

**American College of Technology (ACT)**

**Department of Computer Science**

Postgraduate project proposal

**Title:**

Ethiopian Stock Market Simulation Platform for Learning, Regulatory Compliance and Market Preparedness

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# Chapter 1: Introduction

## Background of the project

The Ethiopian Capital Market Authority (ECMA) is establishing a formal securities exchange to stimulate economic growth and provide a platform for raising capital. This marks a transformative step in Ethiopia's financial landscape, offering unprecedented opportunities for investors, brokers, and regulators. However, the Ethiopian financial market is still in its infancy, and a significant lack of practical experience among stakeholders threatens the success of this initiative.

The Stock Market Simulation Platform is designed to address this gap by providing an interactive and practical learning environment. This platform mimics the functionality of a real stock exchange, allowing users to simulate trading activities, understand market behavior, and test regulatory policies without real-world financial risks. It empowers participants to gain hands-on experience in securities trading, market analysis, and regulatory compliance.

By fostering understanding and market readiness among investors, brokers, regulators, and the general public, this platform plays a critical role in supporting the successful launch of Ethiopia's stock market.

## Statement of the Problem

Ethiopia's new financial market faces challenges in developing skilled and knowledgeable participants. Due to a lack of practical experience, investors, brokers, and regulators may not be well-prepared to handle real-life situations related to trading, market analysis, and regulatory oversight. The absence of a structured educational tool makes it difficult for stakeholders to understand key market operations and comply with regulatory standards.

There is a need for an interactive simulation tool that provides practical experience in stock market trading, market analysis, and regulatory compliance, following the guidelines set by the ECMA.

## Objectives of the project

### General Objective:

### To develop an interactive, user-friendly stock market simulation platform that prepares Ethiopian traders, companies and regulators for the upcoming Ethiopian stock exchange.

### Specific Objectives:

1. To design a platform where users can register as different roles (e.g., Traders, Listed Company Admin’s) and simulate stock market activities.
2. To build a trading engine that supports various order types (e.g., market orders, limit orders) and handles real-time order matching and execution uses Price-Time Priority Algorithm.
3. To create a regulatory module that allows ECMA to monitor simulated market activities, ensure compliance, and test policy impacts.
4. To integrate a price prediction and analytics model that analyzes stock movements and trading volumes to provide users with insights on market trends and future price behavior.
5. To recommend top-performing stocks to traders based on the prediction model's output, helping them make informed investment decisions.

## Scope of the project

The platform is designed to simulate essential functions of a stock market environment, focusing on features such as trading simulation, order matching, price discovery, regulatory compliance, and data services. It offers role-specific functionality for traders, listed company administrators, and regulators, ensuring a tailored experience for each type of user. While the platform enables simulated trading and learning in a secure environment, it does not handle actual financial transactions or operate as a real trading system. Additionally, the system integrates predictive models to assist users in analyzing stock performance, but these models are not meant for real-world trading decisions in the initial release.

## Limitation of the project

* The platform is designed for learning and simulation and may not cover all the details of a real stock market due to the broad and complex rules in the directives.
* The Risk Management Tools and Educational and Training Features may not be fully developed in the initial version due to time constraints but will be considered for future updates.
* Due to the complexity of compliance and market surveillance, some advanced features related to compliance and regulatory testing may be simplified or excluded in this version of the platform.
* Regular updates will be needed to keep up with changes in ECMA regulations and market dynamics.

## System Development Methodology

### System Development Approach

The development of the Ethiopian Stock Market Simulation Platform follows an agile software development methodology to ensure iterative progress, continuous feedback, and adaptability throughout the development lifecycle. Given the absence of a stock market platform in Ethiopia, the platform draws extensively on guidelines and resources from the Ethiopian Capital Market Authority (ECMA) website, along with global best practices researched from platforms such as Investopedia and other real-world stock market simulations. The methodology is divided into the following key phases:

1. **Requirement Analysis and Design**

**1.1 Requirement Analysis**

* Refer to ECMA directives, manuals, and regulatory frameworks available on their official website to ensure platform compliance with all local regulations.
* Supplement local research by examining global best practices and documentation from platforms like Investopedia to understand the dynamics of stock market operations and adapt them to Ethiopia’s context.

**1.2 Designing**

* Develop the platform’s architecture to include core modules such as the trading engine, user management system, portfolio management, and regulatory compliance.
* Design user-friendly interfaces tailored for different roles: traders, listed company admin user and administrators or regulators.
* Outline the Profit and Dividend Calculation module.

1. **Development**

Develop core modules, including:

* **User Management**:
* Build a comprehensive user management system supporting multiple roles such as traders, listed company administrators, and regulators. Include KYC verification, role-based permissions
* **Trading Engine**:
* Implement a robust trading engine capable of processing stock buy/sell orders, matching transactions.
* Adapt regulatory rules defined by ECMA for trading restrictions, limits, and suspension handling.

1. **Testing and Quality Assurance**

**Testing**:

Conduct comprehensive testing at all levels:

* **Unit Testing**: Test individual components (e.g., trading engine, portfolio updates) for correctness.
* **Integration Testing**: Validate the smooth interaction between modules such as trading, portfolio management.

1. **Deployment and Training**

* The platform is still in the development phase, and deployment has not yet been completed..

### System Development Tools

To efficiently develop the Ethiopian Stock Market Simulation Platform, the following tools and technologies are being utilized:

* **Development Frameworks:**
  + **Backend:** Django, for handling server-side logic, APIs
  + **Frontend:** Angular, for building a responsive, interactive, and user-friendly interface.
* **Programming Languages:**
  + **Python:** For robust and scalable backend development.
  + **TypeScript/JavaScript:** For efficient frontend development with Angular.
* **Database Management:**
  + **PostgreSQL:** For managing structured and reliable data storage.
* **Version Control and Collaboration:**
  + **Git:** For source code versioning and management.
  + **GitHub:** For team collaboration, issue tracking, and code review.
* **Additional Tools:**
  + **Postman:** For API testing and debugging.
  + **VS Code:** As the primary IDE for development.

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## Significance of the Project

This project is crucial for Ethiopia's capital market development as it provides a practical learning tool for future market participants. By simulating real market conditions, the platform will help users gain confidence, understand trading mechanisms, develop regulatory compliance skills, and prepare for the real Ethiopian stock exchange. It will also serve as a useful tool for ECMA to test regulatory policies in a controlled environment.

## Beneficiaries of the Project

The Ethiopian Stock Market Simulation Platform is designed to address the knowledge and skill gaps among participants in Ethiopia's emerging financial market. The beneficiaries of the project include the following:

**Ethiopian Capital Market Authority (ECMA)**

* + Gain a practical tool to test and refine regulatory frameworks in a controlled simulation environment.
  + Monitor and enforce market compliance through the platform's regulatory modules.
  + Train staff on market oversight and surveillance, enhancing their readiness for real-world market operations.

**Investors**

* + Learn the basics of stock trading, portfolio management, and market analysis in a risk-free environment.
  + Gain confidence and practical experience to actively participate in the real Ethiopian stock market.
  + Understand the implications of regulatory policies and market dynamics on investment decisions.

**Brokers**

* + Develop practical skills in managing client accounts, executing trades, and navigating trading platforms.
  + Understand order types, order matching, and clearing processes.
  + Prepare for compliance with ECMA regulations and policies.

**Market Makers**

* + Simulate price stabilization strategies and liquidity provision in the market.
  + Learn to manage risks and ensure smooth market operations during high volatility.

**Exchange Operators**

* + Gain experience in managing the trading engine, clearing and settlement systems, and ensuring market integrity.
  + Test market mechanisms and infrastructure in a simulated environment before the live launch of the Ethiopian stock market.

**Regulators**

* + Learn to detect and address potential market manipulation and other compliance issues.
  + Evaluate the impact of new regulatory policies on market behavior without real-world consequences.

**Students and Academics**

* + Use the platform as a learning tool for understanding stock market mechanisms and regulatory systems.
  + Conduct research on market behavior and develop innovative strategies or policies.

**General Public**

* + Increase awareness and understanding of how a stock market operates, promoting broader participation in the financial market.
  + Build trust and confidence in the upcoming Ethiopian stock exchange by offering transparency and education.

## Feasibility Study

The feasibility study evaluates the Ethiopian Stock Market Simulation Platform to determine its viability in terms of technical, economic, and operational aspects, ensuring the project aligns with stakeholder needs and achieves its goals effectively.

### ****Technical Feasibility****

This section assesses the technical viability of developing and implementing the platform.

* **Platform Design and Development**
  + **Backend**: Django is leveraged for its scalability, reliability, and ability to handle complex server-side logic and APIs.
  + **Frontend**: Angular is chosen for creating a highly responsive and interactive user experience.
  + **Database**: PostgreSQL provides robust, structured data management with support for complex queries and scalability.
* **Technical Expertise**
  + The team includes skilled developers with experience in Python, Django, Angular, PostgreSQL, and RESTful API development.
  + Tools like Git and GitHub enable efficient source code management and seamless collaboration among team members.
* **Scalability and Future Upgrades**
  + The platform's modular architecture ensures adaptability for future enhancements, including advanced analytics, sentiment analysis tools, and risk management modules.

### ****Economic Feasibility****

This aspect evaluates the financial viability of the project, including cost analysis and expected benefits.

* **Cost Analysis**
  + **Development Costs:** Includes salaries for developers, designers, and project managers.
  + **Infrastructure Costs:** Cloud hosting services and database management tools.
  + **Maintenance Costs:** Regular updates and system monitoring.
  + **Training Costs:** User training for ECMA staff, brokers, and investors.
* **Expected Benefits**
  + Reducing the cost of errors in the real market by providing a risk-free training platform.
  + Increasing investor participation and market liquidity through better awareness.
  + Supporting ECMA in refining policies, minimizing regulatory implementation risks.

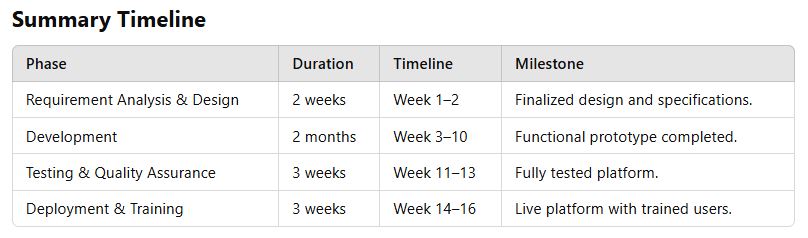
### ****Operational Feasibility****

This aspect evaluates whether the project aligns with the needs of its stakeholders and can be effectively implemented.

* **Stakeholder Alignment**
  + ECMA: The platform provides a testing ground for regulatory policies.
  + Investors and Brokers: Enhances knowledge and confidence, ensuring smooth market participation.
  + Market Makers: Prepares participants for real-life market operations.
* **Ease of Use**
  + The platform’s user-friendly interface ensures accessibility for all participants.
  + Training sessions help stakeholders effectively utilize the system.

## Project schedule

The Ethiopian Stock Market Simulation Platform will be completed in approximately 4 months, divided into four phases with specific milestones and activities.



This schedule ensures timely delivery while allowing for iterative development and stakeholder engagement.

## Project Budget

The total budget for the Ethiopian Stock Market Simulation Platform is set at **200,000 ETB**. Below is a breakdown of the estimated expenses across different cost categories.

**1. Personnel Costs**

* **Developers** (2 @ 20,000 ETB/month for 4 months): 160,000 ETB
* **UI/UX Designer** (1 @ 10,000 ETB/month for 2 months): 20,000 ETB
* **Tester** (1 @ 5,000 ETB/month for 1.5 months): 7,500 ETB

**Subtotal:** 187,500 ETB

**2. Infrastructure Costs**

* **Cloud Hosting Services:** 6,000 ETB
* **Development Tools and Software Licenses:** 2,000 ETB

**Subtotal:** 8,000 ETB

**3. Training and Documentation**

* **Training Sessions for Stakeholders:** 2,500 ETB
* **User Manuals and Documentation:** 1,500 ETB

**Subtotal:** 4,000 ETB

**4. Miscellaneous Expenses**

* **Contingency Funds (unexpected expenses):** 500 ETB

**Subtotal:** 500 ETB

### ****Total Budget: 200,000 ETB****

# Chapter 2: Requirement Analysis

## Current System Description

Since Ethiopia currently lacks a formal stock market or simulation platform, there is no existing system performing the functions required for this project.

### Major function of the current system

There is no operational system in Ethiopia for simulating stock market activities, conducting market analysis, or enforcing regulatory compliance. Educational tools for capital markets are minimal, and practical platforms for stakeholders to gain experience do not exist.

### Problem of Existing System

* **Knowledge Gap**: Stakeholders (investors, brokers, and regulators) lack understanding of stock market operations, trading mechanisms, and compliance requirements.
* **No Practical Training Tools**: There is no safe environment to practice trading, market analysis, or test regulatory policies.
* **Regulatory Challenges**: The absence of a platform limits ECMA's ability to simulate and test regulatory frameworks.
* **Limited Public Awareness**: A lack of accessible tools hinders public awareness and readiness for a functioning stock exchange.

## Requirement Gathering

### Requirement Gathering Methods

* **Observation**: Study similar simulation platforms in other markets for best practices and design inspiration.
* **Document Review**: Analyze ECMA directives, manuals, and resources to ensure compliance.

### Business Rules

* The platform must adhere to ECMA regulatory frameworks.
* Only registered users (investors, brokers, regulators) can access relevant functionalities.
* The trading engine must accurately simulate stock trading mechanisms, including order types and execution processes.
* Market data provided must align with real-world formats for effective analysis.

## Proposed System Description

### Overview

The proposed system is a **Stock Market Simulation Platform** designed to mimic real-world trading activities, regulatory oversight, and market analysis. It will serve as a learning tool for investors, brokers, regulators, and the general public to prepare for Ethiopia's future stock market.

### Functional Requirements

* User Registration and Role Management: Support for various user roles (e.g., Investor, Broker, Regulator).
* Trading Engine: Enable order placement, matching, and execution with multiple order types.
* Portfolio Management: Allow users to manage virtual portfolios and track their performance.
* Regulatory Tools: Provide ECMA with compliance monitoring and rule enforcement capabilities.
* Market Analytics: Offer real-time and historical market data for trend analysis.

### Nonfunctional Requirements

#### Performance

The platform must handle up to 100 concurrent users with minimal latency (< 2 seconds response time).

#### Scalability

The system should support adding new features and scaling up to accommodate more users as market readiness grows.

#### Availability

The platform must be accessible 99.9% of the time to ensure reliability for stakeholders.

#### Reliability

The system must ensure accurate simulations of trading, order matching, and regulatory processes.

#### Maintainability

The platform's codebase must be modular and documented for easy updates and troubleshooting.

#### Security

Implement secure login, role-based access control, and encryption to protect user data and trading activities.

#### Environmental

The system will be hosted on local servers instead of cloud infrastructure. This ensures control over data, reduces hosting costs, and aligns with resource availability while still maintaining low environmental impact through optimized server usage.

#### Usability

The user interface must be intuitive, with clear navigation and accessible features for all user roles.

#### Interoperability

The platform should allow for exporting data and reports in standard formats (e.g., CSV, Excel, or PDF) to support regulatory analysis

# Chapter 3: System Model