MarineEconomyGuard Final Project Summary

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Group #21

MarineEconomyGuard is a resilience platform developed to address the economic instability faced by fishing communities due to declining marine populations. It leverages real-time analytics, predictive modeling, and workforce transition support to help fishing businesses, local governments, and displaced workers adapt effectively to environmental and market changes.

The system's primary functional requirements cover job listing and matching, delivery and usage of training modules, real-time market trend analysis, and a digital product marketplace to facilitate alternative revenue opportunities. Non-functional requirements prioritize system performance (response time under two seconds), reliability (99.9% uptime), scalability (up to 10,000 users within three years), security (GDPR and CCPA compliance), and usability (intuitive UI operable within 10 minutes). Specific acceptance tests were created for each requirement, ensuring traceability and verifiable system performance.

MarineEconomyGuard adopts a robust Client-Server architecture, combining JavaFX for the frontend, Java SE 17 for business logic processing, and PostgreSQL for secure, concurrent data management. External data sources, such as marine population assessments and market pricing feeds, are integrated via RESTful APIs. AWS cloud infrastructure ensures high availability through auto-scaling EC2 instances and S3-based backups, enabling system continuity even during periods of high demand.

User roles include fishing business owners, supply chain managers, individual workers, and local government officials. Each user group interacts with customized workflows: business owners can post job listings and manage training for employees, workers can search and apply for jobs or upskill via dedicated training modules, and governments can monitor economic health through real-time analytics.

A major feature is the Supply Chain Resource Matching Marketplace, allowing businesses to connect buyers and sellers for goods and services, creating new alternative revenue streams. This supports broader economic diversification within coastal communities beyond traditional fishing operations.

MarineEconomyGuard's offline partial functionality is another key strength, maintaining critical operations during network outages to ensure reliability in rural and maritime environments where internet access may be intermittent. Security is deeply embedded through strong encryption, multi-factor authentication, daily integrity checks, and detailed audit logs of all system interactions, preserving data confidentiality and traceability.

The training modules integrated into MarineEconomyGuard allow businesses to rapidly reskill displaced workers, bridging employment gaps efficiently. Progress tracking is automated, providing transparency to employers and motivating workers toward job transitions.

Testing and acceptance covered over 30 detailed scenarios, including job application flows, training progression, supply chain transactions, system load capacity, fault tolerance, and multi-language support. Each requirement was directly validated against operational success criteria.

Project issues such as dependency on real-time data availability and the risk of slow initial adoption were carefully documented. Risk management strategies and contingency plans were developed for each major threat, including cybersecurity breaches and regulatory changes. The total estimated development cost for the platform was approximately $215,000, combining software labor, infrastructure, licenses, and initial support costs.

Future expansions documented in the Waiting Room include AI-driven personalized job recommendations, blockchain integration for supply chain security, additional multilingual capabilities, and a mobile application to extend platform reach. These enhancements are prioritized for phased rollout based on user feedback and market demand.

The project retrospective highlighted major successes in early modular design choices, proactive security planning, and cloud readiness. Areas identified for future improvement included advancing UI prototyping earlier in development and conducting formal risk reviews sooner. Overall, MarineEconomyGuard delivers an innovative, secure, and scalable economic resilience solution poised to make a tangible difference for marine-based economies adapting to environmental change.