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TECHNOLOGY ASSESSMENT OF CLOUD-BASED E-WALLET AS A TECHNOLOGICAL INNOVATION IN THE PHILIPPINES

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DECLARATION

This is to certify that:

I. The special problem comprises only my original work towards the MENRM except where indicated in the Preface

II. Due acknowledgment has been made in the text to all other material used

III. The special problem is fewer than 25,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Rowell G. Cantal

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Abstract

This study assesses the technical innovation of cloud-based e-wallets in the Philippines, with an emphasis on performance improvements, operational advantages, challenges, and total added value. A qualitative case study methodology was used to collect data through Focus Group Discussions (FGDs) with selected members, managers, and unit heads of the Technology, Planning, and Innovation department of the currently widely used e-wallet provider in the Philippines. The findings show that cloud infrastructure significantly enhances e-wallet performance by increasing agility, scalability, and resilience, which allows quicker deployment and ongoing development. The significant advantages include exceptional operational efficiency, cost savings, and the potential for the company to shift its attention away from infrastructure maintenance and onto core service and product innovation. While challenges such as vendor lock-in and ambiguities in the shared responsibility model were discovered, the report recommends mitigating techniques such as a cloud-agnostic strategy and clearer operational frameworks. Cloud-based technology provides significant economic value and a competitive advantage by providing 24/7 availability and driving growth in the digital financial services ecosystem. Furthermore, the study emphasizes the cloud's function as a catalyst for future breakthroughs, such as the integration of AI, Machine Learning, Web3, and cryptocurrencies. The growing concern about environmental and economic sustainability in cloud operations is also discussed, emphasizing the importance of green efforts and transparent carbon footprint reporting. This research offers vital information for e-wallet providers, policymakers, and stakeholders, underlining cloud technology's revolutionary potential in promoting digital financial inclusion and sustainable operations in the Philippines.

I. INTRODUCTION

Background of the Study

Research and Development on Cloud Computing, cloud computing is the next natural step in the evolution of on-demand information technology services and products. To a large extent, cloud computing will be based on virtualized resources. Cloud computing predecessors have been around for some time now, but the term became popular sometime in October 2007 when IBM and Google announced a collaboration in that domain. Cloud is a type of distributed data center that delivers infrastructure as a service. It consists of massive resources and provides some mechanisms to provide, reimage, workload rebalance, de-provide, and monitor those resources. It mentioned that cloud computing is seen as a great network-tech breakthrough, which might bring us to the 'cloud society' after the PCs and the Internet brought us to the 'network society'. In the scheme of cloud computing, all the everyday usage of PCs will be transferred into the clouds; all we need is access to the Internet, and then we do all our work on it (Aliasghar Azma et al., 2021).

A big part of Sustainable Development Goal (SDG) 8: Decent Work and Economic Growth is cloud-based e-wallets. The goal is to promote economic growth that would help everyone. The target is those people in rural areas or who have little income. These applications support financial inclusion by letting and giving those people access to financial services who are not getting enough help. With these applications, people can use their phones and pay for things online. This contributed to the business growing for everyone. The companies that take digital payments require more staff to help customers, assist in fixing issues with the system, and keep

it running smoothly. The use of cloud infrastructure for e-wallets helps many different types of businesses create jobs. Small and medium-sized businesses can also benefit from these technologies because they can help them reach more customers and run their businesses more efficiently. E-wallets also help entrepreneurs better handle their money and create jobs by making it easier for them to get loans through microloans and peer-to-peer lending platforms (IGNITING SDG PROGRESS through DIGITAL FINANCIAL INCLUSION, n.d.).

Cloud-based e-wallets play a vital role in supporting SDG 9: Industry, Innovation, and Infrastructure by advancing financial services through innovative technologies. They facilitate infrastructure development by leveraging inexpensive cloud services to deploy robust e-wallet systems, enabling financial inclusion and strengthening industrial capabilities, particularly in developing countries (Annex 1: BigFintech and Sustainable Development Goals (SDG) Tiered Impact Tables, n.d.).

Some of the challenges (Mohmmed et al., 2024) are performance, scalability, and integration with existing systems. The e-wallets should have the capability to handle the increasing transaction volumes while providing dependable and quick services. Connecting e-wallets with existing systems can lead to compatibility issues, operational downtime, data synchronization, and exchange.

II. REVIEW OF LITERATURE

Cloud-based platforms and e-wallets

With this rising number of electronic wallets or e-wallets, having cloud technology as their infrastructure shows a major change in international financial transactions. Cloud computing enhances the scalability and efficiency of e-wallets by having important features like cost-effectiveness, elasticity, and extensive data management capabilities. With the advantages provided by these features, the resources needed by the e-wallet providers can be adjusted easily depending on the actual user demand. This flexibility ensures e-wallet providers have minimal operational expenses during slow times and smooth performance during peak periods (Cloud Computing and Digital Wallets: A Perfect Match for Scalability, 2024).

E -wallet or electronic wallets, which are oftentimes referred to as a “digital type of e-card that enables purchases through software on tablets, smartphones, and laptops. Before users can have the ability to start making such transactions, users should initially install an e-wallet program on their smartphone, supply all necessary information throughout registration, and then top off their e-wallet account with the use of a credit card or online banking. Through linking their e-wallets to their bank accounts, e-wallet users may instantly top off their accounts (Mohmmed et al., 2024). Digital payments, or commonly referred to as mobile payments, are an innovation of technological evolution, especially in the financial sector. The results of these technological innovations one of which was an electronic wallet. The development of technology continuously produces various innovations and creations that can be

useful for each of its users, one of which is the ease for individuals to fulfill the basic needs in daily life (Soegoto & Tampubolon, 2020).

By having efficient and accessible financial services and fostering a competitive, technology-driven environment that promotes economic growth and improved service delivery, these are the innovations in e-wallets that are made possible because of cloud computing (Nassiry, 2018). The enhanced sustainability in financial transactions by providing cost-efficient, paperless, and traceable payment options, reducing reliance on physical cash, and promoting sustainable industrial practices are additional improved features and services that e-wallets offer (Hopalı et al., 2022).

The Bangko Sentral ng Pilipinas has done a lot to improve the experience of digital payments being used in the Philippines. By the end of 2023, the goal of BSP was to make up more than half of the retail payment transactions processed using digital payments. The said goal and plan to make more people have access to banking services and strengthen a cash-lite economy is part of the BSP's larger Digital Payments Transformation Roadmap (DPTR), according to Bangko Sentral ng Pilipinas (2023). The Digital Payments Transformation Roadmap was initially launched to guide the country towards a more efficient and inclusive digital economy. The roadmap's goals are: Increasing Digital Payment Adoption. The BSP achieved its objective, which is 2023 to have more than half of the retail transactions processed or completed using digital payments. During that year, the total retail transactions made up 52.8%. The other goal of BSP is to increase financial inclusion. With the help of digital payment systems, the formal financial system was introduced to unbanked Filipinos and micro, small, and medium businesses (MSMEs). Also, the BSP wants to drive innovation. In the local markets, QR code transactions were

introduced using “Paleng-QR Ph Plus” to make things convenient for both buyers and sellers.

Technological innovations such as cloud-based platforms for electronic wallets or e-wallet systems in the Philippines have become significant for transforming financial transactions and promoting inclusivity and convenience. Different e-wallet platforms allow users to conduct cashless transactions easily (Jasper, 2024).

Cloud technology features and benefits

The study of Mohammed & Ainhoa (2024), "Cloud Technology Enhancing the Scalability and Security of Digital Wallets," demonstrates the crucial role of cloud technology in significantly improving both the scalability and security of digital wallets. In their research, it highlights how the flexible resources inherent in cloud infrastructure enable digital wallet providers to effortlessly handle growing user numbers and transaction volumes, negating the need for substantial upfront infrastructure costs. Also, the study underscores the necessity of utilizing cloud technology to develop robust, scalable, and efficient digital wallet solutions capable of adapting to the changing demands of both consumers and businesses in the digital era.

In their (2019) work, Venish Raja & Jayasimman emphasized scalability as a critical element in bolstering cloud environment security and mitigating hacking threats. Their study explained that scalability in the cloud is not all about efficient resource utilization, but it is also a key differentiator from traditional outsourcing. Also, Raja & Jayasimman specifically highlighted the advantage of auto-scaling**,** which gives clients a convenient and flexible way to maximize the selected resources according to their specific needs and demands.

Jeyasri Sekar's (2022) and Anurag Mashruwala (2024) both examined the impact of cloud computing on digital payment systems and Financial Technology (FinTech). Sekar focused on the area of how cloud infrastructure supports the use of digital wallets, recognizing its role in enabling seamless access across devices and managing high transaction volumes efficiently. While Mashruwala looked at how cloud-based services have shaped and improved the operational strategies in the FinTech sector, emphasizing their role in reducing infrastructure costs and offering scalable, secure solutions. Both work illustrates how cloud computing not only enhances user experience but also supports business adaptability and innovation across financial platforms.

Himani Fnu & Nirav Modh's (2025) paper pointed out the significant role of cloud computing in the FinTech industry, emphasizing its power to drive innovation and enhance efficiency through scalable and cost-effective solutions**.** In the research that they conducted, it explained how FinTech companies can greatly speed up the deployment of applications, analyze data in real time, and easily combine cutting-edge technologies such as blockchain, artificial intelligence, and machine learning by moving from traditional IT systems to cloud infrastructures. They also shared that these digital changes provide a better customer experience, reduce costs, and make operations more flexible by having the option of personalized services. Their paper also highlighted that using cloud technology, one can have multi-cloud plans, which are important for making sure that businesses do not have to rely on just a single cloud provider and guaranteeing business operations.

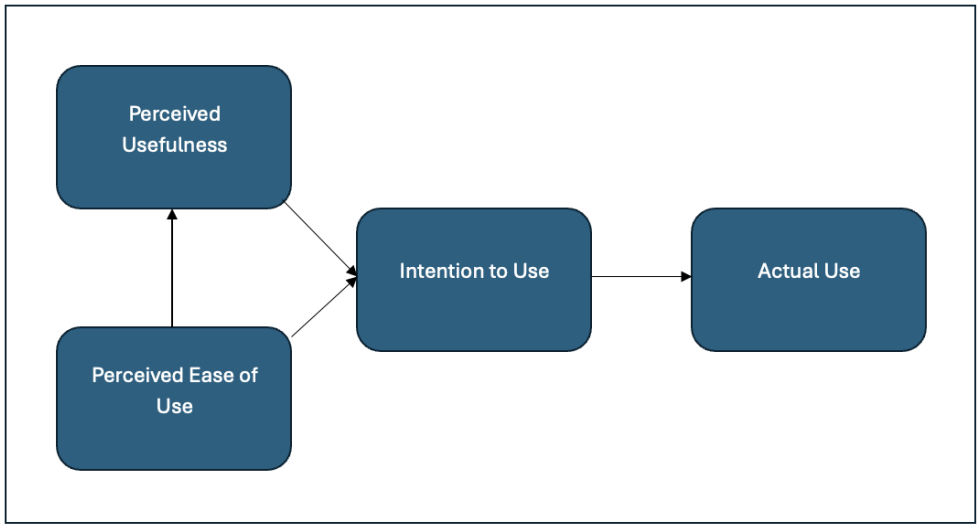
Theoretical Framework

It was in 1993 that Davis's Technology Acceptance Model (TAM) was developed, which focuses on users' perception and interactions to give a predictive and explanatory framework for technology implementation. Based on the Theory of Reason Action, the TAM fills an important part in the literature on information systems by focusing on the psychological aspect that influences system use and giving practitioners insightful information for system deployment. The core of TAM lies in the proposition that users adopt technology based on a cost-benefit analysis of two primary factors: perceived usefulness (the degree to which the technology is believed to enhance performance) and perceived ease of use (the extent to which the technology is perceived as effortless to use). Building on earlier research that connected performance expectations to actual usage, Davis based the idea of perceived usefulness on Bandura's outcome judgment theory. It reflects a user's expectation of a positive result from using technology. On the other hand, perceived ease of use determines a user's confidence in their capacity to use the system easily.

The technology adoption occurs in three stages according to TAM. First, external factors, such as the system design, influence users' cognitive response, especially how useful and easy to use they think it is. These ideas then influence how people feel about the technology and how much they want to use it, which leads to actual use. In the original model, behavioral purpose was a direct indicator of use. Although behavioral intention was a direct predictor of use in the original model, Davis subsequently proposed that attitude toward technology use, which reflects an emotional assessment of possible consequences, could take its place. A more positive attitude would increase the likelihood of adoption. The direct link between perceived value and real use shows how important it is for predicting behavior. Even

though apparent ease of use does not directly affect usage, an application that is easy to use is more likely to be seen as useful, which encourages people to use technology.

Figure 1. Technology Acceptance Model (Davis, 1989).



Operational Definition of Terms

- **Cloud**: refers to servers that are accessed over the Internet, and the software and databases that run on those servers (Cloudflare, 2022).
- **Cloud computing**: Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using internet technologies (Gartner, 2012).
- **electronic-Wallet (eWallet)**: a software, electronic device, or online service that enables individuals or businesses to make transactions electronically (CFI Team, n.d.).
- **Financial Technology (FinTech)**: startup technology providers that approach financial business in innovative (sometimes disruptive) ways through emerging technologies. Fintechs can fundamentally change the way in which a financial

services institution's products and services are created, are distributed and generate revenue. The term may also refer to the technologies these providers offer (Gartner, 2029).

- **Scalability**: the measure of a system's ability to increase or decrease in performance and cost in response to changes in application and system processing demands. Examples would include how well a hardware system performs when the number of users is increased, how well a database withstands growing numbers of queries, or how well an operating system performs on different classes of hardware. Enterprises that are growing rapidly should pay special attention to scalability when evaluating hardware and software (Gartner, n.d.).

II. STATEMENT OF THE STUDY

This study seeks to address the following inquiries regarding the technology assessment of the selected cloud-based e-wallet in the Philippines.

1. What are the key features of cloud technology that are perceived to contribute to the improved performance of specific e-wallet platforms operating in the Philippines?
2. From the perspective of those managing e-wallet platforms in the Philippines, what are the primary benefits and challenges associated with utilizing cloud-based infrastructure for their operations?
3. What is the perceived added value of deploying and operating an e-wallet platform utilizing cloud-based technology in the context of the Philippine financial ecosystem?

IV. OBJECTIVES OF THE STUDY

This study aims to assess a cloud-based e-wallet as a technological innovation in the Philippines. Specifically, it intends to:

1. Identify the key features of the cloud that helped in improving the performance of the specific e-wallet;
2. Analyze the benefits and challenges of using cloud-based technology for e-wallets from the perspective of the people who manage the e-wallets; and
3. Evaluate the added value of running an e-wallet in cloud-based technology.

V. RATIONALE

The findings of this study could provide a better understanding of the cloud features that improve e-wallet performance, which could help e-wallet providers make better technology choices. The study would provide practical insights for effective operations using cloud technology for e-wallets. Also, evaluating the added value of using cloud technology will help stakeholders understand the advantages of this innovation for the Philippine financial system. Ultimately, this research can contribute to the growth and improvement of digital payment solutions in the country.

VI. SCOPE AND LIMITATIONS

The study focused on the cloud infrastructure as a technological innovation of a specific e-wallet provider in the Philippines. The researcher assessed the selected members of the department of the selected e-wallet who are involved in planning, monitoring, and maintaining the infrastructure. The study identified key features that enhanced the performance of the e-wallet, highlighted the benefits and challenges of cloud-based technology from the perspective of those who are managing the e-wallet, and recognized the added value of running an e-wallet on cloud-based technology. In addition, the research attempted to identify the possible innovation that cloud infrastructure can bring for e-wallets.

VII. DESCRIPTION OF THE STUDY AREA

This qualitative case study was conducted within the operational environment of a prominent cloud-based e-wallet provider in the Philippines. The specific locale of the study was the office of this e-wallet provider, situated in Bonifacio Global City (BGC), Taguig, a key financial and business district in Metro Manila.

The participants for this study were carefully selected from the Technology Planning and Innovation (TPI) department of the chosen e-wallet company. This department was identified as the most appropriate group for participation due to their direct involvement in the planning, progress monitoring, and maintenance of the e-wallet's cloud-based infrastructure. The participants included Unit Heads and Managers, all of whom had a minimum of two years of service within the organization. This criterion ensured that all respondents possessed in-depth experience and strategic insights into the company's IT infrastructure and its evolving cloud operations.

VIII. METHODOLOGY

Research Design

The researcher used a qualitative case study research design, utilizing a Focus Group Discussion (FGD) as the method of data collection. The FGD was conducted with selected employees of the specific cloud-based e-wallet provider in the Philippines.

Locale of the Study

There are several digital providers in Manila; the study selected the currently widely used e-wallet application in the Philippines. The locale of the study is in the office of the specific e-wallet provider, which is situated in Bonifacio Global City (BGC), Taguig.

Selection of Respondents

The respondents of the case study were selected members of the Technology Planning and Innovation (TPI) department. The members of the TPI department are the most appropriate people to be involved in the case study since they are part of the planning, progress monitoring of projects, and maintenance of the infrastructure of the specific e-wallet provider.

- Unit Heads: The inclusion of these positions ensures strategic-level insights into cloud-based infrastructure utilization.
- Managers: The inclusion of managers provides perspectives on departmental operations and the impact of cloud technologies on team performance.

- Minimum 2 Years of Service: This criterion ensures that participants possess in-depth experience with the organization's IT infrastructure and the evolution of its cloud-based operations.

Before the actual interview, pre- or pilot testing of the questionnaires with a small group of people working in the Information Technology (IT) industry was conducted.

Data Gathering Procedure

The research will find common free time for the target participants to send the meeting invites for the FGDs. The research is looking to have one or two sessions for FGD, or more if necessary. Each participant will receive a copy of the questionnaire before the FGD session starts. The research will secure the permission from the participants for the FGD sessions to be audio-recorded to transcribe the audio recording precisely and accurately.

Data Analysis

The researcher will use the following questions to analyze the information that will be collected.

Questions related to key cloud features and performance

1. What specific features or aspects of the cloud infrastructure do you believe have significantly contributed to the performance of the e-wallet? Can you provide specific examples?

2. In what ways has utilizing the cloud environment improved the technical capabilities and overall functionality of the e-wallet services compared to what might have been possible with traditional infrastructure?

3. Beyond current performance, what specific cloud features or services do you think could further innovate or significantly improve the e-wallet's technical capabilities in the next 1-3 years?

Questions related to benefits and challenges of managing cloud-based e-wallet

4. From your perspective as someone involved in managing this cloud-based e-wallet infrastructure, what are the key advantages or benefits you've observed in using cloud technology for our operations?

5. What are some of the significant challenges or difficulties that come with managing an e-wallet platform on a cloud infrastructure?

6. Considering the challenges you've faced, what innovative solutions or improvements in cloud management strategies do you believe are necessary to enhance operational efficiency and mitigate future risks?

Questions related to the added value of cloud-based technology

7. In your opinion, what is the overall added value of running the e-wallet platform on cloud-based technology compared to traditional methods? Consider factors like scalability, security, innovation, and cost-effectiveness.

8. How do you believe the use of cloud technology has positioned the e-wallet within the competitive landscape of digital financial services in the Philippines?

9. Looking forward, what new services, features, or strategic innovations for the e-wallet do you envision becoming possible or significantly enhanced specifically due to continued advancements in cloud technology?

Ethical Considerations

In conducting this case study, the research followed the 2022 National Ethical Guidelines for research involving human participants. The researcher adhered to the Data Privacy Act of 2012 also known as Republic Act No. 10173. Any personal data was securely handled and anonymized to protect participants' identities. The researcher obtained consent when necessary and ensured that everyone understood how their information would be used. The researcher also aimed to present the findings accurately and fairly, avoiding any bias or misrepresentation. The researcher's goal is to contribute meaningful insights while maintaining transparency, integrity, and a strong commitment to data privacy.

IX. RESULTS

The findings of this study were based on the Focus Group Discussion (FGD) and aligned with the stated objectives, focusing on the innovative impact of cloud technology on the e-wallet.

Firstly, regarding the key features of the cloud that improve e-wallet performance, the study found that the cloud's features of agility, scalability, and resilience are significant. Participants consistently emphasized the cloud's ability to facilitate "deploy on demand" and "Continuous Improvement Continuous Development (CICD)," enabling fast adaptation and growth. As mentioned by Participant-1, "Scalability is also an element; it measures how many users will be catered to and how many transactions we are expecting." The cloud's resilience, bolstered by practices like "chaos engineering," ensures the infrastructure “will not go down even under stress, as highlighted by Participant-1. Furthermore, the cloud provides "Advanced security and compliance," including native DDoS protection”, as noted by Participant-, and significantly contributes to "time and effort in configuration and deployment," as shared by Participant-4.

Secondly, when it comes to analyzing the benefits and challenges of using cloud-based technology for e-wallets from the point of view of the people who manage the e-wallet, the findings show notable advantages alongside specific challenges. Some of the key benefits include the remarkable operational agility that allows the provisioning in "minutes compared to weeks" (Participant-2), and “significant cost advantages, such as discounts for long-term commitments” (Participant-5). Cloud adoption also allows the people who manage the e-wallet to "focus on the service and products rather than focusing on infrastructure maintenance" (Participant-2). It

leverages the "technical expertise of the cloud providers" (Participant-3) for support when it comes to operational capabilities, cost, and security. However, participants recognized significant challenges such as vendor lock-in, as articulated by Participant-3, and ambiguities when it comes to the "shared responsibility model," questioned by Participant-4. To mitigate these challenges, participants suggested proactive solutions like the adoption of a "cloud agnostic approach" that will provide flexibility across providers and implementing clear "RACI" processes and "escalation workflows" for incident management.

Lastly, when it comes to evaluating the added value of running an e-wallet on cloud-based technology, the discussion captured that it brings unparalleled scalability and cost-effectiveness, enhanced innovation capabilities, and a significant competitive advantage. The cloud enables "scalability and cost effectiveness" (Participant-6) by allowing resources to be turned on or shut down when needed. Cloud shows a powerful "innovation catalyst" through features like "containerization," which allows for trying new services "without disturbing the current or overall functionality of the e-wallet" (Participant-4). The cloud's 24/7 availability and "Pay as You Go" model contribute to a "limitless" service catering and are a major "growth factor" within the digital financial services landscape, as evidenced by the high adoption rate in the Philippines, helping to "connect people to do business" even during the pandemic (Participant-1). Looking forward, cloud advancements are expected to enable "PhiGital" environments, streamline processes through AI tracks, facilitate "Web3" for data portability, and pave the way for "cryptocurrency" as a future default payment method, as mentioned by Participant-1.

Grouping of Codes and Identifying Themes

The study utilized thematic analysis to identify patterns in data and understand participants' points of view on having cloud infrastructure for e-wallet services. Thematic development was based on the verbatim transcription of the Focus Group Discussion (FGD), ensuring the findings are derived from empirical data. The process included familiarization with the data, initial coding, grouping, collating, and reviewing themes thoroughly.

The process involved checking for internal coherence and external distinctiveness to make sure and establish consistent patterns and an accurate representation of the collective meaning of the codes. Each theme was then clearly defined and given a right-to-the-point, descriptive name, showing its significance to the overall understanding of cloud adoption in e-wallet services.

The structure of the thematic analysis presented the defined themes, supported verbatim directly from the FGD transcript. The approach makes sure that the findings of the study are based on transparency, verifiability, and facts. The study's findings are deeply derived from first-hand experience and knowledge provided by the participants, allowing for a thorough and detailed understanding of cloud adoption in e-wallet services.

Theme vs Response Matrix

Theme	Representative Participant Responses (Evidence from FGD Transcript)
Theme 1: Core Performance and Foundational Capabilities of Cloud	"Ways of working for delivering goods because it is highly agile. Deploy on demand…rollout. Continuous Improvement Continuous Development (CICD). Scalability is also an element, it measures how many users will be catered to, how many transactions we are expecting." (Participant-1) "Key considerations to use cloud is on scaling requirements. To deliver specific service." (Participant-3) "Elastic scalability, cloud allows us to automatically scale compute and storage resources compared to a traditional set up, that you need to over provision your hardware." (Participant-2) "Faster improvement and development, pipelines..serverless." (Participant-2) "With the use of cloud computing technologies, it can save you time and effort in configuration and deployment, giving you more flexibility to assess and complete a project." (Participant-4)
Theme 2: Enhanced Reliability, Security, and Availability	"Another element is chaos engineering, basically linking to the resilience element of the technology. It empowers the idea that whatever happens to your infrastructure will not go down." (Participant-1) "High availability and resilience, cloud providers offer built-in redundancy across multiple availability zones and regions, these are key elements that are largely improved compared to a traditional infrastructure." (Participant-2) "Advanced security and compliance, cloud providers have native security controls like DDOS, not readily available in traditional infrastructure set up." (Participant-2) "Elements like business support, disaster recovery, and you have the commonality of integration which is important when you

	are driving a business totally in the cloud." (Participant-1)
Theme 3: Operational Efficiency and Strategic Focus	"Operational agility of things, we can provision faster like minutes compared to weeks on using cloud." (Participant-2) "When using the cloud, you are just focusing on the service and products rather than focusing on infrastructure maintenance." (Participant-2) "In terms of cost there's a lot of advantage that cloud service providers offer, for long term commitment they offer discounts." (Participant-5) "Technical expertise of the cloud providers. With the use of their technical experts, they help us build an application in terms of operational capabilities, cost, and security." (Participant-3) "Maintenance, cloud service providers can do it for the client." (Participant-5)
Theme 4: Future Innovations Driven by Cloud	"Artificial Intelligence (AI) and Machine Learning (ML) integration is a great game changer... AI can seem to address a lot of things; the cloud infrastructure will be the one to enable that platform making sure it can digit tons of information." (Participant-1) "Emerging technologies lead to PhiGital, a combination of Physical and Digital environments. Cloud is significant to give life to this." (Participant-1) "The design of Web3, with Web3 users can have information containerized, basically they can move their data from one platform to another." (Participant-1) "Next area will be the cryptocurrency, this will increase over time, this will be the default mode of payment in the future." (Participant-1) "AI driven and ML learning approach. To improve our tools for financial operations and cloud operations. To have more visibility to how to manage our operational costs." (Participant-3) "Serverless service set up and scalable services like databases and EKS." (Participant-4)

Theme 5: Challenges and Mitigation Strategies	"Vendor lock in approach. If your application is focused on one cloud provider approach, cloud agnostic approach can help you manage all advantages of cloud technologies." (Participant-3) "Shared responsibility model, who is really the expert is it the customer or the cloud provider?" (Participant-4) "On process Responsible, Accountable, Consulted and Informed (RACI) should be clear." (Participant-6) "Escalation workflow." (Participant-6) "Cloud agnostic gives you flexibility where you can mix to subscribe for enterprise licensing vs to open-source infrastructure." (Participant-3) "Design your solutions into a data lock-in approach, moving data from one country to another to address regulatory requirements." (Participant-3)
Theme 6: Economic Value and Competitive Advantage	"Scalability and cost effectiveness. Cloud based technology helps you buy by clicking on their portal. Cost effective because you can shut down a resource if you don't need it anymore or if you will not use it." (Participant-6) "Containerization, advantage of trying a service or feature to add in your e-wallet without disturbing the current or overall functionality of the e-wallet. It gives you flexibility to do things. Innovation propels the use of technology." (Participant-4) "During the pandemic, it helped connect people to do business." (Participant-1) "The cloud is 24 by 7; it gives you the opportunity to cater services without limit. 'If you are in the cloud, you are limitless.' In cloud you Pay as You Go, traditional is Pay Based on Your Purchased." (Participant-1) "Growth is a factor where cloud really thrives, I think here in the Philippines, 85% of the corporate organization shifted to cloud for their infrastructure." (Participant-1)
Theme 7: Sustainability Considerations	"Companies will look at how they will make it sustainable, what the

	infrastructure of tomorrow will look like when we talk about resilience since there are places in the world that are running out of space to hold data centers." (Participant-1) "Space will demand more land area, land area equates operational expenses or capital expenditure." (Participant-1) "Sustainability will be the thing." (Jayvee) "Environment Sustainability Governance (ESG), an indicator of how you operate as a business contributing to betterment of the environment, marketing for green energy or programming." (Participant-1)

Theme 1: Core Performance and Foundational Capabilities of Cloud

- Agility of Delivery
- On-Demand Deployment
- Continuous Improvement/Continuous Development Benefits
- Scalability (Users/Transactions)
- Flexible Scaling (No Bottlenecks)
- Scaling as Cloud Driver
- Service Delivery Enablement
- Platform Engineering
- Seamless Transactions
- Data-Driven Agility
- Elastic Auto-Scaling (vs Traditional)
- Faster Dev/Serverless
- Time/Effort Savings (Deployment)

Theme 2: Enhanced Reliability, Security, and Availability

- Chaos Engineering (Resilience)

- Infrastructure Resilience (Uptime)
- Disaster Recovery/Business Support
- High Availability/Redundancy
- Advanced Cloud Security (Distributed Denial of Service)

Theme 3: Operational Efficiency and Strategic Focus

- Faster Provisioning (minutes vs weeks)
- Operational High Availability
- Focus on Core Business (vs Infra Maintenance)
- Managed Security Benefits
- Managed Maintenance Benefits
- Provider Technical Expertise

Theme 4: Future Innovations Driven by Cloud

- Future: Serverless
- Future: Scalable Databases
- Future: Artificial Intelligence /Machine Learning Integration
- Future: Data Intelligence
- Future: Multi-Chip Adoption
- Future: Artificial Intelligence Hosting
- AI Enabling Manual Work Automation
- Future: PhiGital (physical and digital) Trend
- Cloud for Innovation Convergence
- Artificial Intelligence for Efficiency (Time To Market)
- Future: Web3 (Data Portability)
- Future: Cryptocurrency (Default Payment)

- Decentralized Market Evolution
- Artificial Intelligence /Machine Learning Integration for Financial Operations/Cloud Operations Cost Visibility
- Future: E-wallet Financial Management

Theme 5: Challenges and Mitigation Strategies

- Challenge: Vendor Lock-in
- Challenge: Shared Responsibility Confusion
- Solution: Clear Responsible Accountable Consulted Informed Matrix
- Solution: Escalation Workflow
- Solution: Role Clarity
- Solution: Cloud Agnostic for Design
- Solution: Cloud Agnostic for Licensing
- Dynamic Business Agility
- Multi-Cloud Use Cases (Specialization)
- Solution: Data Lock-in Design (Regulatory)
- Web3 Adoption Challenges
- Regulatory Evolution
- BSP Regulation of Crypto (Centralized)

Theme 6: Economic Value and Competitive Advantage

- Cost Management Flexibility (Turn On/Off)
- Cost Advantage (Discounts)
- Overall Value: Scalability/Cost
- Ease of Procurement
- Resource Optimization for Cost

- Containerization (Non-Disruptive)
- Flexibility/Innovation Driver
- Pandemic Enabler (Connectivity)
- 24/7 Availability/Limitless Service
- Limitless Potential/Pay-as-You-Go
- Growth Catalyst/High Philippine Adoption

Theme 7: Sustainability Considerations

- Sustainability Concern (Data Center Space)
- Cost of Data Center Expansion
- Sustainability as Key Future Factor
- Environmental Social and Governance
- Green Energy

Reviewing and Definition of Themes

Theme 1: Core Performance and Foundational Capabilities of Cloud. This theme covers the basic features of cloud technology that directly affect the performance of the e-wallet, like its scalability, speed in deployment, and efficiency in performing different tasks. The participants kept mentioning the cloud's natural capability to change and adapt.

Theme 2: Enhanced Reliability, Security, and Availability. This theme touches on how cloud technology improves the e-wallet's stability, handles security threats, and ensures continuous service availability.

Theme 3: Operational Efficiency and Strategic Focus. This theme describes the practical advantages observed by participants, highlighting how cloud adoption

improves the operations and allows the teams to focus more on core business functions instead of infrastructure maintenance.

Theme 4: Future Innovations Driven by Cloud. This theme includes the forward-looking view on how continued advancements in cloud technology will deliver new features, services, and strategic transformations for the e-wallet.

Theme 5: Challenges and Mitigation Strategies. This theme discusses the difficulties encountered in managing cloud-based infrastructure and the proposed ideas or strategic approaches to resolve them.

Theme 6: Economic Value and Competitive Advantage. This theme sums up the overall business value that comes from using cloud technology, particularly to its impact on cost-effectiveness and the e-wallet's position in the competitive digital financial services industry.

Theme 7: Sustainability Considerations. This theme talks about a future concern regarding the environmental and long-term economic sustainability of cloud infrastructure, specifically when it comes to physical data center expansion.

X. ANALYSIS AND DISCUSSION

The analysis of this study is based on the qualitative data gathered through a Focus Group Discussion (FGD). It is designed to explore the varied impact of cloud infrastructure on a specific e-wallet that is currently widely used in the Philippines. The primary objective of this analysis was to show and interpret the underlying patterns and meanings within the participants' discussion by means of identifying, analyzing, and evaluating the key features, benefits, challenges, and added value of cloud-based technology. The entire analytical process, from data familiarization to theme creation, was thoroughly performed and directly derived from the verbatim transcription of the FGD to ensure a strong and fact-based interpretation of the findings.

The formulation of themes followed a structured thematic analysis approach, a method that is well known for its flexibility and depth in qualitative inquiry. Initially, the researcher undertook an extensive process of familiarization with the data by thoroughly reading the entire FGD transcript. This part was crucial for understanding the overall context, identifying initial points of interest, and developing a comprehensive understanding of the participants' statements based on their experiences. The next step is the initial coding, which was carefully created, wherein the transcript was reviewed line-by-line. During this stage, the researcher looked for significant terminologies, expressions, and concepts directly relevant to the research questions were extracted and assigned initial descriptive codes. This comprehensive coding ensured that no relevant information was overlooked, capturing the details of each participant's contribution. The researcher started searching for themes by grouping these numerous initial codes into broader, more abstract categories. This

repetitive process involved identifying commonalities, recurring ideas, and shared perspectives among the codes, allowing for the combination of small details of data to make useful patterns. These identified patterns were then carefully reviewed by the researcher for coherence and distinctiveness, ensuring that each theme represented a clear and unified idea while remaining distinguishable from others. This critical evaluation also involved verifying that the themes accurately reflected the entirety of the dataset. Lastly, each theme was carefully defined and assigned a descriptive name, clearly showing its conceptual boundaries and its significance within the broader study, to provide a clear framework for presenting the findings.

The thematic analysis led to several core themes; each was strengthened by the informative discussion from the FGD participants:

One of the notable themes focused on the Core Performance and Foundational Capabilities of Cloud. The participants consistently emphasized the cloud's features of agility, scalability, and resilience as fundamental drivers of the e-wallet's improved performance. Participant-1 articulated how the cloud enables "Ways of working for delivering goods because it is highly agile. Deploy on demand…rollout. Continuous Improvement Continuous Development (CICD)." The critical role of scalability was further emphasized, with Participant-1 noting its importance in measuring "how many users will be catered to, how many transactions we are expecting." Another participant, Participant-2, underscored this by explaining the "Elastic scalability" of cloud, which allows for automatic scaling of resources, unlike traditional setups. The concept of "chaos engineering" was introduced by Participant-1 as proof of the cloud's resilience, empowering the belief that "whatever happens to your infrastructure will not go down." This theme underscores the cloud's

capacity to perform seamless, adaptable, and strong operational frameworks for the e-wallet.

The second notable theme discussed was Enhanced Reliability, Security, and Availability. The FGD discussions revealed that the cloud significantly strengthened the e-wallet's operational integrity. Participants highlighted the "High availability and resilience" offered by cloud providers through "built-in redundancy across multiple availability zones and regions," as explained by Participant-2. This innate redundancy is an immense improvement over traditional infrastructure, ensuring continuous service delivery. Furthermore, the advanced security posture of cloud environments was frequently recognized, with Participant-2 highlighting that "cloud providers have native security controls like DDOS, not readily available in traditional infrastructure set up." The cloud comprehensive security framework is vital not only when it comes to maintaining user trust but also when it comes to protecting sensitive financial data.

The theme of Operational Efficiency and Strategic Focus also came out, reflecting the advantages that the organization gained through utilizing and adopting the cloud. Participants underscored how cloud technology streamlines operations, allowing for faster provisioning, reducing maintenance challenges, and providing a more strategic allocation of internal resources. Participant-2 briefly captured this notable benefit by stating, "When using the cloud, you are just focusing on the service and products rather than focusing on infrastructure maintenance." The cost advantages, such as discounts for long-term commitments (Participant-5), and the readily available "technical expertise of the cloud providers" (Participant-3), further contribute to the e-wallet's operational efficiency and allow the organization to concentrate on its core business objectives rather than infrastructure maintenance.

Future Innovations Driven by Cloud was one of the significant themes. Participants envisioned the cloud as a key platform for integrating next-generation technologies into e-wallet services. Discussions focused towards the potential of "Artificial Intelligence (AI) and Machine Learning (ML) integration," with Participant-1 suggesting that "AI can seem to address a lot of things, the cloud infrastructure will be the one to enable that platform." The concept of "PhiGital," a combination of physical and digital environments, was discussed as a future landscape made possible by cloud advancements. Moreover, the emergence of "Web3," enabling users to have "information containerized" and portable across platforms, and the anticipated wider use of "cryptocurrency" as a future default payment method, were all seen as innovations driven by continued advancements in cloud technology.

Also, the analysis covered the theme of Challenges and Mitigation Strategies associated with cloud adoption, another notable theme. The primary concerns discussed by the participants included the risk of "Vendor lock-in approach," where applications become heavily dependent on a single cloud provider, as shared by Participant-3. Another significant challenge highlighted was the ambiguity within the "Shared responsibility model," with Participant-4 questioning, "who is really the expert, is it the customer or the cloud provider?" The participants proposed strategic solutions to address these concerns such as the utilization of the "cloud agnostic approach", this approach aims to maintain flexibility across multiple cloud providers and implementing clear "RACI (Responsible, Accountable, Consulted and Informed)" processes and "escalation workflow" (Participant-3) to ensure effective incident management and accountability.

The other notable theme is the Economic Value and Competitive Advantage provided by cloud technology, which is a key issue. Participants consistently emphasized the unparalleled scalability and cost-effectiveness that the cloud offers.

Participant-6 explained that cloud-based technology "helps you buy by clicking on their portal" and is "Cost-effective because you can shut down a resource if you don’t need it anymore." This pay-as-you-go model is very different from traditional infrastructure's upfront capital expenditures. The cloud's ability to facilitate "Containerization" (Participant-4) also allows for much faster feature deployment without disrupting existing services, serving as an "Innovation catalyst." Crucially, the cloud has positioned the e-wallet competitively, enabling 24/7 service availability and fostering significant "Growth" within the Philippine digital financial services market, as evidenced by the high percentage of corporate organizations shifting to the cloud for infrastructure (Participant-1).

The last one is considered an emerging theme, it is the Sustainability Considerations. Participants raised concerning questions about the long-term environmental and economic sustainability of cloud infrastructure, particularly concerning the physical footprint and energy consumption of data centers. Participant-1 shared the thought, "Companies will look at how they will make it sustainable, what the infrastructure of tomorrow will look like... since there are places in the world that are running out of space to hold data centers." The discussion also touched upon "Environment Sustainability Governance (ESG)" as an important indicator for businesses operating in the cloud, signaling a growing awareness of the ecological impact of digital infrastructure.

The thematic analysis of the FGD transcript indicates how the participants' firsthand experiences and insights support each formulated theme. The findings clearly demonstrate the cloud's significant role when it comes to enhancing performance, ensuring reliability, optimizing operations, and driving future innovation for the e-wallet, while also dealing with critical challenges and emerging considerations like sustainability. The analysis provides valuable empirical evidence directly aligned with the study's objectives.

XI. RECOMMENDATION AND CONCLUSION

The study focused on assessing the use of cloud-based technology in a specific e-wallet platform in the Philippines. Its main objectives were to identify the cloud features that enhance the e-wallet's performance, examine its benefits and challenges from the perspective of its internal managers, and evaluate its overall value within the Philippine financial system. A qualitative case study design was used, with data gathered through a Focus Group Discussion (FGD). Participants were selected from the Technology Planning and Innovation department of the e-wallet company based in Bonifacio Global City, Taguig. These participants, including Unit Heads and Managers with at least two years of experience, were involved in planning, monitoring, and maintaining the platform's infrastructure. Prior to the FGD, pilot testing of the questionnaire was conducted with IT professionals, and participants received the questionnaire a day in advance. Consent for audio recording was obtained to ensure accurate transcription.

Making the cloud an infrastructure has improved operational capabilities, provided better quality of performance, reliability, and security of the e-wallets, while supporting innovation and providing a competitive advantage in the digital financial services market. This change has made it possible for the e-wallet to move its focus from maintaining its infrastructure to providing core services and creating new products. It has also contributed to future progress in AI, Web3, and possibly decentralized finance.

Conclusions

The conclusion from the Focus Group Discussion makes it clear that cloud infrastructure plays a significant part in the e-wallet's core features, such as

enhancing its performance, agility, and scalability. The cloud's built-in reliability and advanced security features are significant for maintaining user trust and ensuring continuous service delivery. Also, cloud adoption greatly contributes to operational efficiency, simplifying processes that result in faster provisioning, lowering maintenance costs, and providing greater strategic focus on core business activities instead of just managing the infrastructure.

People could agree that new ideas and tools in the future will highly likely depend on the cloud. It is widely known as an essential platform for integrating advanced technologies such as Artificial Intelligence (AI) and Machine Learning (ML), the development of Web3, and driving the broader adoption of cryptocurrency. Apart from the significant advantages, there are challenges that do exist, such as vendor lock-in and the complexities of the shared responsibility model, which requires careful planning and methods for mitigation. Despite these challenges, the cloud definitely provides a recognizable advantage or added value with its scalability, cost-effectiveness, and 24/7 availability that strengthens the e-wallet's position within the growing Philippine digital financial services industry. Lastly, the long-term environmental and economic sustainability of cloud infrastructure is becoming a major concern, especially as we consider building more and bigger data centers.

Recommendations

To effectively utilize the cloud infrastructure for the e-wallet and efficiently manage its innate complexities, different strategic recommendations are discussed with the participants of the study. Firstly, it is highly recommended that the e-wallet company consider adopting a cloud-agnostic strategy. This approach will play a vital role in increasing operational flexibility and mitigating the risks associated with vendor

lock-in. This will allow the e-wallet to strategically select and integrate the most suitable features and services from multiple cloud providers to meet diverse and continuously evolving demands. By doing this, it will immediately contribute to the optimization of the e-wallet's cloud infrastructure and enhance its competitiveness, aligning with the study's significance for the e-wallet company.

Secondly, to improve operational efficiency and effectively mitigate future risks, not only the department of the participants but the entire organization should prioritize the establishment of clear and well-defined operational frameworks. This includes exercising strong RACI (Responsible, Accountable, Consulted, and Informed) tables and implementing strong problem-solving methods. Such clarity in roles' responsibilities and processes will guarantee that potential incidents will be managed efficiently, and problems will be resolved smoothly, which directly improves the e-wallet's services.

In addition to maximizing the transformative potential of cloud-native technologies innovations, the e-wallet organization is recommended to make a strategic investment in developing the necessary skill sets among its personnel. This could guarantee that the organization possesses the internal expertise to successfully fully manage various emerging technologies like Artificial Intelligence, Machine Learning, Web3, and cryptocurrency, which will result in increased competitiveness in the digital financial services landscape. This proactive development of human capital is vital for making technological potential into tangible service improvements.

When it comes to addressing existing challenges, it is recommended that the people in the position to proactively engage with cloud providers who demonstrate a willingness and offer commitment in addressing issues such as vendor lock-in through

multi-cloud or hybrid strategies. Also, recommending and ensuring that these cloud providers clearly define the shared responsibility model is critical to maintaining user confidence and strong security postures. This collaborative yet proactive approach contributes valuable insights and best practices to the larger digital financial services industry.

To continuously improve operational efficiency and promote cost-effectiveness of the e-wallet organization, the team is highly advised to implement evolving optimization practices. This includes automating the routine tasks and performing regular resource evaluation to ensure optimal utilization of cloud resources. Such optimization allows the management team to dedicate more time and effort to key business demands, which directly contribute to continuous service improvement and maintaining a competitive edge.

Lastly, recognizing the growing global importance of responsible technology use, the e-wallet company is recommended to prioritize environmental and economic sustainability within its cloud operations. This includes actively evaluating and coordinating with cloud providers' green initiatives, striving to maintain clear carbon footprint reports, and implementing an effective optimization strategy for all cloud resources. This commitment not only promotes and establishes the e-wallet as an environmentally conscious organization but also brings awareness to policymakers and regulators about the increasing demands and best practices in the digital financial industry that is concerned with sustainable operations.

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APPENDICES

Appendix A

University of the Philippines Open University

Dear Mr./Ms. _____,

I am writing to formally invite you to participate in a Focus Group Discussion (FGD) and SWOT Analysis for my case study, "TECHNOLOGY ASSESSMENT OF CLOUD-BASED E-WALLET AS A TECHNOLOGICAL INNOVATION IN THE PHILIPPINES." Your experience and understanding of the e-wallet landscape would provide invaluable insights crucial to the success of this research.

This case study aims to achieve the following objectives:

- To identify the key features of the cloud that helped improve the performance of the specific e-wallets.
- To analyze the benefits and challenges of using cloud-based technology for e-wallets from the perspective of the individuals who manage these platforms.
- To evaluate the added value of running an e-wallet in cloud-based technology.

I believe your experience will offer a unique and meaningful perspective, significantly enriching our findings. The FGD will be held on June , 2025 at Bonifacio Global City, Taguig. The session is expected to last approximately 45 - 60 minutes.

Please be advised that, for accuracy in data collection and analysis, the interview session will be recorded. Rest assured, all recorded data and transcribed information will be handled with the utmost confidentiality.

In adherence to the Data Privacy Act of 2012 (Republic Act No. 10173), all personal data collected during this interview will be securely processed and maintained. Your identity will be anonymized in any reports or publications stemming from this case study to protect your privacy. Your participation is entirely voluntary, and you are free to withdraw at any point.

I am confident that your contribution will be instrumental in developing a comprehensive and insightful technology assessment of cloud-based e-wallets in the Philippine context.

Thank you for considering this invitation.

Sincerely,

Rowell G. Cantal
Master's Student
Faculty of Management and Development Studies

Appendix B

Focus Group Discussion Questionnaire

Questions related to key cloud features and performance

1. What specific features or aspects of the cloud infrastructure do you believe have significantly contributed to the performance (e.g., speed, reliability, scalability) of the e-wallet? Can you provide specific examples?
2. In what ways has utilizing the cloud environment improved the technical capabilities and overall functionality of the e-wallet services compared to what might have been possible with traditional infrastructure?
3. Beyond current performance, what specific cloud features or services do you think could further innovate or significantly improve the e-wallet's technical capabilities in the next 1-3 years?

Questions related to the benefits and challenges of managing cloud-based e-wallet

4. From your perspective as someone involved in managing this cloud-based e-wallet infrastructure, what are the key advantages or benefits you've observed in using cloud technology for the operations? (e.g., cost, security, flexibility, maintenance)
5. What are some of the significant challenges or difficulties that come with managing an e-wallet platform on a cloud infrastructure? (e.g., security concerns, vendor lock-in, managing costs, technical expertise required)
6. Considering the challenges you've faced, what innovative solutions or improvements in cloud management strategies do you believe are necessary to enhance operational efficiency and mitigate future risks?

Questions related to the added value of cloud-based technology

7. In your opinion, what is the overall added value of running the e-wallet platform on cloud-based technology compared to traditional methods? Consider factors like scalability, security, innovation, and cost-effectiveness.
8. How do you believe the use of cloud technology has positioned the e-wallet within the competitive landscape of digital financial services in the Philippines?
9. Looking forward, what new services, features, or strategic innovations for the e-wallet do you envision becoming possible or significantly enhanced, specifically due to continued advancements in cloud technology?