Project Design Phase-II

Solution Requirements (Functional & Non-functional)

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Team ID: LTVIP2025TMID50318

Project Name: Measuring the Pulse of Prosperity: An Index of Economic Freedom Analysis
Maximum Marks: 4 Marks

Functional Requirements

Following are the functional requirements of the proposed Economic Freedom Analysis solution:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Import & Integration	Import Heritage Foundation Economic Freedom data via API
		Validate data completeness and accuracy
		Handle missing values and data inconsistencies
		Store raw data in structured database format
FR-2	Data Processing & Normalization	Normalize indicators to 0-100 scale
		Apply data transformation algorithms
		Implement data quality checks and validation rules
		Generate data processing logs and reports
FR-3	Index Construction	Calculate Economic Freedom Composite Index (EFCI)
		Apply Principal Component Analysis (PCA) weighting
		Generate country rankings based on EFCI scores
		Validate index consistency using Cronbach's alpha
FR-4	Statistical Analysis	Perform correlation analysis with prosperity metrics
		Execute regression analysis (EFCI vs GDP per capita)
		Calculate statistical significance and confidence intervals
		Generate robustness checks and sensitivity analysis
FR-5	Visualization & Reporting	Create interactive dashboards with country rankings
		Generate scatter plots and correlation visualizations
		Produce heat maps for regional analysis
		Export charts in multiple formats (PNG, SVG, PDF)
FR-6	Data Export & Documentation	Export analysis results in CSV, Excel, and JSON formats
		Generate comprehensive methodology documentation
		Create automated report generation functionality
		Provide data dictionary and variable descriptions
FR-7	Search & Filter Capabilities	Search countries by name or ISO code
		Filter data by regions, income levels, or score ranges
		Sort rankings by different criteria
		Apply multiple filter combinations
FR-8	Historical Analysis	Track changes in economic freedom scores over time
		Compare year-over-year performance
		Identify trends and patterns in economic freedom
		Generate time-series visualizations

Non-functional Requirements

Following are the non-functional requirements of the proposed Economic Freedom Analysis solution:

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	The system shall provide an intuitive user interface that allows researchers and policymakers to easily navigate through economic freedom data, visualizations, and analysis results. The interface should be accessible to users with varying technical backgrounds and require minimal training.
NFR-2	Security	The system shall implement secure data handling practices, including encrypted data transmission, secure API connections to Heritage Foundation data sources, and protection against unauthorized data access. All data processing shall maintain data integrity and confidentiality.
NFR-3	Reliability	The system shall maintain 99.5% uptime for data processing and analysis functions. Error handling mechanisms shall be implemented to gracefully manage data inconsistencies, API failures, or computational errors without system crashes.
NFR-4	Performance	The system shall process economic freedom data for 180+ countries within 30 seconds. Index calculations and statistical analysis shall complete within 60 seconds. Dashboard visualizations shall load within 3 seconds for optimal user experience.
NFR-5	Availability	The system shall be available 24/7 with scheduled maintenance windows not exceeding 4 hours per month. Automatic backup systems shall ensure data recovery capabilities within 15 minutes of any system failure.
NFR-6	Scalability	The system architecture shall support expansion to include additional economic indicators, countries, or analytical methods without significant performance degradation. The system shall handle up to 1000 concurrent users and process datasets up to 10GB in size.
NFR-7	Compatibility	The system shall be compatible with major web browsers (Chrome, Firefox, Safari, Edge) and support both desktop and mobile device access. Export functionality shall support standard data formats (CSV, Excel, JSON, PDF).
NFR-8	Maintainability	The system code shall follow established coding standards and include comprehensive documentation. Modular architecture shall allow for easy updates to analytical methods, data sources, or visualization components without affecting other system functions.
NFR-9	Data Accuracy	The system shall maintain 99.9% data accuracy through automated validation checks, error detection algorithms, and regular data quality audits. Any data discrepancies shall be flagged and logged for manual review.
NFR-10	Compliance	The system shall comply with academic research standards for reproducibility, data citation requirements, and statistical analysis best practices. All methodological choices shall be documented and transparent to users.

Quality Attributes

Performance Metrics

- **Data Processing Speed:** < 30 seconds for full dataset processing

- **Query Response Time:** < 2 seconds for search and filter operations

- **Visualization Rendering:** < 3 seconds for complex charts and maps

- **Report Generation:** < 60 seconds for comprehensive analysis reports

Reliability Metrics

- **System Uptime:** 99.5% availability target

- **Data Accuracy:** 99.9% accuracy in calculations and processing

- **Error Recovery:** < 15 minutes for system restoration

- **Backup Frequency:** Daily automated backups with weekly verification

Usability Metrics

- **Learning Curve:** New users should be productive within 30 minutes

- **Navigation Efficiency:** Key functions accessible within 3 clicks

- **Error Prevention:** Clear validation messages and input guidelines

- **Accessibility:** Compliance with WCAG 2.1 Level AA standards

Technical Constraints

Data Constraints

- Primary data source limited to Heritage Foundation Economic Freedom Index

- Analysis covers 180+ countries and territories

- Historical data availability varies by country and indicator

- Data updates dependent on Heritage Foundation release schedule

System Constraints

- Web-based application architecture

- Integration with Tableau Public for dashboard hosting

- GitHub repository for code and documentation storage

- Academic/research environment deployment requirements

Resource Constraints

- Single developer implementation

- Academic project timeline limitations

- Limited computational resources for complex statistical modeling

- Free-tier hosting and visualization platform restrictions