Global Malnutrition Trends: A Power BI Analysis (1983-2019)** project aims to analyze historical malnutrition data to identify key trends, regional disparities, and underlying causes. By leveraging data from WHO, UNICEF, and other global sources, the study visualizes malnutrition patterns through interactive Power BI dashboards. The project integrates socioeconomic and policy-related factors to provide insights that aid policymakers, NGOs, and researchers in addressing nutrition challenges effectively. Machine learning techniques such as time-series forecasting and clustering are used to predict future risks and correlations. Ultimately, this analysis supports data-driven decision-making to improve nutrition security and public health outcomes worldwide.

1.2 Purpose:

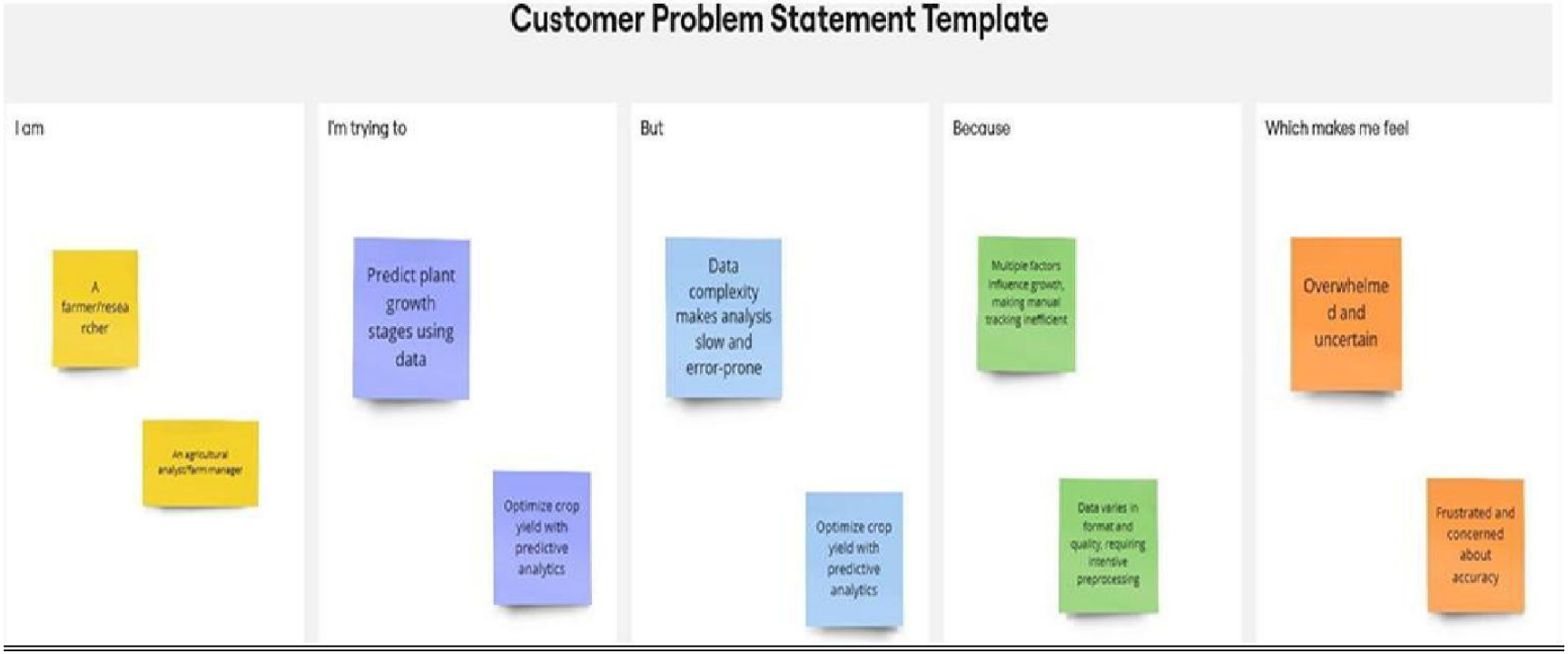
The purpose of the Global Malnutrition Trends: A Power BI Analysis (1983-2019) project is to analyze historical malnutrition data to identify key trends, regional disparities, and underlying causes. It aims to provide data-driven insights using interactive Power BI dashboards to help policymakers, NGOs, and researchers make informed decisions. By integrating socioeconomic and policy-related factors, the project supports the development of effective intervention strategies to combat malnutrition. Machine

learning techniques, such as time-series forecasting and clustering, are used to predict future malnutrition risks. Ultimately, the project seeks to enhance public health outcomes by improving nutrition security and addressing global disparities.

2 IDEATIONPHASE:

2.1 PROBLEMSTATEMENT

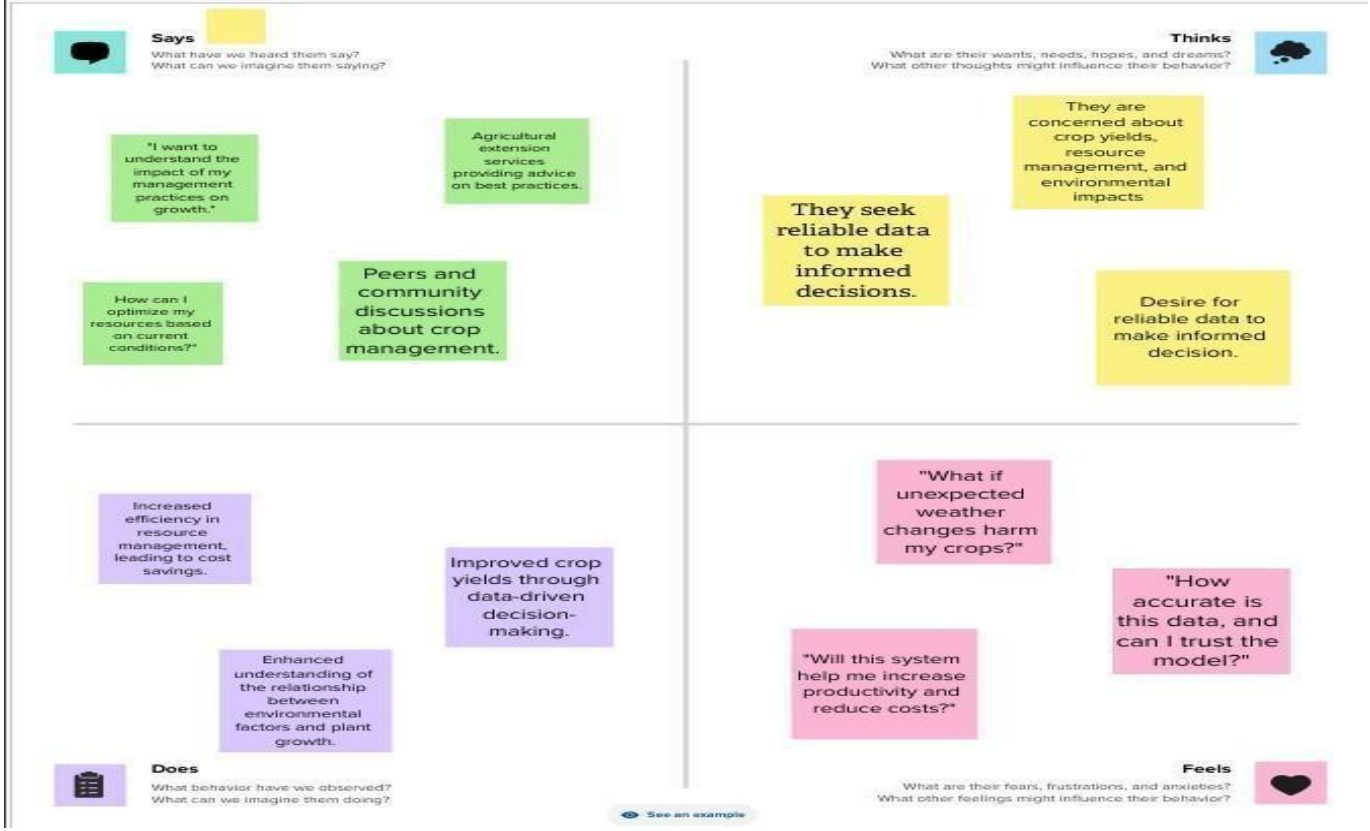
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1 Rising Rates of Malnutrition in Vulnerable Populations.	a health policymaker /humanitarian worker	provide adequate nutrition to children and vulnerable communities.	malnutrition remains widespread, especially in low-income and conflict-affected regions.	of poverty, lack of access to nutritious food, and weak healthcare systems.	frustrated and helpless as preventable deaths and developmental issues persist.
PS-2 Micronutrient Deficiencies and Hidden Hunger	a public health professional /nutrition advocate.	□ reduce micronutrient deficiencies in underprivileged communities. □	many individuals do not get enough essential vitamins and minerals.	□ of poor diets, lack of awareness, and limited access to fortified foods. □	concerned about the long-term impact on health, immunity, and productivity
PS-3 Impact of Climate Change on Food Security	an environmentalist/agricultural researcher.	improve food security and sustainable agriculture.	climate change is disrupting food productio	extreme weather conditions, droughts, and soil degradation	alarmed as more people struggle with hunger and malnutrition.



2.2EmaphtyMap Canvas.

2.3Brainstorming:

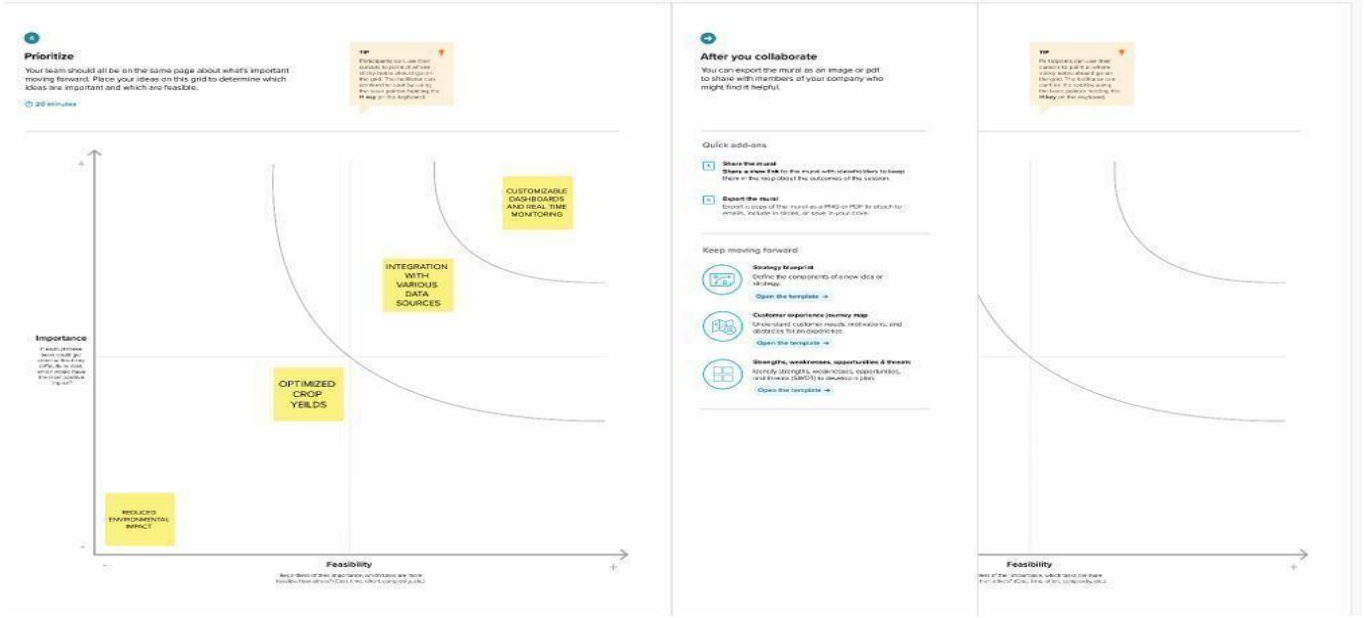
1. Project Overview Objective: What is the primary goal of this Power BI analysis? Scope: Define the time



(1983-2019) and geographic coverage (global, regional, country-specific). Significance: Why is analyzing malnutrition trends important? 2. Data Collection & Sources Possible Data Sources: - WHO, FAO, UNICEF, World Bank, Global Nutrition Report, national health surveys - Supplementary datasets (e.g., economic, agricultural, climate data) Data Attributes: - Country, region, year - Malnutrition indicators (stunting, wasting, underweight, obesity) - Socioeconomic factors (income levels, education, healthcare access) - Policy-related variables (government programs, aid distribution) 3. Power BI Dashboard Components - Visuals & Charts: - Trend Analysis: Line charts showing malnutrition trends over time - Geographical Heatmaps: Regional distribution of malnutrition rates - Comparative Analysis: Bar charts comparing countries and regions - Correlation Matrices: Relationship between malnutrition and other variables - Interactive Filters:Country, year, malnutrition type, economic factors 4. Expected Insights & Recommendations - Key trends in malnutrition and their implications - Policy recommendations for governments

& NGOs - Future projections and areas needing further research

Step-3: Idea Prioritization



Key Idea	Description	Impact	Feasibility
Addressing Childhood Undernutrition	Focus on reducing stunting, wasting, and underweight in children.	Very High	High
Improving Food Security	Ensuring access to affordable, nutritious food in vulnerable regions.	Very High	Medium
Enhancing Maternal and Infant Nutrition	Promoting breastfeeding, prenatal care, and maternal supplements.	High	High
Tackling Micronutrient Deficiencies	Implementing fortification programs (iron, vitamin A, iodine, etc.).	High	Medium
Strengthening Nutrition Education	Raising awareness on healthy eating habits and dietary diversity.	Medium	High
Climate-Resilient Agriculture	Supporting sustainable farming to counter climate-related food shortages.	High	Medium
Reducing Ultra-Processed Food Consumption	Implementing policies to reduce junk food consumption and promote healthy alternatives.	Medium	Low

3.RequirementAnalysis.

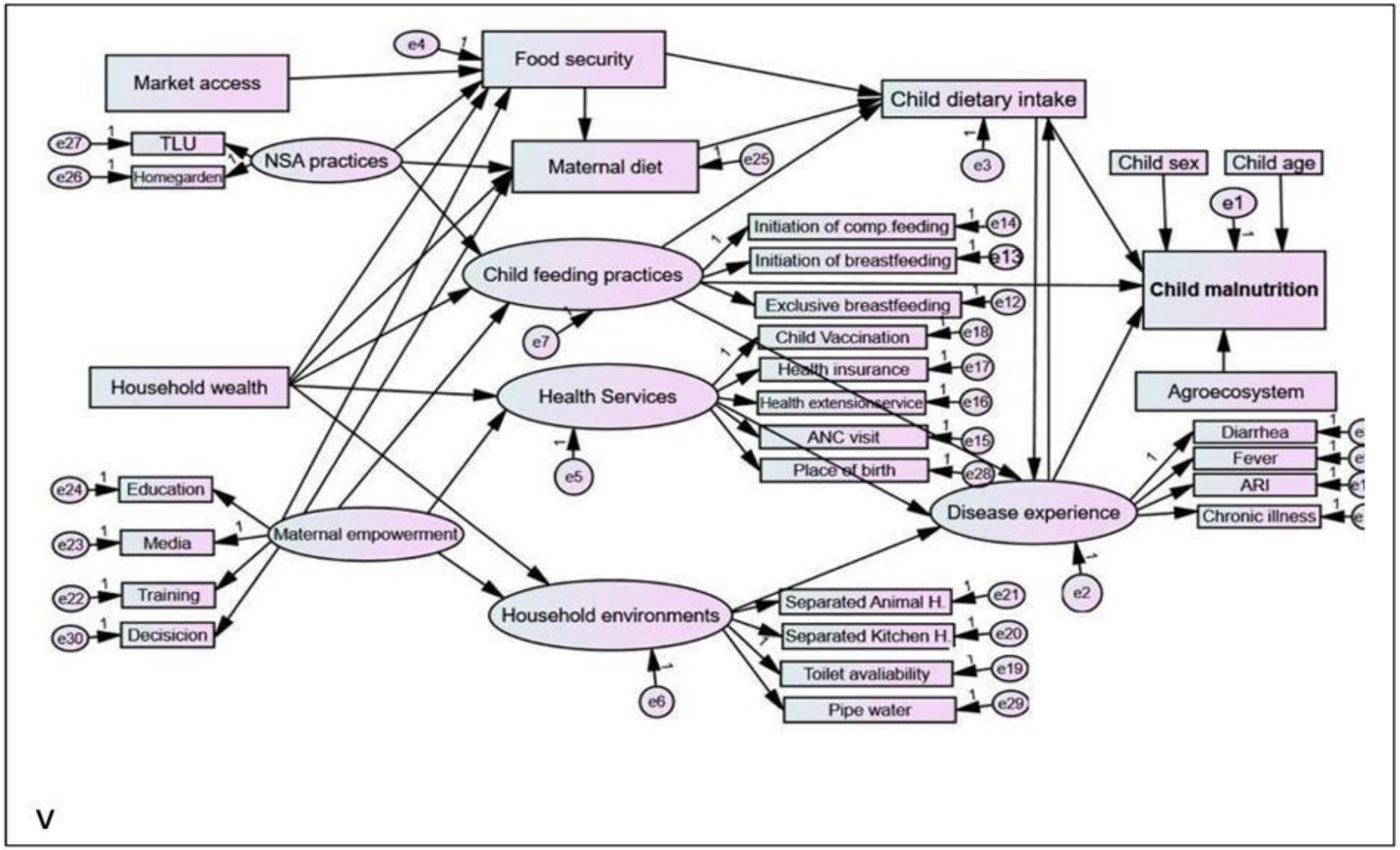
3.1CustomerJourneyMap

3.2.SolutionRequirement.

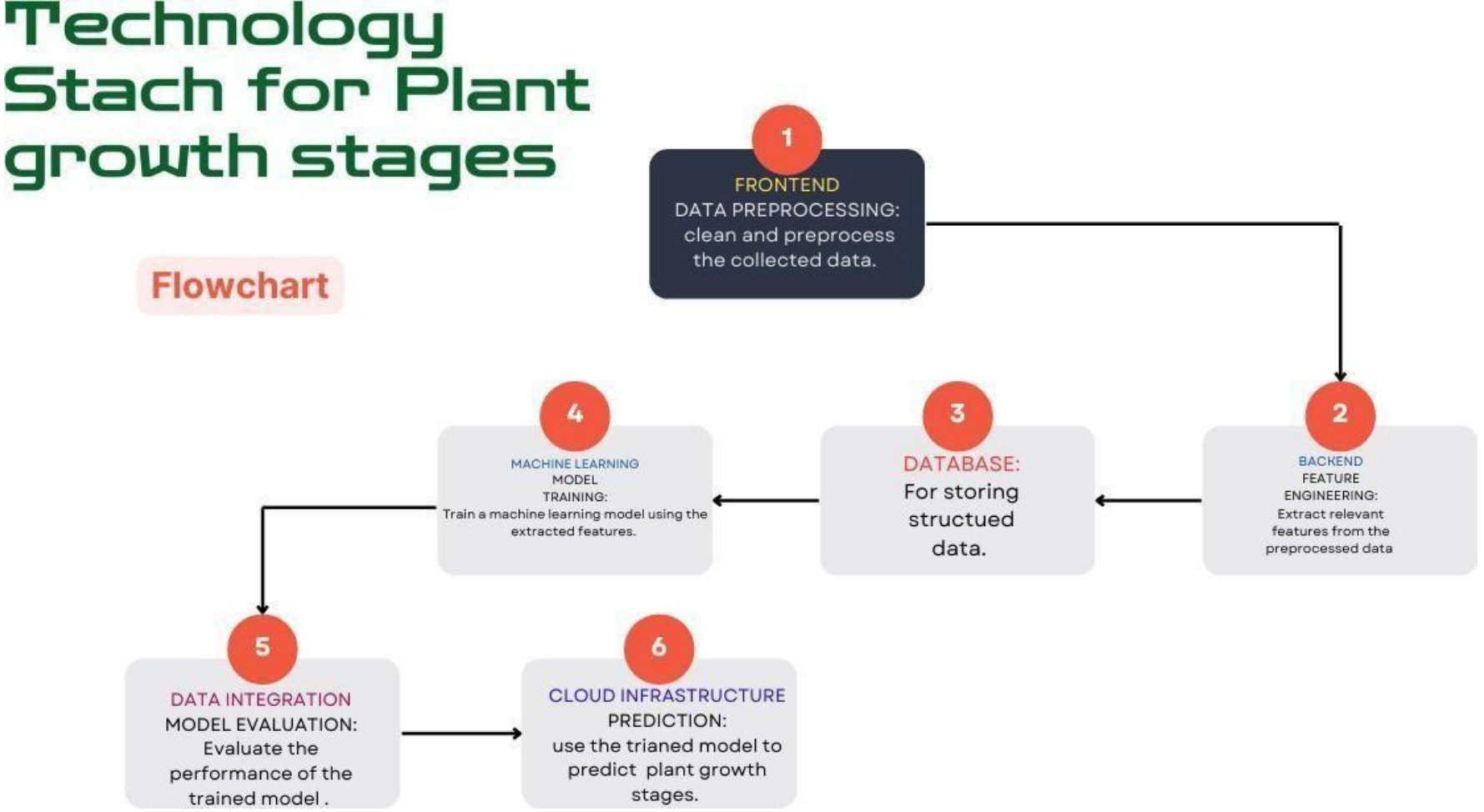
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Ingestion	Collect malnutrition datasets from WHO, UNICEF, and World Bank Support manual upload of CSV/Excel files
FR-2	ETL (Extract, Transform, Load)	Clean missing values, remove duplicates Normalize data formats across different sources Perform aggregation by country, region, and year
FR-3	Data Storage & Processing	Store raw data in Azure Blob / AWS S3 Load transformed data into PostgreSQL / BigQuery Enable indexing for faster queries
FR-4	Data Enrichment	Merge malnutrition data with GDP, population stats Apply statistical analysis for data validation
FR-5	Machine Learning & Trend Analysis	Implement time-series forecasting for malnutrition trends Apply clustering techniques for regional insights Train regression models to correlate malnutrition with socio-economic factors
FR-6	Data Visualization	Create Power BI dashboards with interactive charts Implement geographic heatmaps for regional comparison

FR No.	Non-Functional Requirement	Description
NFR-1	Performance & Scalability	The system should process large datasets (millions of records) efficiently and support future data growth.
NFR-2	Security & Access Control	Implement role-based access control (RBAC), encryption, and multi-factor authentication (MFA) for data protection.
NFR-3	Usability & User Experience	Dashboards and reports should be user-friendly, intuitive, and support interactive visualizations.
NFR-4	Availability & Reliability	The system should have 99.9% uptime and ensure failover mechanisms for continuous operation.
NFR-5	Data Accuracy & Consistency	Data should be validated, cleaned, and free from inconsistencies before visualization.
NFR-6	Compliance & Data Privacy	Ensure compliance with GDPR, HIPAA, or other applicable data protection regulations.

3.3DataFlow Diagram.



3.3TechnologyStack.



4.SolutionFit

1. Problem Statement

Malnutrition remains a critical global challenge, affecting millions, especially in developing countries. Despite various initiatives, real-time tracking and historical trend analysis of malnutrition data are often inadequate.

Policymakers, researchers, and organizations lack an intuitive and data-driven approach to monitor and combat malnutrition effectively.

2. Customer Pain Points

Lack of comprehensive, visual insights into long-term malnutrition trends.

Difficulty in identifying correlations between economic, social, and health indicators affecting malnutrition.
Policymakers and NGOs struggle to make data-backed decisions due to fragmented and unstructured data sources.

3. Proposed Solution

A Power BI-based analytical dashboard that visualizes malnutrition trends (1983-2019) using historical datasets.

Key features:

Interactive maps and trend charts to identify regional disparities.

Time-series analysis to understand progress and setbacks.

Correlation analysis with economic and health indicators.

Enables better decision-making by providing a data-driven narrative of global malnutrition patterns.

4. Value Proposition

Data-Driven Insights: Transforms complex datasets into actionable visualizations.

User-Friendly Interface: Interactive dashboards for policymakers, researchers, and organizations.

Predictive Capabilities: Helps forecast future malnutrition risks using historical trends.

Impact Assessment: Measures the effectiveness of past interventions and policies.

5. Validation & Evidence

Historical datasets from WHO, UNICEF, World Bank, and FAO are analyzed to ensure accuracy.

Initial Power BI prototypes have demonstrated clear patterns and correlations in malnutrition trends.

Feedback from experts and policymakers supports the need for a visual analytics tool for decision making.

6. Next Steps

Refinement: Enhance data integration and visual storytelling elements.

Stakeholder Collaboration: Work with health organizations and policymakers for feedback.

Predictive Analysis: Incorporate machine learning models to forecast future malnutrition trends.
Scalability: Expand the tool to cover additional health indicators and real-time data updates.

4.1 PROPOSEDSOLUTION

S.No.	Parameter	Description
•	Problem Statement (Problem to be solved)	Malnutrition remains a persistent global challenge, affecting millions across various socio-economic backgrounds. Despite efforts by governments and international organizations, decision-makers face data accessibility issues, fragmented insights, and lack of historical trend analysis to evaluate the effectiveness of interventions.
•	Idea / Solution description	The proposed solution is a Power BI-based analytical dashboard designed to analyze global malnutrition trends from 1983 to 2019. This solution integrates historical data from sources such as WHO, UNICEF, and the World Bank to provide comprehensive insights into malnutrition patterns across different regions and time periods. Through interactive visualizations, users can explore malnutrition trends, identify correlations with socio-economic and health factors, and assess the impact of past interventions. Additionally, the dashboard incorporates predictive analytics to forecast future malnutrition risks, enabling proactive decision-making. By offering a user-friendly interface with dynamic charts, maps, and reports, this solution empowers policymakers, researchers, and NGOs to make data-driven decisions and implement more effective strategies to combat malnutrition worldwide.

•	Social Impact / Customer Satisfaction	The Power BI-based Global Malnutrition Trends Analysis has the potential to create a significant social impact by empowering policymakers, NGOs, and researchers with data-driven insights to combat malnutrition effectively. By providing a clear understanding of historical trends, regional disparities, and predictive analytics, this solution enables targeted interventions that can lead to better health outcomes, reduced child mortality, and improved nutritional policies worldwide. Key Social Benefits: ✓ Improved Policy Decisions: Governments and organizations can make informed choices to allocate resources where they are needed most. ✓ Early Detection & Prevention: Predictive analytics helps identify high-risk areas before malnutrition worsens. ✓ Better Intervention Strategies: Evaluates past initiatives, enabling the design of more effective nutrition programs. ✓ Enhanced Public Awareness: Interactive dashboards help raise awareness among stakeholders and the public.

4.2 SOLUTIONARCHITECTURE:

1. Integratedatasources:Combinedatafromvarioussources,includingsensors,weatherstations,andfarm management systems.

3:DataAnalysisandModeling

1. Datapreprocessing:Clean,transform,andnormalizedataforanalysis.

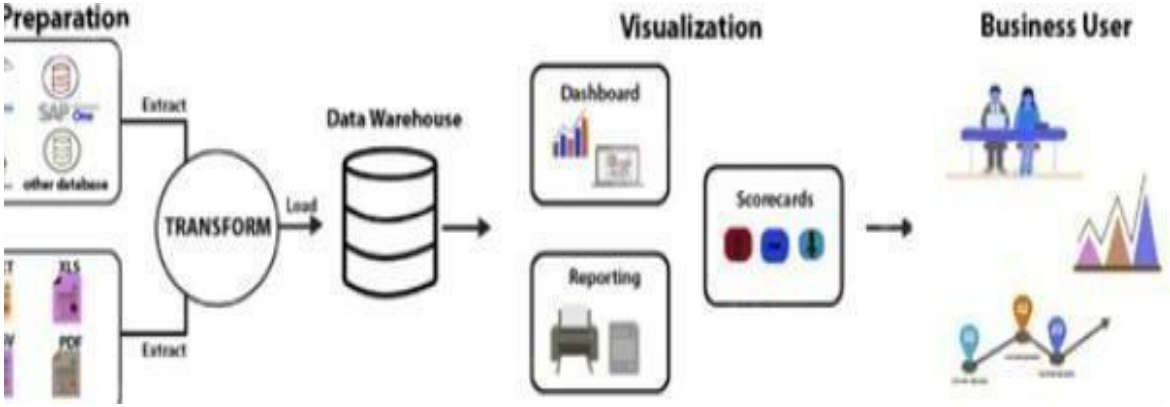
2. Featureengineering:Extractrelevantfeaturesfromenvironmentalandmanagementdata.
3. Modelselection:Chooseasuitablealgorithmforpredictingplantgrowthstages,suchasdecisiontrees,randomforests, or neural networks.
4. Modeltrainingandevaluation:Trainandevaluatethepredictivemodelusingvariousmetrics,includingaccuracy,precision, and recall.

SolutionDesign.

1. Definesolutionarchitecture:Designasolutionarchitecturethatintegratesthepredictivemodelwithauser-friendly interface.
2. Choosetechnologies:Selecttechnologies,includingPowerBI,AzureMachineLearning,andAzureIoTHub.
3. Designdatapipeline:Designadatapipelinethatintegratesdatafromvarioussourcesandfeedsitintothepredictive model.

5:ImplementationandDeployment

1. Implementpredictivemodel: ImplementthepredictivemodelusingAzureMachineLearning.
2. Develop user interface: Develop a user-friendly interface using Power BI that allows farmers and agricultural managers to input data and view predictions.
3. Deploysolution: Deploythesolutiontoacloud-basedplatform,suchasAzure.



5. PROJECT PLANNING AND SCHEDULING.

5.1 Project Planning:

Sprint	Functional Requirement(Epic)	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint-1	Data collection and Integration.	USN-1	Gather relevant environmental data, including temperature, humidity, soil moisture, and light levels.	7	High	KANCHUPATI LAVANYA
	Data Preperation	USN-2	Cleans the collected data for analysis.	8	High	KANCHUPATI LAVANYA,SHAIK KARISHMA

Sprint-2	Data Analysis and Modeling	USN-3	Utilize Power BI's analytical tools to explore relationship s between environmental factors and plant growth stages.	5	Low	SHAIK KARISHMA
	Visualization Developnment	USN-4	Create interactive visualizatio n for key metrics	6	Medium	NAGIREDDY DEEPTHI
	Dashboard Design	USN-5	Design userfriendly interfaces that allow stakeholder	8	High	NUDURUPATI SRIVIDYA
			s to easily access and interpret data			

			Incorporate visual elements such as charts, graphs, and map store present data effectively.			NAGIREDDY DEEPTHI
Sprint-3	Implementation	USN-6	Provide training and support to users to ensure they can effectively utilize the dashboards for decisionmaking	7	Medium	KANCHUPATI LAVANYA, NUDURUPATI SRIVIDYA
	Feedback		Gather feedback from stake holder on initial dashboard	6	Medium	SHAIK KARISHMA

	Evaluation and Continuous Improvement	USN-7	Analyze user engagement with the dashboards and gather feedback for enhancements. Foster a culture of data-driven decision-making with in the organization to maximize the benefits of the project.	9	High	SHAIK KARISHMA, NUDURUPATI SRIVIDYA ,KANCHUPATI LAVANYA

Project Tracker, Velocity & Burn down Chart:(4Marks)

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	21	10Days	22Feb2025	03March2025	22	03March 2025
Sprint-2	20	10Days	04March 2025	13March2025	21	13March 2025

Sprint-3	15	3Days	13March 2025	14March 2025	14	14March 2025

Velocity:

Total Story Points Completed:56

Total Number of Sprints=3

Velocity=Total Story Points/Number of Sprints

Velocity=56/3=18.66

Burn down Chart:

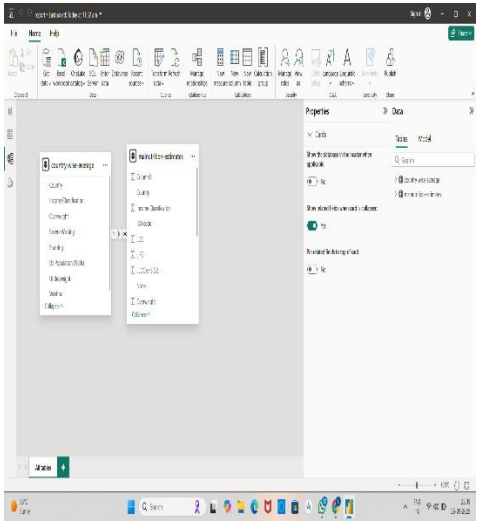
A burn chart is graphical representation of work left do versus time. It is often used in agile software development methodologies such as Scrum. Burn down charts be applied to any project containing measurable progress over time.

Sprint	Day	TotalStoryPoints	StorypointsCompleted	RemainingStoryPoints
1	1	56	0	56
	2	56	0	56
	3	56	0	56
	4	56	0	56
	5	56	0	56
	6	56	0	56

	7	56	0	56
	8	56	0	56
	9	56	0	56
	10	56	21	35
2	1	56	21	35
	2	56	21	35
	3	56	21	35
	4	56	21	35
	5	56	21	35
	6	56	21	35
	7	56	21	35
	8	56	21	35
	9	56	21	35
	10	56	20	15
3	1	56	15	15
	2	56	15	15
	3	56	15	15
	4	56	15	15
	5	56	15	15

	6	56	15	15
	7	56	15	15
	8	56	15	15
	9	56	15	15
	10	56	15	0

6. FUNCTIONAL AND PERFORMANCE

2.	Data Preprocessing	
3.	Utilization of Data Filters	We had shorted the data by giving the data type text, whole no. and the decimal no.

4.	DAX Queries Used	1. Total Malnourished Population Over Time TotalMalnourished = SUM('MalnutritionData'[Malnourished_Population]) 2. Malnutrition Rate (%) by Country MalnutritionRate = DIVIDE(SUM('MalnutritionData'[Malnourished_Population]), SUM('MalnutritionData'[Total_Population]), 0) * 100 3. Moving Average for Malnutrition Rate (5-Year) Malnutrition_MA5 = AVERAGEX(DATESINPERIOD('MalnutritionData'[Year], MAX('MalnutritionData'[Year]), -5, YEAR), [MalnutritionRate])

		4.Top 5 Most Affected Countries in a Given Year Top5Countries = TOPN(5, SUMMARIZE('MalnutritionData', 'MalnutritionData'[Country], "MalnutritionRate", [MalnutritionRate]), [MalnutritionRate], DESC)

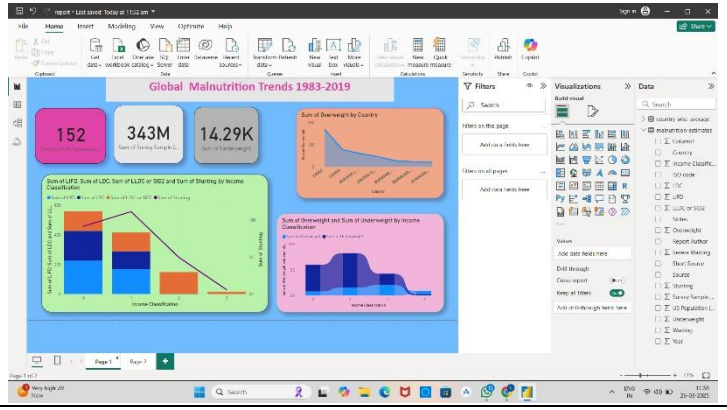
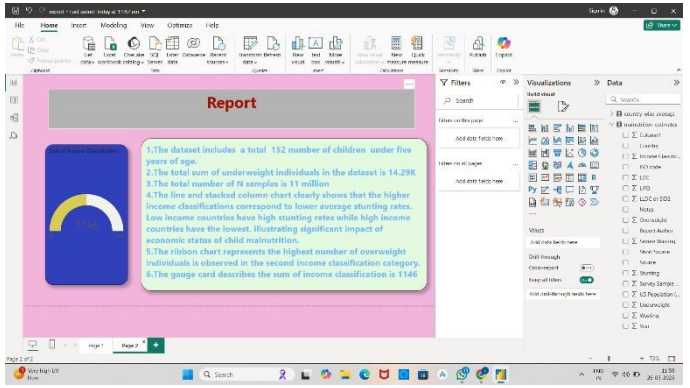
6.1. Performance Testing

ModelPerformanceTesting:

Projectteamshallfillthefollowinginformationinmodelperformancetestingtemplate.

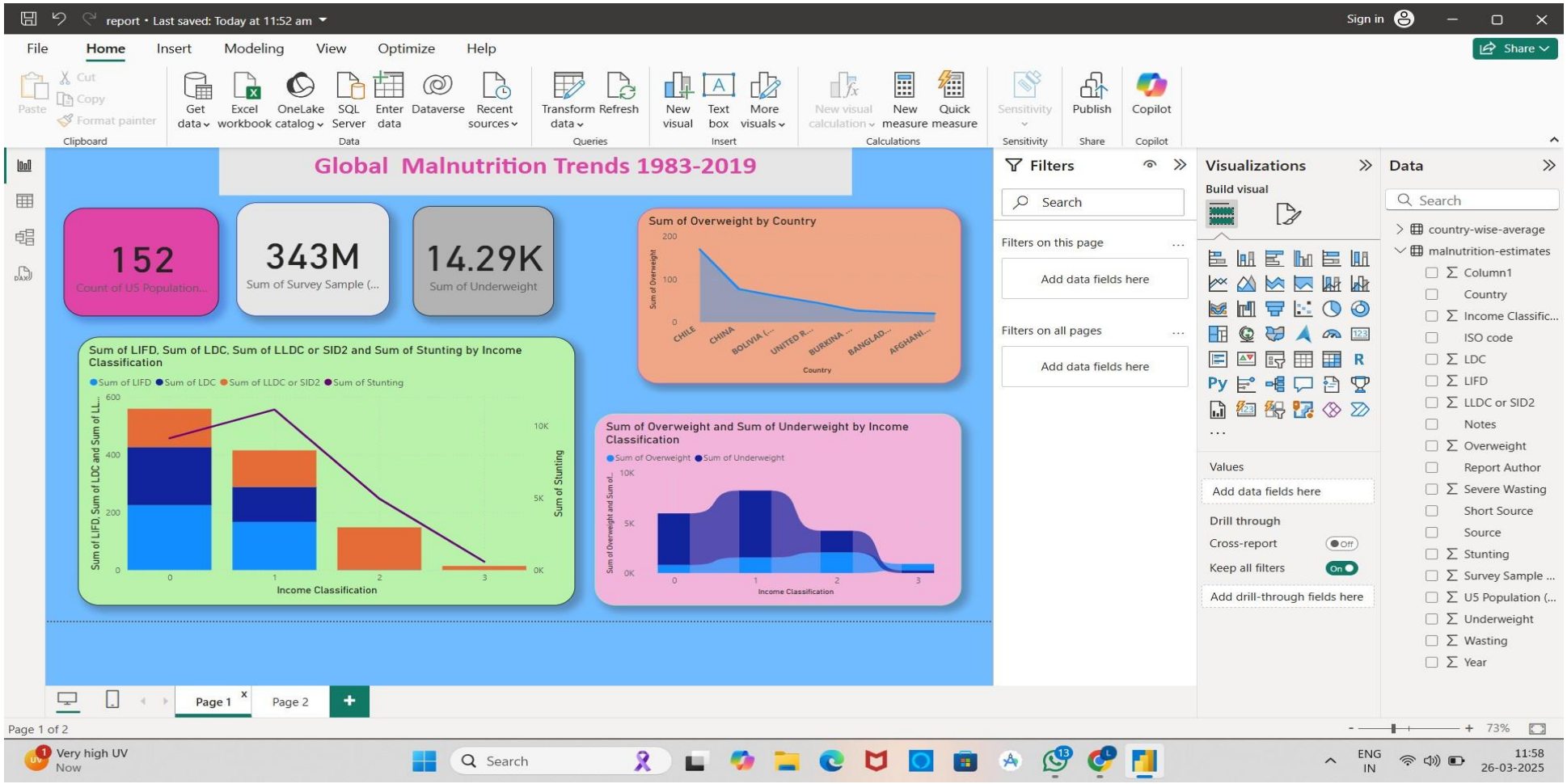
6

S.No	Parameter	Screenshot/Values
1.	Data Rendered	8 column and 152 Rows.

5.	Dashboard design	
6	Report Design	

7. RESULTS

7.1 Dashboard



Title: "Global Malnutrition Trends 1983-2019"

Visual Elements:

Three key metrics displayed in colored boxes:

152 (Count of US Population)

343M (Sum of Survey Sample)

14.29K (Sum of Underweight)

Multiple charts and graphs:

A line graph showing the Sum of Overweight by Country (includes countries like Chile, China, Bolivia, and others).

A bar and line combination chart depicting the Sum of LIFD, LDC, LLDC, SID2, and Sum of Stunting by Income Classification.Another graph illustrating Sum of Overweight and Sum of Underweight by Income Classification.

Filters and Data Fields:

A filter panel on the right allows filtering by different fields such as Country, Income Classification, Overweight, Underweight, Stunting, and more.

A data pane showing available fields like Country-wise average, Malnutrition estimates, Year, and other attributes.

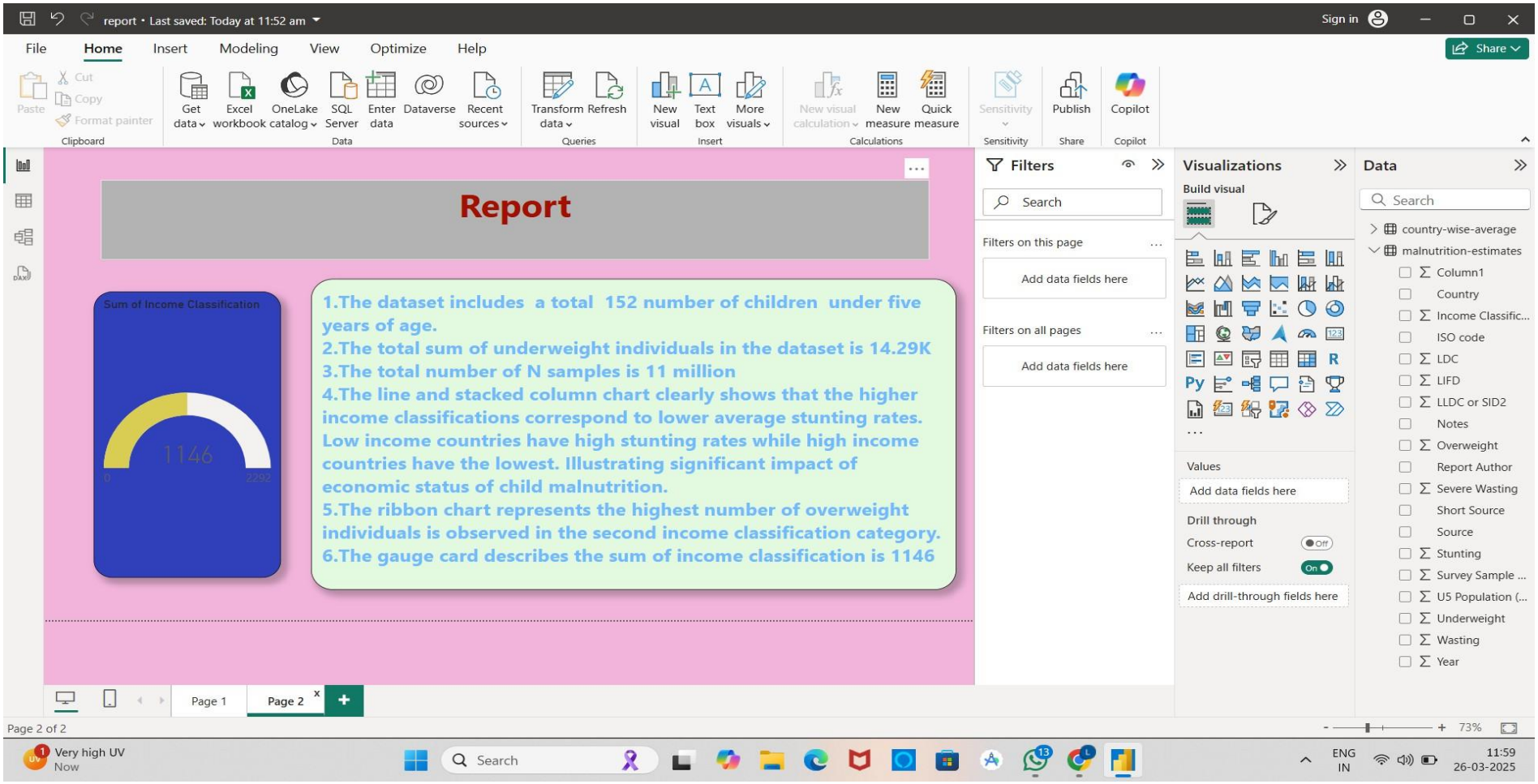
Interface Details:

The Power BI ribbon at the top contains options like Get Data, Transform Data, Visualizations, Filters, and Copilot.

The dashboard has a colorful theme with blue, pink, green, and orange backgrounds for different sections.

The bottom navigation shows Page 1 of 2, indicating multiple pages in the repo

7.2REPORT



Key Statistics:

- The dataset includes **152 children under five years of age**.
- The total **sum of underweight individuals** is **14.29K**.
- The total number of **N samples is 11 million**.

Key Insights:

- A **line and stacked column chart** shows that higher-income classifications correspond to lower average **stunting rates**.
- **Low-income countries** have high **stunting rates**, whereas high-income countries have the lowest—indicating a significant economic impact on **child malnutrition**.
- A **ribbon chart** indicates that the highest number of **overweight individuals** is observed in the **second income classification category**. **Visual Elements:**
- A **gauge chart** (on the left side) displays the **sum of income classification as 1146**.
- A large **text box** summarizes the report's findings in blue text over a green background.

Interface Details:

- The Power BI **ribbon at the top** has options like **Get Data, Transform Data, New Visual, Publish, and Copilot**.
- The **Filters and Data Pane** on the right allow adding and modifying visualizations based on fields such as **Country, Overweight, Underweight, Stunting, and Year**

8.ADVANTAGES&DISADVANTAGES

Advantages:

1.Interactive Data Visualization:

- Power BI provides dynamic charts, graphs, and filters that allow users to explore malnutrition trends across countries and income classifications.

2.Data-Driven Insights:

- The analysis highlights key statistics, such as stunting, underweight, and overweight cases, helping policymakers and health organizations make informed decisions.

3.Comparative Analysis by Income Classification:

- The report shows clear relationships between income levels and malnutrition rates, offering insights into economic disparities in child health.

4.**Real-Time Data Refresh & Updates:**

- If connected to live datasets, Power BI can provide updated insights without manually recreating reports.

5.User-Friendly Interface:

- Power BI's drag-and-drop functionality makes it easy for non-technical users to explore the data.

6.**Customizable & Scalable:** · The dashboard allows users to add filters, change visuals, and scale analysis based on evolving needs.

Disadvantages :

- **Data Accuracy & Completeness Issues:**
- Historical data (1983-2019) may have inconsistencies, missing values, or biases affecting the accuracy of insights.
- **Limited Granularity:**
- Aggregated data may not provide detailed insights at the regional or household level, limiting localized policy recommendations.
- **Complexity for New Users:**
- While Power BI is user-friendly, new users may struggle with advanced features like DAX calculations, relationships, and custom visuals.
- **Performance Issues with Large Datasets:**
- Analyzing millions of records can slow down performance, requiring data optimization techniques.
- **Dependence on Data Sources:**
- The quality of insights depends on the reliability of external data sources, which may have collection biases or outdated information.
- **Limited Offline Accessibility:** · Power BI reports require internet access for cloud-based sharing, making it less convenient for offline users.

9. CONCLUSION:

The Global Malnutrition Trends (1983-2019) Power BI Analysis provides valuable insights into malnutrition patterns across income classifications and countries, highlighting the strong correlation between economic conditions and child health. The

report reveals that low-income countries face higher stunting and underweight rates, while wealthier nations exhibit lower malnutrition levels, emphasizing the need for targeted policy interventions. While Power BI enables dynamic visualization and comparative analysis, challenges such as data accuracy, granularity limitations, and performance constraints must be addressed for more precise insights. Enhancing the study with real-time data integration, regional-level analysis, and predictive modeling can further strengthen its impact. Overall, this project serves as a powerful tool for data-driven decision-making in the fight against global malnutrition.

10. FUTURESCOPE

- **Real-Time Data Integration:**

- Incorporating **live data sources** from organizations like WHO, UNICEF, and FAO can provide up-to-date insights into malnutrition trends.

- **Predictive Analytics & AI Integration:**

- Using **machine learning models** within Power BI can help forecast future malnutrition rates based on economic, demographic, and healthcare trends.

- **Regional & Household-Level Analysis:**

- Enhancing the dataset with **granular-level data** (state, district, or household-level) can provide **more targeted insights** for policymakers.

- **Policy Impact Assessment:**

- Analyzing the **effectiveness of government nutrition programs** and interventions can help refine policies and improve child health outcomes.

- **Geospatial Visualization:**

- Implementing **maps and heatmaps** in Power BI can offer **better geographic insights** into malnutrition hotspots across countries and regions.

  - **Integration with Socioeconomic Indicators:**

- Linking malnutrition trends with **education, poverty, sanitation, and healthcare access data** can provide a **holistic understanding** of underlying causes.

  - **User-Friendly Dashboards for Decision-Makers:**

- Creating **customized, interactive dashboards** for health organizations, NGOs, and policymakers can enhance usability and drive **data-driven decision-making**.