University of Phoenix®

Project Plan Draft

Fill out each of the sections below with information relevant to your project. Be sure to include the company name associated with your project.

Company Name: FINTECH LLC

Based on further research on industry trends, top technology vendors, project management, development, deployment approaches and analysis of impact and risks there are "three improvements recommended to this Project Plan" as follows:

1. Mobile Application feature was not originally included in this project plan, but its addition is a first improvement recommendation to this project plan based on the explanation as provided below.

   Explanation: Based on industry trends and history research mobile baking application has become more popular and widely accepted in recent years, it appears to be an important feature of internet banking (digital bank/neobank) for a convenient banking platform, because the majority population have access to smartphones rather than the computers, besides it the most convenient way of connecting and multi-tasking.

2. This project plan did not offer digital currency exchange, but further researching top technology vendors, its recommendation addition gives the bank an edge in future banking, an opportunity to welcome future growth and the investors who choose digital currency exchange in place of fiat currency.

   Explanation: Digital currency, e.g., blockchain/cryptocurrency is considered a future currency exchange. Banks can leverage its services involving digital currencies to compensate for banking fees, transfer funds, and save cryptocurrency in the form of

savings accounts. The digital currencies allow banks to ensure enhanced security. It is not a tangible asset but a purely digital form of funds and can be used more than once because there's no physical transfer involved, similarly, double spending is not possible either. It can streamline financial infrastructure to conduct monetary transactions by minimizing processing times, overhead costs, and resources. It also provides transparency and security because of the involvement of cryptographic technology.

3. Digital Lending/Smart Contracts: Loans were not offered on this platform, but based on industry outlook DeFi smart contracts are considered as recommended addition to this platform in cost-effective lending. This is a third recommended improvement to this plan based on the following explanation.

   Explanation: DeFi (Decentralized Finance) is an emergent financial technology that is based on secure distributed immutable ledgers. It is an alternative approach unlike traditional banks as it is a conceptual marketplace that uses digital assets instead of fiat currency. DeFi assets are held in cold storage for its safety and can only be accessed by secure codes/digital keys or tokens saved elsewhere as is the case with blockchain cryptocurrencies. DeFi allows banks to combine traditional financial services with DeFi. However, DeFi is still at its innovation, it involves complex lending systems, but smart contracts could increase efficiency in the issuance of consumer credits to automate loans with least overhead cost, time and resources.

Network Technology Recommendations

Network Technology Selection Criteria

Selection Criteria Name	**Selection Criteria Description**	**Selection Criteria Value (Weighting in Points)** ***(e.g., 3 – Excellent, 2 – Good, 1 – Acceptable)***

(short name to ID the criteria)	***(Define the criteria for technology to associate with a point value.)***	
Security (SEC) & Compliance	Evaluates the network ability to protect sensitive customer data and financial transactions against unauthorized access, breaches, and cybersecurity threats. Ensure compliance with banking regulations. This criterion assesses how well the network technology can protect against cyber threats e.g., hacking, data breaches, malware. It involves encryption standards, authentication methods and other necessary security protocols. Ensure the technology provides robust security	**3–Excellent**: **Advanced security and compliance with all necessary security standards, end-to-end encryption, MFA, regular security updates, & robust threat detection system.** 2–Good: Adequate security and compliance with most standard requirements. May lack advanced threat detection or regular updates. 1–Acceptable: Basic security meets minimum standards. May have significant gaps in compliance, vulnerabilities, and lack regular updates. For Blockchain/Digital Currencies, Security is paramount due to the nature of financial transactions. Technologies with strong encryption, multi-signature wallets, and secure smart contract implementations score higher. In the case of DeFi high security is required for smart contracts, liquidity pools, and user funds. Penetration testing and regular audits improve the score. The Mobile App requires secure data transmission, user authentication, and secure storage

	measures to protect data, transactions, and user information.	of keys. Apps with these features score higher. Weighting in Points 3 – Excellent, 2 – Good, 1 – Acceptable
Manageability (MGMT)	Ease of deployment, configuration, and ongoing management and maintenance. The ease of network monitoring, maintenance, routine updates, and troubleshooting.	3–Excellent: Easy to manage with comprehensive monitoring and management tools. **2–Good**: **Moderate management and tools**. 1–Acceptable: basic management and limited tools.
Performance (PERF)	Measures the ability of the network technology to handle high data throughput and low latency, crucial for seamless user experience in online banking transactions. Delivers fast response times and efficient data transfer.	3–Excellent: High throughput, low latency under peak loads. **2–Good**: **Moderate throughput & latency adequate for typical operational demands**. 1–Acceptable: Basic throughput & latency suitable for minimal operational requirements

User Experience (UX)	The network's ability to support a smooth and efficient user experience for customers accessing online banking system in managing their accounts.	3–Excellent: An optimal user experience, high satisfaction. **2–Good**: **Ensures a moderate user experience with acceptable satisfaction**. 1–Acceptable: Basic user experience, minimal satisfaction.
Reliability	Measure the network technology ability to maintain consistent performance and uptime. Reliability includes aspects like redundancy, failover mechanisms, historical performance data. The technology must provide consistent performance and availability without failures.	3 – Excellent: Proven high uptime (> 99.99%) with redundant systems and automatic failover mechanisms. 2 – Good: High uptime (>99.9%) with some redundancy but limited automatic failover. 1 – Acceptable: Moderate uptime (>99%) with minimal redundancy and no automatic failover. For Blockchain/Digital Currencies**,** the **t**echnologies with high uptime, redundancy, and fault tolerance score higher. For DeFi, protocols with a history of reliable performance and robust infrastructure is required. For the Mobile App, apps that ensure minimal downtime, regular updates, and reliable performance across devices are highly desired.

		Weighting in Points: 3 – Excellent, 2 – Good, 1 – Acceptable.
Scalability	Evaluates how well network technology can grow with the business. It considers the ease and cost of scaling up or down to meet demands. The ability of the technology to handle growth in users, transactions, and data without performance degradation.	3 – Excellent: Easily scalable with minimal costs and effort, supplies. Supports dynamic scaling. 2 – Good: Scalable but requires significant planning and moderate costs. 1 – Acceptable: Limited scalability, high costs expansion. For Blockchain/Digital Currencies, the solutions incorporating Layer 2 scaling, sharding, or high throughput consensus mechanisms score higher. DeFi: Protocols that handle increasing volumes and users without bottlenecks score higher. Mobile App: Apps designed to handle increasing user loads and transactions efficiently score higher. Weighting in Points: 3 – Excellent, 2 – Good, 1 – Acceptable
Feasibility	Measures the practicality of implementing the network technology costs, integration with existing	3 – Excellent: Highly feasible with low cost, easy integration, minimal resource requirements. 2 – Good: Feasible with moderate cost and resource requirements, some integration challenges.

	system & resource requirements. The practicality of implementing and maintaining the technology within the organization's current capabilities.	1 – Acceptable: Feasible with high cost, significant resource requirement, manor integration challenges. Blockchain/Digital Currencies: Technologies that integrate easily with existing systems and require minimal changes are highly desired. DeFi**:** Protocols with well-documented APIs, SDKs, and support resources are highly prioritized. Mobile App**:** Apps that are easy to develop, maintain, and update within current capabilities score higher in adoption process.
Accessibility	Assessment, how easily users can access the network and services, device compatibility, locations etc.	3 – Excellent: High accessible with support for a wide range of devices, locations, & user need. 2 – Good: Accessible with support for most devices and location but limited support for user needs. 1 – Acceptable: Basic accessibility with support for standard devices and locations, significant limitation in user needs Blockchain/Digital Currencies: User-friendly interfaces, multilingual support, and accessibility features score higher.

		DeFi: Platforms that are easy for users to understand and navigate, with accessible documentation score higher. Mobile App: Apps with intuitive design, accessibility features, and broad device compatibility score higher. Weighting in Points**:** 3 – Excellent, 2 – Good, 1 – Acceptable.
Cost (TCO)	Initial investment of total cost of ownership, operational expenses, licensing, ongoing maintenance, and infrastructure.	**3–Excellent**: **Low overall cost with cost-effective operations**. 2–Good: Moderate cost and manageable expenses. 1–Acceptable: High initial and operational costs

Network Technology Recommendation

Recommended Network Technologies	**Description**	**Benefits**	**Aggregate Selection Criteria Score** ***(Score for this technology based on the selection criteria detailed above.)***
SD-WAN (Software-Defined WAN)	SD-WAN makes use of software in managing and	Integrates encryption and segmentation security features. Cost efficient due to the use of	**3-Excellent**: 3* (Security + Cost + Perform + Scalable

	optimizing multiple types of connections (MPLS, broadband, LTE) for optimal performance, flexibility, and cost.	low-cost broadband connections and traditional WAN links. Flexible to changing business needs. Scales to support additional locations. Enhanced performance & management.	+ Reliable + Easy Integration + Manage + User Exp) = 24 Ven = 2 **15/15**
WAN	Connects multiple LANs over large areas	Extensive coverage centralized data management, high scalability.	**12/15**
WLAN	Wireless communication within local area	Flexible, supports mobility, cost effective.	**12/15**
LAN	Connects devices with a limited area	High-speed, strong security measures, reliability	**13/15**
SAN	High-speed access to consolidated storage.	High performance, centralized storage, scalable.	**13/15**
AWS	Cloud computing services	Flexible, robust security, global availability.	**14/15**
Microsoft Azure	Cloud computing services	Integration with Microsoft, high security, flexible.	**14/15**

Cloud Networks (PaaS)	Hosting infrastructure, applications, and services on public cloud platforms, for example, AWS, Azure. PaaS solutions like Google Firebase or AWS Amplify provide backend services for mobile app development, including databases, authentication, and hosting.	Offers flexibility, scalability, global access, enhanced collaboration, disaster recovery, least overhead, and cost effectiveness. The recommended network technologies provide robust, scalable, and secure solutions for implementing digital currencies, DeFi lending platforms, and mobile apps AWS and Azure are excellent choices across all criteria for digital currencies, DeFi lending, and mobile app development due to their robust, secure, scalable, and high-quality services. The slight variation in cost-effectiveness can be taken into consideration based on specific budget constraints and value assessments.	**3–Excellent**: (Performance + cost + manageability + user exp) = 12 **2–Good**: Security. **Score**: (12+2) = 14/15 Aggregate Score: 14/15

Zscaler Zero Trust Network Access (ZTNA)	ZTNA framework by defaults trusts no one inside or outside the network. Provides secure remote access by verifying every user and device before access is granted to resources.	Enhanced security, strong authentication, and continuous monitoring reduces the risk of data breaches. Simplified and scalable remote access without relying on VPNs Offers reduces attack surface. Cloud native by easy integration and supports secure cloud direct connect. Offers highest aggregated score due to superior security model, scalability, and secure cloud direct connect well suited for digital banking model requiring robust security and flexible access control.	**3–Excellent**: 3*(Security + performance + user exp + scalable + manage) = (3*5) = 15 **2–Good**: Cost = 2 **Score**: 15/15
Virtual Private Network (VPN)	Creates and extends a secure tunnel over a public network enabling secure transmission of data	Enhanced security ensures user data and sensitive financial information remains encrypted from cyber threats.	**3–Excellent**: 3* (Security + cost) = 6 **2–Good**: 2* (Performance +

	between users and the servers. Encrypts data passing through public internet connections and secures sensitive data from cyber security threats.	Hides user IP address, enhances user's privacy for online banking operations. Compatible with various devices and platforms to facilitate accessibility. Although secure but the underlying public internet is less secure.	user exp + manage) = 6 **Score**: 12/15

Network Technology Vendor Selection Criteria (*Third-party technology provider*)

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)
Security & Compliance	The vendor's ability to implement security measures of financial and data encryption, comply with relevant financial and data regulations specific to banking industry. Blockchain, cryptocurrencies, and smart contracts are targets for cyber-attacks. Ensuring robust security measures to protect against hacking, fraud, and other malicious activities is critical, can be challenging and time intensive.	25 Points
Performance	The vendor's ability to deliver fast, efficient operations, high performance under varying loads, and	15 Points

Integration Capabilities & Manageability	The ease of vendor's technology integration with the bank and the third-party applications. The ease of administering robust tools for manageability and maintainability of the banking platform to reduce the time and costs involved in operations.	10 Points
User Experience &	Vendor's ability to offer quality of user experience, user interface, design, ease of use, overall user satisfaction,	10 Points
Product Quality	Evaluation of the overall quality of the products and services provided by the third-party technology vendor.	10 Points
Scalability	Support the growth of the bank in user volume and feature expansion.	10 Points
Support	expertise in customer support, response time, and support channels.	10 Points
Cost (TCO) & Vendor Reputation	The overall cost of service, setup fees, subscription, license fees, or additional costs for maintenance and upgrades. Vendor's reputation base on customer reviews, testimonials, and case studies.	10 Points

Network Technology Recommended Vendors

Vendor Name	Vendor Strengths	Vendor Weaknesses	Products/Services Provided to Project	Aggregate Selection Criteria Score
Cisco	Extensive experience, reliability performance, strong security measures, excellent scalability,	Higher costs, complex licensing models, enterprise focus can be	Routers, switches, firewalls, Network management tools.	95 Points

	comprehensive support and training resources	overwhelming for small businesses.	Reliable and scalable network infrastructure. Robust security solutions	
Huawei	Competitive pricing, broad networking product range, strong performance, and rapid innovation cycle help to keep the internet bank at the forefront of technology. Reliable in uptime and network security. Huawei and Cisco offer competitive solutions for digital currencies, DeFi lending, and mobile apps.	Geopolitical issues can affect their adoption. Compliance with Western regulations can be challenging but can be modified. Cisco generally scores higher due to its superior cybersecurity, reliability, and support and maintenance services.	Cost-effective network infrastructure with a broad product range to meet diverse needs. Routers, switches, wireless solutions, network security. Huawei offers better cost-effectiveness but has lower scores in other areas compared to Cisco.	90 Points

Network Technology Deployment Challenges

Deployment Challenge	Deployment Challenge Description

(short name to ID the challenge)	***(What obstacles can potentially complicate or delay deployment of technology, and affect the project timeline?)***
Security & Compliance (Sec)	Ensure deployment meets stringent security standards and regulatory requirements i.e., data encryption, secure access controls, any laps in data protection laws (GDPR), financial regulations (FDIC Act), and cybersecurity standards (e.g., ISO 27001) expose the bank to significant financial risks and potential legal issues. Obstacles delay in obtaining necessary certifications, complexity in implementing and testing robust security measures, potential vulnerabilities that need patching or mitigation. Blockchain, cryptocurrencies, and smart contracts are targets for cyber-attacks. Ensuring robust security measures to protect against hacking, and other malicious activities. It can be challenging, resource and time intensive.
Usability	Making sure the network technology is user-friendly and meets the needs of the customers and staff. Poor user interface leads to customer dissatisfaction, difficulty in training staff to use the new system effectively, and resistance to changing employees accustomed to existing systems. Ensuring the mobile app works seamlessly across different operating systems (iOS, Android) and devices can be complex. Addressing compatibility issues can delay deployment.
Poor Network Performance	Ensure the network technology performs reliably and efficiently under various conditions and loads. Inadequate bandwidth leads to slow response times, network congestion & bottlenecks, challenges in load balancing & optimizing network traffic.

Installation & Configuration Management	Efficient installing and configuring network components to ensure they function correctly and optimally. Complexity of installation process require specialized expertise. Incompatibility issues with existing infrastructure, manual configurations and troubleshooting is time consuming.
Integration	Seamless integrating new network technology with existing systems and software. There will be compatibility issues with legacy systems, data migration challenges, potential loss or corruption, need for extensive custom development and testing.
Connectivity	Ensure consistent and reliable network connectivity both internally and externally. Physical infrastructure limitations e.g., inadequate cabling or outdated hardware, dependence on third-party provider for internet and network services. Potential disruption due to maintenance or outages.
Scalability	Ensure the network technology can scare to accommodate growth in users, data, and transactions. Challenges may cause difficulty in predicting future growth accurately, limitations in current network architecture, high costs associated with scaling infrastructure.
Accessibility	Ensure the network technology is accessible to all users. Obstacle to ensure compliance with accessibility standards e.g., WCAG, potential need for significant redesign of interfaces and user flows, testing for accessibility across various devices and platforms.
Resiliency	Ensure the network technology can recover quickly from failures and maintain service continuity. Obstacles in designing and implementing robust disaster

	recovery plans, potential gaps in coverage or single point of failure. Ensure redundancy and failover mechanisms are in place and tested.
Cost	Managing the overall costs associated with deploying and maintaining the network technology. Challenges are high initial investment in new technology, infrastructure, ongoing maintenance, operation costs, and budget overruns due to unforeseen issues or delays.
Interoperability	Ensuring seamless interaction between different blockchain networks and existing financial systems can be complex. Lack of standardized protocols can hinder interoperability, complicating the integration process for Blockchain, DeFi lending smart contracts, and Mobile app is dependent upon limited platform options.
Complexity of Implementation	Deploying advanced network technology can be complex, requiring specialized skills and detailed planning. Any miscalculation in planning or execution can significantly lead to delays, technical issues or increased costs. Any lack in communication and collaboration may become a big challenge. This challenge can be properly addressed mutually by persistent collaborations between the stakeholders and the team members.

Technology Adoption Methods

Method Name ***(short name to ID the method)***	**Method Description** ***(Summarize the process for adopting the technology.)***

Agile Adoption	Use of Agile methodologies to adopt technology in iterative fashions for continuous adjustment and feedback to focus on flexibility, responsiveness, and user interaction. Plan adoption in small, manageable increments or iterations. Implement, test, and gather feedback for each iteration. Apply adjustments or refinement based on evolving requirements or feedback. This flexible approach brings adaptiveness to continuous improvement and user engagement.
Sandbox Environment	Creation of non-production environment to test the new technology permits thorough testing without affecting live operations. Setup of sandbox environment replicates the production environment to conduct extensive testing on security, performance, and integration processes. This approach refines the deployment plan and addresses issues or bugs in the newly developed system before it goes live. This safe testing ground reduces risks, improves readiness, and allows users to explore features and provide feedback.

Cost/Benefit Considerations

Benefits	Costs	Considerations
Implementation of robust security measures reduces the risk of data breaches, fraud, or cybersecurity vulnerabilities.	Costs include ongoing maintenance, support, updates, security patches and employee awareness to identify security threats.	Keeping in consideration the tools and technology to reduce risks and potential costs associated with security breaches, software updates, non-compliance

		fees or evolving cyberthreats and vulnerabilities.
Simplifying IT infrastructure to streamline automation operations, reduces manual tasks, manage overhead costs, increase in ROI, and improves productivity.	TCO includes Initial investment, operational expenses, training, integration or potential disruptions. Managing these costs effectively to maintain financial stability ensures successful technology adoption.	Consider a balance between the benefits against the costs by evaluating long-term value, total cost of ownership, and its impact on business operations, Effective planning, researching market, vendor selection, and clear collaborations are pivotal in maximizing the return on investment and achieving project goal.
Blockchain costs high for initial development and deployment associated with setting up blockchain infrastructure, including hardware, software, and developer expertise. Ongoing costs for network	Immutable ledger provides clear and verifiable transaction history. High security due to cryptographic principles and decentralization. Streamlines processes by removing	Ensure the chosen blockchain technology can handle the expected transaction volume. Ability to integrate with existing systems and other blockchain networks.

maintenance, updates, and security. Energy Consumption: High energy costs, particularly for Proof of Work (PoW) consensus mechanisms. Costs for training staff to understand and work with blockchain technology.	intermediaries and automating transactions. Enhanced trust through consensus mechanisms and decentralized control.	Adherence to local and international regulations. Consider more energy-efficient consensus mechanisms like Proof of Stake (PoS).
High costs for developing smart contracts and DeFi protocols. High costs for auditing smart contracts to ensure they are free of vulnerabilities. Potential costs related to meeting regulatory requirements. Costs for providing liquidity incentives and rewards to users.	Provides financial services to unbanked or underbanked populations. Reduces transaction times and costs by eliminating intermediaries. Open-source nature allows for transparent operations and auditing. Encourages financial innovation through new financial products and services	Ensure robust security measures to protect against smart contract vulnerabilities Strategies to increase user adoption DeFi platforms. Ensuring sufficient liquidity to support transactions and services. Navigating the evolving regulatory landscape for DeFi.
Costs for designing, developing, and testing the mobile app. Ongoing costs for	Provides a convenient and user-friendly way for customers to interact with services. Enhances	Provides a convenient and user-friendly platform to interact with services.

updates, bug fixes, and new features. Expenses for marketing and user acquisition. Costs related to ensuring compliance with data protection and privacy laws.	accessibility by allowing users to access services anytime, anywhere. Collects valuable user data that can be used to improve services and personalize user experiences. Increases brand loyalty through a well-designed and functional app.	Enhances accessibility. Collects valuable user data that can be used to improve services and personalize user experiences. Increase of brand loyalty through a well-designed app. Convenient connectivity.

Database System Recommendation

Database System Selection Criteria

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)
Performance & Flexibility	Measuring efficiency of the database handling read and write operations. Its ability to support transaction-heavy environments. Ensure data is consistently available, quickly restore if corrupted. The database can handle faults without losing data or downtime. Seamless API, third-party, and platform integration. Supports structured/unstructured data types, adapt to requirements, extensive documents, user friendly, and a cost-effective model.	15/20
Security & Compliance	Provides robust mechanisms to encrypt data at rest and in transit from unauthorized access, cyberthreats and security breaches. Must be able to manage encryption, granular access controls, auditing	20/20

	capabilities, and support compliance with regulations e.g., GDPR, HIPAA, PCI DSS.	
Data Privacy	Ensure the database system can safeguard personal and sensitive information, prevent unauthorized access, and data breaches. Implement data masking, anonymization, role-based access controls, data minimization.	15/20
Configuration	The ease and flexibility of the database system can be configured to meet the specific needs of the bank. Setup complexity, support for custom configurations, user-friendliness of configuration tools.	10/20
Reliability	The ability of the database system to consistently perform well and remain operational without failures. Consider uptime guarantees, disaster recovery options, fault tolerance and failover mechanisms, backup and restore capabilities.	15/20
Scalability	The ability of the database system to handle increasing amounts of data and concurrent user transactions as the bank grows. Consider horizontal and vertical scaling options, performance under load support for distributed databases.	15/20
Integration	The ease of database system to integrate with other systems and applications used by the bank. Consider compatibility with existing software, availability of APIs and connectors, support for data import/export.	10/20

Customization	The ability of the DBS to fit the specific requirement and workflows of the bank. Consicer flexibility in schema design, support for custom functions and procedures, adaptability to specific use cases.	10/20

Database System Recommendation

Recommended Database System	Description	Benefits	Aggregate Selection Criteria Score
MariaDB	Open source, structured, semi structured RDBS, SQL compliance, advanced features, retrieve and store JSON reports in strings, (JSON_QUERY, JSON_EXISTS). Supports invisible columns in database views	Supports performance, scalability, cost effective, and security-SSL/TLS, encryption data-at rest/in-transit, granular access control mechanism, authentication, and authorization. Excels large volume of unstructured data with flexible schema designs, point-in-time recovery. Binary log and temporary table encryption. Invisible columns are not listed on user platform when performing SELECT/INSERT statements. Thread pooling in its thread pool plugin to offer management of 200K connections at once. Transaction safe storage engines. Supports Galera Cluster 4.0 on 80 and 443 ports, and ACID	Secure 15/15. Scalable 10/10, Reliable 10/10, Backup 10/10, Cost 10/10, Integration 10/10, Manage 9/10, Flexible 8/10, Perform-8/10, Community Support 5/5 Total Score: 95/100

		transactions. multiple mission critical subscription support (MariaDB, n.d.).	
OrientDB	Unstructured, OODB,	Incremental backups, unmatched security, 24x7 support, query profiler, distributed clustering configuration, metrics recording, live monitor with configurable alerts, scalable, low TCO (OrienctDB, n.d.).	95/100
CouchDB	Distributed NoSQL with a document and a key-value store,	JSON document storage, powerful query through N1QL which extends SQL to JSON. Flexible, high performance. Manage customer profiles and transaction data with flexible structures. Real-time analysis of user behavior and preferences for targeted services.	93/100
MongoDB and PostgeSQL	Viable options with balanced scores across criteria for the blockchain and smart contracts.	Availability of support services, documentation, and a strong community of developers for troubleshooting and knowledge sharing. Amazon Aurora stands out for its high scores in scalability, security, reliability, and support.	93/100
Firebase Google	Choose the database system based on	Firebase offers strong performance, scalability, security, and integration	95/100

	specific project requirements, and ease of integration with existing infrastructure and technologies.	capabilities, balancing performance, scalability, security, cost, etc.	

Database System Vendor Selection Criteria

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)
Security & Compliance	How well the vendor abides security standards and regulations. Vendors capable of providing cyber security and compliance with industry regulations (GDPR, HIPAA, PCI, DSS). Implement encryption methods, access controls, audit trails, regular security updates, certifications and adherence to compliance standards. Ensure vendor is experienced in robust security measures to protect against blockchain and smart contract vulnerabilities, cyber crimes, or frauds, and adhere to local and international regulation standards.	20/20
Tech. Support	Vendor's availability, responsiveness, and quality of tech support services around the clock 24/7. Consider expertise of support staff, response time, availability of dedicated account managers, and quality of support documentation and resources. Consider vendor offers energy efficient mechanism like Proof of Stake (PoS).	16/20

	Ensuring the mobile app works seamlessly across different operating systems (iOS, Android) and devices can be complex. Addressing compatibility issues can delay deployment.	
Hosted Solution/On-Prem	The flexibility of the vendor to offer both cloud-hosted and on-premises deployment options. Availability of both deployment options ease of migration between options, security measures for each option and TCO for each option.	15/20
Scalability	Ability of vendor's database system to scale efficiently as the bank grows. Support for horizontal and vertical scaling, performance under high loads, distributed database capabilities and scalability limits.	15/20
Flexibility	Ability of the vendor's database system to meet the evolving need of the bank, customizability of the database, support for various data models, flexibility in schema design, and support multiple programming languages and frameworks.	10/20
Accuracy	The reliability of precision of the database system in managing and retrieving data without errors.	10/20
Cost	The overall cost of implementing and maintaining the vendor's DBS. Initial licensing fees, subscription costs, maintenance, and support fees, costs for scaling and TCO. Choosing the right DBS capable of handling blockchain and smart contracts. Initial development and deployment associated cost in setting up	15/20

	blockchain, DeFi, and mobile app. DBS Cost effectiveness involved in employing blockchain, developing smart contracts, DeFi protocols, and mobile app launch and integration with frontend and backend services. Cost involved for mobile app, blockchain, DeFi maintenance, marketing, and technologies integration into existing DBS.	

Database System Recommended Vendors

Vendor Name	Vendor Strengths	Vendor Weaknesses	Products/Services Provided to Project	Aggregate Selection Criteria Score
MariaDB	Fork of MySQL, enhanced features, secure & performance, relational. semi structured (JSON), columnar storage. Open-source, flexible, enterprise level support, scalable, 24/7 tech support.	Requires careful schema design for optimal performance, aggregation queries can be resource intensive, fewer advanced features than commercial databases, may require manual scaling efforts for	MariaDB Server: For structured and semi-structured data. MariaDB ColumnStore: For analytics and columnar storage. MariaDB Xpand: Distributed SQL for high scalability. SkySQL for cloud database services.	95/100

		very large deployments.	MariaDB JSON: Native JSON support for semi-structured data supports customer interactions data, chat, logs, support ticket metadata	
OrientDB	Multi-model database support graph, document, object-oriented data, flexible, scalable architecture with SQL-like querying. Native support for dynamic schema or complex relationships. Open source with commercial support options.	Can be complex to manage compared to single-model databases. Performance tuning can be challenging for mixed workloads. Smaller community and ecosystem.	OrientDB: Multi-model database for graph data, semi-structured, object-oriented. RESTful API access and SQL-like query, ACID transaction. OrientDB Studio: Web interface for management and visualization. OrientDB Enterprise Edition: Advanced features and commercial support.	95/100

CouchDB	Document oriented NoSQL with easy data synchronization across devices, robust features, web-based heavy, RESTful HTTP API and document model align well with web development paradigms. Data access and manipulation by standard HTTP methods (GET, POST, PUT, DELETE). Designed for offline-first and distributed applications. Minimal config and simple instalment, Active community, flexible licensing. Designed for less experienced team, easily deployable & managed.	Requires familiarity with JSON and web technologies. Limited querying, not optimal for high-volume transactional workloads. Complex deployment requires tuning. Smaller ecosystem and support.	CouchDB: Main database for semi structured JSON data. PouchDB: JavaScript library for local storage and sync. Fauxton: Web-based interface to manage. CouchDB Replication: Synchronization between its instances. Simple installation minimal config to get started.	93/100

AWS	Both platforms are excellent choices across all criteria for digital currencies, DeFi lending, and mobile app development due to their robust, secure, scalable, and high-quality services.	The slight variation in cost-effectiveness can be taken into consideration based on specific budget constraints and value assessments	Amazon Aurora, Amazon RDS, AWS Key Management Service (KMS) for security.	93/100
MongoDB	High scalability, flexible schema design, strong community support.	Potential performance issues with complex transactions, requires optimization for high security.	MongoDB Atlas (cloud database service), MongoDB Enterprise Advanced.	94/100
Google Firebase	Seamless integration with mobile platforms, real-time database capabilities, strong support for analytics and user engagement.	Limited to Google Cloud ecosystem, can be costly at scale.	Firebase Realtime Database, Firestore, Firebase Authentication.	93/100

Database System Deployment Challenges

Deployment Challenge	Deployment Challenge Description

Security and Compliance	Implement robust security measures and security protocols to protect sensitive financial data from unauthorized access and breaches. Implement intrusion detection systems, encryption, and firewalls to safeguard the system from cyberattacks. Ensuring compliance with regulations such as GDPR, PCI DSS, and other industry standards. DeFi platforms rely heavily on smart contracts, which can have vulnerabilities. Ensuring that these contracts are secure and free from bugs. This can be complex and time-consuming. The regulatory landscape for blockchain and DeFi is still evolving. Uncertainty around regulations can pose risks and cause delays in deployment.
Cost Management	Manag the costs associated with deploying and operating the database system, including licensing, hardware, cloud services, and operational expenses. This is particularly challenging in cloud environments with variable pricing models. Implementation of software and hardware system redundancy and failover mechanisms may accumulate extra expenses.
Data Consistency and Integrity	Ensuring the database maintains consistency and accuracy of data across all transactions and the distributed systems where data replication and synchronization can be complex or challenging.
Transaction Management and Data Availability	Ensuring robust transactions processing capabilities e.g., ACID for data reliability. Designing the database system to remain operational and accessible even during hardware failures, software bugs, or network issues. This requires setting up redundant systems, failover mechanisms, load balancing, continuous monitoring, regular testing, robust security measures, and disaster recovery planning in the

	event of unexpected disruptions to prevent data loss, mitigating financial losses, minimize downtime, ensuring customers conduct their financial transactions without interruptions (Veengu, n.d.). Seamless interaction of smart contracts between different blockchain networks and existing financial systems can be complex, ensuring designing robust DBS transactions processing abilities and data reliability that is operational and accessible during any failover events of hardware, software, or networks. Ensuring designing robust DBS transactions processing abilities and data reliability of mobile app that is operational and accessible during any failover events such as hardware, software, or network issues.
Cybersecurity	Protecting database systems for blockchain, DeFi lending smart contracts from cyber threats and ensuring sensitive data is secure from unauthorized access, breaches, and other malicious activities. Challenges vulnerability management, access controls, data encryption, compliance requirements, and incident response system.
Performance	Maintaining high performance under heavy load and ensuring low latency for queries and transactions involving optimizing database design, indexing, and query execution plans. Designing of multi-zone system to shift traffic smoothly to a different zone if something goes wrong in one area to maintain maximum uptime.
Resource Utilization	Efficiency managing and allocating system resources CPU, memory, storage to ensure optimal database performance and cost-effectiveness. Challenges in

	capacity planning in accurately predicting future resource needs based on anticipated growth and usage patterns, performance tuning in continuously optimizing database performance avoiding bottlenecks to ensure efficient resource use, scalability to adjust resource allocation dynamically to handle varying workloads, peak usage periods, cost management to balance resource use avoiding over provisioning, and under provisioning that leads to performance issues.
Data Migration	Moving data from existing systems to the new database system while ensuring data integrity, minimal downtime, seamless transition. There may be challenges in data integrity-data accurately transferred without loss or corruption, downtime minimization-during migration process to avoid business disruption, compatibility issues-between old/new systems or differences in data formats/schemas, migration tools/processes-in developing robust processes to manage migration. Testing/validation to ensure the migrated data functions correctly in the new system.
High Availability	Ensure the DBS is highly available, can recover quickly from failures to maintain continuous service. Challenges such as: redundancy and failover in continuous availability, disaster recovery planning develop and test plans to address different types of failures of hardware, software, network. Load balancing to distribute workload across multiple servers to prevent any single point of failure and to ensure optimal performance. Monitoring and alerting the system continuously to detect response to potential issues before they lead to downtime. Maintenance windows in planning and executing without impacting system availability.

Technology Adoption Methods

Method Name	Method Description
Agile Adoption Framework	Agile principles facilitate technology adoption. This method puts emphasis on iterative development, flexibility in adapting to changes in the adoption process, and customer feedback.
Digital Transformation Frameworks	This comprehensive method is designed to guide organizations in the transition to digital technologies through strategic planning, operational frameworks, Seamless interaction of smart contracts between different blockchain networks and existing financial systems, ensuring designing robust smart contracts transactions processing abilities and data reliability that is operational and accessible and cultural influences necessary for successful technology adoption.

Cost/Benefit Considerations

Benefits	Costs	Considerations
Implementation of security, fraud prevention, and compliance prevents customers personal data and financial loss, builds customer's trust and credibility for the business.	Costs associated with its implementation and maintenance.	Analysis of costs associated with data security and regulatory compliance takes into consideration the batter ways to enable improved technology and analytics to make cost effective data-driven business decisions. Assessment of how technology can bolster

		security measures in reducing risks of breaches, frauds, cyberthreats, and cybercrimes.
Automating business processes with cutting-edge advanced technology tools can reduce errors, response time, miscalculations, overburdening or lagging the financial system. This will enhance customer satisfaction which in turn increases business revenue with improved bank products, services, and reputation.	Costs associated with automation and modern system processes	Evaluation of how automation can reduce human errors in manual interventions. Consideration of how technology can enhance system productivity and workflow with advanced technology tools. Assess how technology is readily adaptable and innovative in the long run. Consider how tech can foster collaboration within the organization and the customers. Analyze how the adoption of cutting-edge tech can enhance bank's brand, image, and reputation.

Immutable ledger providing clear and verifiable transaction history. High security due to cryptographic principles and decentralization. Streamlines processes by removing intermediaries and automating transactions. Immutable records reduce the risk of fraud. Reduced transaction times/ costs by eliminating intermediaries. Open-source nature allows transparency operations and auditing. Encourages financial innovation through new financial products and services. Potential for high liquidity due to global participation.	High costs for setting up blockchain infrastructure, hardware, software, and developer expertise. Ongoing costs for network maintenance, updates, and security. High energy costs, especially for Proof of Work (PoW) consensus mechanisms. Costs for training staff to understand and work with blockchain technology. Potential costs for adhering to various regulatory requirements.	Ensuring the chosen blockchain technology can handle the expected transaction volume. Ability to integrate with existing systems and other blockchain networks. Adherence to local and international regulations. Consider more energy-efficient consensus mechanisms like Proof of Stake (PoS). Managing data privacy concerns within a transparent system.
transaction times and costs by eliminating intermediaries. Open-source nature allows for transparent operations and	Costs for developing smart contracts and DeFi protocols. High costs for auditing smart contracts. Potential costs to	Ensuring robust security measures against smart contract vulnerabilities. Strategies to increase user adoption and trust

auditing. Encourages financial innovation through new financial products and services. Potential for high liquidity due to global participation.	meet regulatory requirement. Potential costs for insuring against smart contract failures.	in DeFi platforms. Ensure sufficient liquidity to support transactions and services. Navigating the evolving regulatory DeFi landscape.
Provides a convenient and user-friendly platform to connect with services. Enhances accessibility through mobile devices Collects valuable user data that can be used to improve services and personalize user experiences. Increases brand loyalty through a well-designed app. Facilitates communication with users through push notifications and in-app messaging.	Costs for designing, developing, and testing the mobile app. Ongoing costs for updates, bug fixes, and new features. Expenses for marketing and user acquisition. Costs related to ensuring compliance with data protection and privacy laws. Costs for providing user support and handling feedback.	Ensuring a seamless and intuitive user experience. Ensure app works across most devices and operating systems. Protecting user data and ensure app security. Ensure the app can handle increasing user numbers and data loads. Ensure seamless integration with backend services and third-party APIs.

Software Application Recommendations

Software Application Selection Criteria

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)

Security, Compliance &	Banking data applications must adhere to the highest security standards and comply with regulatory requirements	20/20
Performance & User Experience	The ability of the software to tailor to load demands without compromising performance and fluctuate with the volume increase or decrease, maintain flexibility, performance, integrates smoothly with system applications and third-party applications in providing smooth user experience. Applications should offer an intuitive user experience and be accessible to all users for customer satisfaction.	10
Cybersecurity	The ability of the application to protect blockchain, DeFi smart contracts, mobile app data and maintain security against cyberthreats, unauthorized access data breaches, and other vulnerabilities. Consider encryption, access controls, regular security updates, adherence to regulatory standards, incident response capabilities.	20
Functional Requirements	The degree to which software application meets the specific functional needs and requirements of the bank. Consider core banking features, support for financial transactions, reporting capabilities, compliance with banking regulations, customization, etc.	20
Usability	The ease of use and user-friendliness of the software application for both customers and bank employees. Consider user interface	15

	design, navigation ease, intuitiveness, user training & support, feedback system.	
Integration with Other System	Ability of software to integrate seamlessly with other existing systems and software. Consider availability of APIs, compatibility with existing systems, data import/export features, third-party integration support.	15
Accessibility	The software application is accessible to all users and those with disabilities. Consider compliance accessibility standards WCAG, support for assistive technologies, adaptable interface designs.	10
Scalability	The application scales effectively as the bank grows, accommodating increased numbers of users, transactions and data. Consider performance under load, support for horizontal and vertical scaling, flexibility to add new features, infrastructure requirements	10
Cost	The total cost of ownership of the software application includes initial acquisition, implementation, ongoing maintenance, and support costs. Licensing fees, subscription costs, implementation costs, training expanses, support and maintenance fees, cost effectiveness compared to alternatives.	10
TCO/ROI	. Evaluation of total cost of ownership and expected return on investment are equally important to make economically viable business sustenance decisions.	10

Software Application Recommendation

Recommended Software Application	Description	Benefits	Aggregate Selection Criteria Score
Payment Gateway: Stripe, PayPal, Adyen	Stripe: A versatile and powerful payment processing platform supports a range of online processing transaction made at the platform.	High security standards and compliance with payment regulations (PCI DSS). Scalable, high performance, integration capabilities for seamless digital banking platform. Smooth user experience for customers and developers. Flexibility and highly customizable interfaces, leading provider in the industry. Excellent developer support, regular updates, streamlined payment processing, cost-effective with strong ROI.	Sec & Compliance: 25/25 Scalable & Performance: 19/20 Integration Capabilities: 14/15 User experience & Access: 9/10 Flexibility & customization: 4/5 Support & maintenance: 8/10 Vendor Reputation & Stability: 3/5 TCO & ROI: 9/10 Total Score: 91/100
DevOps & CI/CD Tools: Jenkins, GitLab, CircleCI	An open-source automation server used for continuous	Secure by design with plugins to enhance security and compliance, scalable high performance handles numerous simultaneous builds and deployments, integration with wide range of tools and services for	Security & Compliance: 23/25 Scalable & Performance: 17/20 Integration Capabilities: 14/15 User experience & Access: 8/10

	integration and delivery to support rapid development and deployment.	seamless DevOps workflows. Exceptional user-experience with extensive plugin support. High ROI, open-source, and free. Enhanced development efficiency. Strong community support and continuous updates. Highly customizable, widely adopted, and trusted in the DevOps community.	Flexibility & customization: 4/5 Support & maintenance: 7/10 Vendor Reputation: 5/5 TCO & ROI: 9/10 Total Score: 87/100

Software Application Vendor Selection Criteria

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)
Security and Compliance	The software can ensure data security and be able to meet regulatory requirements.	25
Scalability and Performance	The ability of the software to manage increased load, maintain performance, and support vertical and horizontal scalability.	20

Software Application Recommended Vendors

Vendor Name	Vendor Strengths	Vendor Weaknesses	Products/Services Provided to Project	Aggregate Selection Criteria Score

Salesforce	Dominates the CRM market, highly customizable, robust ecosystem, remarkable user experience with intuitive user-friendly interface.	High cost, complex to configure, and manage without experienced personnel	Salesforce Financial service cloud CRM tailored for financial and banking services.	Security & Compliance: 25/25 Scalable & Performance: 18/20 Integration Capabilities: 13/15 User experience & Access: 9/10 TCO & ROI: 7/10 Support & maintenance: 9/10 Flexibility & customization: 4/5 Vendor Reputation: 4/5 **89/100**
Stripe	Developer friendly due to excellent documentations and	Higer transaction fees, limited support primarily through	Comprehensive Payment Gateway	Sec & Compliance: 25/25

	tools for easy integration and customization. Supports wide range of payment methods, scalable infrastructure in handling high transaction volumes efficiently. Innovative features and services introduced frequently to customize transaction processing. Easy integration, excellent documentation and support, robust API.	chat and email, which may not be suitable to most businesses. Transaction fees can add up for high-volume businesses limited to payment processing.	transactions processing platform. Stripe Connect, Stripe Radar (fraud prevention)	Scalable & Performance: 19/20 Integration Capabilities: 14/15 User experience & Access: 9/10 Support & maintenance: 8/10 TCO & ROI: 6/10 Flexibility & customization: 4/5 Vendor Reputation: 3/5 **89/100**
Jenkins	Open-source and free platform, highly customizable with strong community, extensive plugin available to extend	Requires careful setup and configuration which can be complex for new users. Self-hosted setup requires	Jenkins automation server platform for continuous integration and continuous	Security & Compliance: 23/25 Scalable & Performance: 17/20

	functionality and integrate with other tools. Scalable automation supports large-scale build and deployment processes efficiently, large community support backed by extensive documentation.	significant monitoring and upkeep. Complex to set up and manage, requires significant maintenance.	delivery (DevOps CI/CD tools), Jenkins (open-source automation server), Jenkins Pipeline.	Integration Capabilities: 14/15 User experience & Access: 8/10 TCO & ROI: 9/10 Support & maintenance: 6/10 Flexibility & customization: 4/5 Vendor Reputation: 5/5 **88/100**
Google Firebase	Seamless integration with mobile platforms, real-time database capabilities, strong support for analytics and user engagement.	Limited to Google Cloud ecosystem, can be costly at scale.	Firebase Realtime Database, Firestore, Firebase Authentication, Firebase Analytics.	80

Aave	Leading DeFi lending protocol, high liquidity, strong security features.	Dependent on Ethereum, potentially high transaction fees.	Aave Protocol, Aave Arc (institutional DeFi).	70
Chainlink Labs	Industry leader in decentralized oracles, strong security features, extensive partnerships.	Dependent on smart contract platforms, potential scalability issues.	Chainlink Oracles, Chainlink VRF.	73
ConsenSys	Expertise in Ethereum-based solutions, strong developer community, extensive suite of tools.	Limited to Ethereum ecosystem, potentially high costs for complex implementations.	ConsenSys Quorum, Infura, Truffle Suite.	71

Software Application Deployment Challenges

Deployment Challenge	Deployment Challenge Description
Data Security and Compliance	Financial institutions must comply with stringent data security regulations and regulatory standards of GDPR, PSD2, and others. It is crucial that the new software applications meet these standards. Ensure implementation of robust data encryption for data at-rest/in-transit, secure access controls for authentication/authorization mechanisms, and comprehensive audit trails to monitor access and changes to sensitive data. Managing legal risks associated with data breaches or non-compliance. This can be challenging and resource intensive.

	Protecting database systems for blockchain, DeFi lending smart contracts from cyber threats and ensuring sensitive data is secure from unauthorized access, breaches, and other malicious activities. Vulnerability management, access controls, data encryption, compliance requirements, and incident response systems may hinder software deployment. The regulatory landscape for blockchain and DeFi is still evolving. Uncertainty around regulations. This can pose risks and cause delays in deployment.
User Experience & Interface Design	The software must be capable of handling modern internet banking applications, intuitive, and seamless user experience on multiple devices. Designing and deploying applications that meet high user expectations for user's ease of use, speed accessibility. The application must accommodate diverse users with varying levels of tech knowledge.
Data Migration	Moving data from legacy systems to the new software application with minimal disruption. Ensure data integrity, downtime, compatibility issues, data mapping, and testing to validate the accuracy and completeness of migrated data.
Cybersecurity	Protect the software from cyberthreats & ensure robust security measures put in place. Ensure threat detection and response mechanisms in real-time implementation. Vulnerability management to identify and mitigate vulnerabilities with the application. Security patches and updates implementation in timely manner. Incident response plan implementation and providing employee training on cybersecurity best practices.

Time	Managing the project timeline to ensure timely deployment of the software application. Developing a detailed project plan with realistic timeliness and resource availability of necessary resources, personnel, and hardware. Delays in mitigating risks due to unforeseen issues of dependencies. Milestones in establishing and tracking key projects. Stakeholder communicating clear and consistent about project and timeliness.
System Conflict	Ensure the new application integrates smoothly with existing systems without causing conflicts. Compatibility with existing hardware and software systems. Interoperability with other applications and services seamlessly. Data synchronization between systems to ensure consistency. Legacy systems may not easily integrate, addressing such challenges. Prompt conflict resolution strategies to develop.
Performance	Ensure application performs optimally under various loads and conditions. Test load to identify performance bottlenecks. Continuously optimizing the application for better performance. Scalability ensures increasing user loads.
Cost	Manage the total cost of deploying and maintaining the software application. Ensure budgeting, unexpected expenses may arise during deployment, cost-benefit analysis to ensure the project provides value. ROI to justify the expenditure. Ongoing operational costs, maintenance costs, and post-deployment costs to be taken in consideration.

Technology Adoption Methods

Method Name	Method Description

DevOps Integration	DevOps combines development and operations to streamline the software delivery pipeline through automation, continuous integration, and continuous deployment (CI/CD). This method enhances collaboration between developers and IT operations, reducing deployment times and improving system reliability. It fosters a culture of continuous improvement and rapid delivery, essential for the fast-paced demands of internet banking.
Pilot Testing (Sandboxing)	Pilot testing involves deploying the new technology in a controlled, limited environment or with a small subset of users before a full-scale rollout. This allows the organization to identify and resolve potential issues, gather user feedback, and make necessary adjustments. Sandboxing provides a safe space to test integrations and performance without affecting the broader system.

Cost/Benefit Considerations

Benefits	Costs	Considerations
Advanced technologies, such as AI and big data analytics, enable better data collection and analysis, providing valuable insights for decision-making and customer engagement.	Many modern technologies, especially cloud-based solutions, involve ongoing licensing or subscription fees, which can add up over time.	Comparing the long-term benefits and cost savings against the ongoing operational costs is essential. This includes evaluating vendor pricing models and potential for cost escalation.
Adopting agile and DevOps methodologies, along with	Relying on third-party vendors for critical	Ensuring that vendor agreements include clear Service Level

modern development tools, can accelerate the deployment of new features and products, improving responsiveness to market demands.	technology components can create dependencies. Costs associated with vendor services, support, and potential vendor changes need to be accounted for.	Agreements (SLAs) and exit strategies is crucial for maintaining operational control and flexibility.
Immutable ledgers provide clear & verifiable transaction history. High security due to cryptographic principles and decentralization. Automated transactions, no mediators, Decentralized control & immutable records enhance trust, security, reduce frauds, transaction times and costs. Open-source nature allows for transparent operations and auditing. Potential for high liquidity due to global participation.	High costs for setting up blockchain infrastructure, hardware, software, and developer expertise. Ongoing costs for network maintenance, updates, and security. High energy costs, especially for Proof of Work (PoW) consensus mechanisms. Costs for training staff to understand and work with blockchain technology. Potential costs for adhering to various regulatory requirements.	Ensuring the chosen blockchain technology can handle the expected transaction volume. Ability to integrate with existing systems and other blockchain networks. Adherence to local and international regulations. Consider more energy-efficient consensus mechanisms e.g., Proof of Stake (PoS). Managing data privacy concerns within a transparent system.

Transaction times and costs reduced as no intermediaries. Open-source nature allows for transparent operations and auditing. Encourages financial innovation through new financial products and services. High liquidity by global participation.	Costs for developing smart contracts and DeFi protocols. High costs for auditing smart contracts & meet regulatory requirements. Ensure free of vulnerabilities. Costs for training staff to do smart contracts, provide liquidity incentives/ rewards to users.	Ensuring robust security measures to protect against smart contract vulnerabilities DeFi strategies to increase user adoption and trust. Ensure sufficient liquidity to support transactions and services. Navigate the evolving regulatory landscape. Ensure the reliability and accuracy of smart contracts.
Convenient user-friendly platform to connect with services. User access in multi-tasking. Collects valuable user data to personalize user experience. well-designed app increases brand loyalty, direct communication by push notifications & in-app messaging.	Costs for designing, developing, and testing the mobile app. Ongoing costs for updates, bug fixes, and new features. Marketing user acquisition expenses. Costs to comply data protection & privacy laws and providing user support and feedback.	Ensure a seamless and intuitive user experience. Ensure the app works across different devices and operating systems. Secure user data & app to handle increasing user numbers and data loads. Ensure seamless integration with backend services and third-party APIs.

Cloud Services Recommendations

Cloud Services Selection Criteria

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)

Security and Compliance	Vendor's strength to provide optimal security standards and compliance with regulatory needs in its cloud services. Blockchain & DeFi platforms rely heavily on smart contracts, can have vulnerabilities. Ensure these contracts are secure, free from bugs & compliant.	20
Performance and Scalability	Vendor's capability to excel in performance and deliver cloud services which scale effectively.	15
Cybersecurity	Data encryption at rest & in transit. Robust access controls, authentication & authorization mechanisms. Compliance AML (anti-money laundering), KYC (Know your customer) and lawful store data on blockchain, adhere to industry standard regulations (GDPR, HIPAA, PCI DSS). Relevant security certifications ISO 27001, SOC2, etc.	20
Flexibility	The ability of the cloud service to adapt to changing business needs and support various applications and workloads. Scalability for resources up or down based on demand, service offerings e.g., IaaS, PaaS, SaaS. Customization of cloud environment. Integration with on-prem systems and other cloud	20

	services. Multi-cloud and hybrid cloud environment deployment support.	
Reliability	The dependability of the cloud service to ensure high availability and performance. SLA guarantees uptime and performance. Infrastructure redundancy to prevent single points of failure. Robust disaster recovery plans and capabilities, continuous performance monitoring and reporting. Quality and availability of support services	20
Accessibility	Ease of access and use of the cloud service by all users, and the disables. User-friendly interface and ease of use. Compatibility with assistive technologies. Multi-device access, availability of data centers in regions that meet data residency requirements.	15
Cost	Overall cost-effectiveness of the cloud service, initial setup, ongoing operational costs, and any hidden fees. Costs for designing, developing, and testing the mobile app, developing smart contracts DeFi protocols. High energy costs, especially for Proof of Work (PoW) consensus mechanisms involving blockchain/cryptocurrencies.	15

Cloud Services Recommendation

Recommended Software Application	Description	Benefits	Aggregate Selection Criteria Score
Digital Banking Platform: Backbase, Q2, Finastra's Fusion	A leading digital banking platform optimizes in seamless customer experience on online and mobile channels.	Offers advanced security and regulatory compliance. Designed to manage performance and scalability with large user bases and high transaction volumes. Extensive API support for easy integration with core banking and third-party services. Intuitive and customizable user interface with strong accessibility features. Effective TCO to ROI model. Comprehensive support and continuous updates. Highly flexible supporting extensive customization. Well reputed in digital banking era.	Security & Compliance: 24/25 Scalable & Perform: 17/20 Integration Capabilities: 14/15 User Exp/Accessible: 9/10 Cost & ROI: 7/10 Support & Maintenance: 8/10 Flexible & Custom: 4/5 Vendor Reputation: 4/5 Total Score: 87/100
DevOps & CI/CD Tools:	Jenkins: (As discussed above) an open-source automation server used for	Secure by design with plugins to enhance security and compliance. Capable of handling scalability and performance due to numerous and simultaneous deployments. Integrates	Security & Compliance: 23/25 Scalable & Perform: 17/20

Jenkins, GitLab, CircleCI	continuous integration and delivery, supporting rapid development and deployment.	with extensive tools and services for seamless DevOps workflows. User friendly interface offers huge plugin support. Free, open-source platform offers significant ROI. Strong community support and continuous maintenance updates. Flexible and highly customizable due to extensive plugins. Widely adopted and trusted,	Integration Capabilities: 14/15 User Exp/Accessible: 8/10 Cost & ROI: 9/10 Support & Maintenance: 7/10 Flexible & Custom: 4/5 Vendor Reputation: 5/5 Total Score: 87/100
SaaS	Delivers application over the internet as service,	Users access applications remotely on the internet. Reduces the need for internal IT infrastructure resources as the service provider manages the application infrastructure and data. Easily scales to accommodate growing business needs without significant upfront investment. The service provider manages automatic updates to ensure the application is always up to date with the latest features and security patches. High	Cybersecurity: 20 Flexibility: 18 Reliability: 19 Accessibility: 17 Cos: 18 Total Score: 92

		availability and redundancy built into the service provider's infrastructure.	
IaaS	IaaS provides virtual computing resources over the internet. It offers virtual machines, storage, and networking allowing businesses to run their applications and manage their infrastructure.	Provides control over the infrastructure compared to SaaS, allows customization and configuration to meet specific needs. Scalability of resources up or down based on demand, offering flexibility, for varying workloads. Cost savings pay-as-you-go pricing models reduce the need for significant upfront investment in hardware. Disaster recovery option improves business continuity. Robust security features and compliance certifications offered by leading IaaS providers.	Cybersecurity: 22 Flexibility: 20 Reliability: 18 Accessibility: 15 Cost: 18 Total Score: 93
Private Cloud	A private cloud is a cloud computing environment exclusively used by one	Provides greater control over data security and privacy as the resources are not shared with other organizations. It allows for significant customization to meet specific business and regulatory	Cybersecurity: 24 Flexibility: 16 Reliability: 18 Accessibility: 13 Cost: 16 Total Score: 87

	organization. It can be hosted on-premises or by a third-party provider.	requirements. It allows easy regulatory and compliance requirements making it ideal for industries with high-security needs. Dedicated resources allow better performance public cloud. Offers security for blockchain, smart contracts, and mobile platforms.	
Public Cloud	A public cloud is a cloud computing environment where services are delivered over the internet and shared across multiple organizations.	Cost-effective option offers a pay-as-you-go model, reduces the need for upfront capital expenditure. High scalability offers the ability to scale resources up or down based on demand. Remote accessibility with an internet connection offers flexibility for remote work. High availability with robust infrastructure and redundancy provided by leading public cloud providers in blockchain, DeFi smart contracts and mobile app.	Cybersecurity: 20 Flexibility: 19 Reliability: 20 Accessibility: 17 Cost: 19 Total Score: 95

Cloud Services Vendor Selection Criteria

Selection Criteria Name	Selection Criteria Description	Selection Criteria Value (Weighting in Points)

Security and Compliance	Vendor's excellence in meeting high security and compliance standards.	20
Accessibility	Encompasses the ability to service potential users, accessing remotely, from multiple devices from different global locations, service providers commitment to meet accessibility standards and providing support for assistive technologies. Offers accessible customer support channels and training resources.	15
TCO & ROI	The overall cost of the vendor's solution, including initial investment, maintenance, and the value delivered relative to the cost that generates high return on investment. Additional software, and developer expertise. Ongoing costs for network maintenance, updates, and security. High energy costs, especially for Proof of Work (PoW) consensus mechanisms. Costs for training staff to understand and work with blockchain technology. Potential costs for adhering to various regulatory requirements. Costs for developing smart contracts and DeFi protocols. High costs for auditing smart contracts to ensure utmost security. Potential costs to meet regulatory requirements. Potential costs for underwriting smart contracts, designing, developing, & testing mobile app. Ongoing costs for updates, bug fixes & new features. Marketing &	15

	user acquisition expenses. Costs of complying with data protection & privacy laws. Costs providing user support and feedback.	

Cloud Services Recommended Vendors

Vendor Name	Vendor Strengths	Vendor Weaknesses	Products/Services Provided to Project	Aggregate Selection Criteria Score
Backbase	Specialized in seamless digital banking across multiple platforms, strong unified platform for customer engagement and experience. Rapid deployment for quick time-to-market with ravishing digital banking feature. Modular and flexible platform for customized banking needs.	Primarily front-end focused, excellent for customer interfaces, relies on integrations with other systems for core banking functionalities. Complex integration with legacy or existing back-end systems.	A comprehensive Backbase digital banking platform focusing on enhancing digital customer interactions.	Security & Compliance: 24/25 Scalable & Performance: 17/20 Integration Capabilities: 14/15 User Exp & Access: 9/10 Cost & ROI: 7/10 Support & Maintenance: 8/10 Flexibility & Customization: 4/5 Vendor Reputation: 4/5 **87/100**

Jenkins	Open-source and free platform, highly customizable with strong community, extensive plugin available to extend functionality and integrate with other tools. Scalable automation supports large-scale build and deployment processes efficiently, large community support backed by extensive documentation.	Requires careful setup and configuration which can be complex for new users. Self-hosted setup requires significant monitoring and upkeep.	Jenkins automation server platform for continuous integration and continuous delivery (DevOps CI/CD tools),	Security & Compliance: 23/25 Scalable & Performance: 17/20 Integration Capabilities: 14/15 User experience & Access: 8/10 TCO & ROI: 9/10 Support & maintenance: 7/10 Flexibility & customization: 4/5 Vendor Reputation: 5/5 **87/100**
Nymbus	Full-service cloud core banking, speed & agility in launching new banking features, rapid deployment, front-end, back-end services, digital banking, core processing,	Targets small to medium sized banks, credit unions. Scalability challenged.	Cloud-based core banking platform that integrates with digital channels and other	84/100

	payment solutions, innovative & modernized digital fintech services	Small market penetration.	banking services.	

Cloud Services Deployment Challenges

Deployment Challenge	Deployment Challenge Description
Cost Management and Optimization	Cloud services often operate on a pay-as-you-go model, which can lead to unexpected costs if not properly managed. Understanding and optimizing cloud usage, avoiding over-provisioning, and managing expenses related to data transfer, storage, and compute resources are crucial. Implementing cost-monitoring tools and establishing clear cost-management practices are essential for controlling expenses.
Performance Issues	Potential issues arise in ensuring that cloud services meet the required performance standards, speed, responsiveness, and reliability. Such issues may affect the user experience and the efficiency of cloud-based applications. Delays in data transmission over the network can cause slow response times and impact user experience for real-time applications. Bandwidth limitation or insufficient bandwidth can lead to bottlenecks reducing the speed in processing data transferred. Scalability challenges may arise as demand increases, the cloud service must scale efficiently to maintain performance levels. Shared resources in a multi-tenant environment can lead to competition for computing power, storage, bandwidth affecting performance. Monitoring and optimization is needed to

	identify performance bottlenecks and optimize resources required for sophisticated tools and expertise.
Integration Issues	Such challenges are associated with connecting cloud services with existing on-prem systems, third-party applications, and other cloud services. Successful integration is paramount for seamless data flow and operational efficiency. Ensuring compatibility between the cloud services and existing systems can be difficult if there are differences in technology stacks, or data formats. Data synchronization across different systems can be challenging especially in real-time scenarios. Developing and maintaining APIs and connectors to facilitate integration requires significant effort and expertise. Integration with legacy system that may not support modern integration methods can be challenging and problematic. Vendor-lock-in in using proprietary APIs for technologies can make it hard to switch providers or integrate with other services in the prospects.
Data Security	Data security to protect data from unauthorized access, breaches, or other cyberthreats. Robust data security is critical to maintain compliance with regulations. Obstacles in access controls, data encryption, and compliance with GDPR, HIPAA, PCI DSS, etc., mandates data protection measure. Continuous security monitoring is crucial for potential security threats and vulnerabilities require the best tools and expertise. An effective incident response system addresses and mitigates quick security breaches or threats. The Mobile App requires secure data transmission and user authentication. Blockchain needs secure storage of keys, high security for DeFi smart contracts, liquidity pools, and user

	funds. Penetration testing and regular audits improve the system. Blockchain, cryptocurrencies, and smart contracts are targets for cyber-attacks. Security is paramount for blockchain/digital currencies and smart contracts strong encryption, multi-signature wallets, and secure smart contract implementations DeFi platforms rely heavily on smart contracts, which can have vulnerabilities. Ensuring that these contracts are secure and free from bugs can be complex, time & resource intensive. The regulatory landscape for blockchain and DeFi is still evolving. Uncertainty around regulations can pose risks and cause delays in deployment.
Managing Shared Responsibility	In cloud environments, security and operational responsibilities are shared between the cloud provider and the customer. Understanding and managing these shared responsibilities, including who is accountable for what aspects of security, compliance, and operational management, is critical. Clear agreements and understanding of roles are necessary to ensure all aspects are adequately covered.

Technology Adoption Methods

Method Name	Method Description
Cloud-Native Adoption	Cloud-native adoption involves designing and deploying applications that leverage cloud computing capabilities from the outset. This method ensures that applications are scalable, resilient, and optimized for cloud environments. It allows for leveraging cloud-native features like microservices, containerization, and serverless architectures, which can enhance agility and operational efficiency.

Remote and Distributed Deployment	With the rise of remote work, adopting technology that supports remote and distributed deployment has become essential. This method ensures that systems and applications can be deployed and managed across geographically dispersed teams. It involves leveraging cloud services, remote monitoring tools, and virtual collaboration platforms to support seamless adoption and operations.

Cost/Benefit Considerations

Benefits	Costs	Considerations
Implementing cutting-edge technology prepares the organization for future innovations and makes it easier to adopt subsequent technologies or improvements.	Transferring data from old systems to new ones can be costly and complex, requiring careful planning to maintain data integrity and minimize downtime.	Ensuring a detailed data migration plan that addresses data mapping, cleaning, validation, and testing is essential to avoid data loss or corruption.
Advanced technologies can provide better tools for risk assessment, monitoring, and mitigation, enhancing the organization's ability to manage and respond to various risks effectively.	Meeting regulatory compliance during technology adoption may involve legal consultation, compliance audits, & documentation adds up to total cost.	Maintain up-to-date knowledge of relevant regulations and ensure the new technology complies with all legal requirements to prevent costly compliance issues later.
Open-source nature allows for transparent operations & auditing. Reduced transaction	Costs for developing smart contracts and DeFi protocols. High costs for auditing secure	Navigate the evolving regulatory landscape for reliability & accuracy of

times & costs by eliminating mediators. Innovative financial products & services. Potential for high liquidity due to global participation.	smart contracts. Potential costs to meet regulatory requirements, training staff to create & handle smart contracts. Potential costs against smart contract failures.	smart contracts, robust security measures to protect vulnerabilities. Ensure sufficient liquidity to support transactions and services.
Immutable ledger providing clear and verifiable transaction history, cryptographic principles & decentralization. Streamlined processes without intermediaries and automated transactions. Enhanced trust by consensus mechanisms and decentralized control. Reduced risks by immutable records.	High energy costs Proof of Work (PoW) consensus mechanisms. Training staff to understand and work with blockchain technology. Potential compliance adherence costs. High costs for setting up blockchain infrastructure, including hardware, software, and developer expertise. Ongoing costs for network maintenance, updates, and security.	Ensure blockchain can handle expected transaction volume. Ability to integrate with existing systems and other blockchain networks. Adherence to regulations, PoS consensus mechanisms energy efficiency, manage data privacy concerns within a transparent system.
User-friendly mobile app for customers to interact with services at ease. Collects valuable user data to improve services and personalize user experiences. Increase brand	Costs for designing, developing, and testing the mobile app. Ongoing costs for updates, bug fixes, and new features. Expenses for marketing & user acquisition. Costs to comply with data protection and privacy laws.	Ensuring designing robust and intuitive user experience and system for transactions Mobile app data reliability of operational and accessible during any failover events, hardware, software, or

loyalty through a well-designed functional app. Facilitates direct communication with users through push notifications and in-app messaging.	Costs of providing user support and handling feedback. Costs for designing, developing, and testing mobile app. Ongoing costs for updates, bug fixes, and new features.	network issues. Protect user data and ensure app security. Ensure the app can handle increasing user numbers and data loads. Ensure seamless integration with backend services and third-party API.

REFERENCES:

American Deposit Management Co. (n.d.). *What is DeFi and How is it Impacting Banking?* https://americandeposits.com/what-is-defi-how-impacting-banking/#:~:text=With%20DeFi%2C%20lending%2C%20trading%2C,verification%2C%20and%20logging%20of%20transactions.

Alkami Digital Banking. (n.d.). *Digital Banking Solutions*. https://www.alkami.com/digital-banking-solutions/?utm_source=PRIN&utm_medium=press-release-community-banking-stories-dbs&utm_content=community-banking-stories-dbs&utm_campaign=2024-PRInfluencer%7CCommunityBankingStories

AWS. (n.d.). *MariaDB vs SQL*. https://aws.amazon.com/compare/the-difference-between-mariadb-vs-mysql/#:~:text=And%20it's%20the%20primary%20relational,was%20acquired%20by%20Oracle%20Corporation.

Channel E2E. (2023, March 3). *Huawei Unveils New Digital Managed Network Solution For Carriers*. https://www.channele2e.com/news/huawei-unveils-new-digital-managed-network-solution-for-carriers

FDIC. (n.d.). *FDIC Regulations*. https://www.fdic.gov/regulations/laws/rules/index.html

Fintech Magzine. (2022, June 8). *Technology in Fintech and the story of Online Banking*. https://fintechmagazine.com/banking/fintech-timelines-and-the-story-of-online-banking

Investopedia. (2024, March 15). *Digital Money: What It Is, How It Works, Types, and Examples*. https://www.investopedia.com/terms/d/digital-money.asp

MariaDB. (n.d.). *MariaDB vs PostgreSQL* https://mariadb.com/products/enterprise/comparison/mariadb-vs-postgresql/

OrienctDB. (n.d.). *OrientDB Overview*. https://orientdb.org/docs/3.0.x/misc/Overview.html

Veengu. (n.d.). *Banking Software High Availability*. https://veengu.com/banking-software-high-availability/

Zscaler. (n.d.). *What Is Zero Trust Network Access?* https://www.zscaler.com/resources/security-terms-glossary/what-is-zero-trust-network-access