International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-13 Issue-5, April 2024

A Framework for Innovating the Technological Startup in the Cordillera Region through an E-commerce Mobile Platform

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Abstract*: The technological startup community is beginning to be recognized in solving various needs in the Cordillera region. However, these technological startups experience limited growth due to challenges such as financial concerns, limited market reach, a lack of awareness of intellectual property rights, and inadequate digital infrastructure. Thus, the researcher proposed the development of an e-commerce mobile application that addresses the needs of startups. Through the use of data gathering techniques, the researcher determined the design considerations in terms of the architecture framework and features of the e-commerce mobile application that addressed the problems encountered by startups in the Cordillera region. The use of the 4+1 view model illustrated the architecture framework of the e-commerce mobile platform for intended stakeholders by providing a logical view, process view, physical view, development view, and scenario view. The architecture framework was used to determine the features to be integrated into the proposed e-commerce mobile application, addressing the challenges faced by technological startups in the Cordillera region.

***Keywords*: E-commerce, Mobile Platform, Technological Startup, 4+1 Architecture Framework**

I. INTRODUCTION

The Philippine startup ecosystem's progression presents significant potential to make a substantial contribution to national economic growth and development. Billones et.al (2020) discussed that the Philippines boasts a rapidly growing startup ecosystem [1], fueled by a young and tech-savvy population, increasing internet penetration, and government initiatives promoting innovation [2]. Venture capital investment in Philippine startups specifically located in the National Capital Region has seen a sharp rise over the past few years, indicating growing investor confidence and opportunities for expansion [3]. The proliferation of startups is flourishing across various sectors, including fintech [4], e-commerce, logistics, agritech, and cleantech showcasing their extensive economic potential [5]. Filipino startups are increasingly gaining recognition on the global stage, winning awards and attracting international partnerships [6].

Nestled amidst the breathtaking landscapes and rich cultural heritage of the Cordillera region in the Philippines, a vibrant and thriving spirit of entrepreneurship thrives within its communities. A fusion of traditional ingenuity and modern techniques creates unique and innovative products and services for many startups, comprised of innovators who foster economic development. The spirit of communal cooperation fuels collaborative ventures and community-driven solutions that address local challenges. From sustainable farming initiatives to eco-tourism endeavours, startups through their technological innovations prioritize the well-being of their communities, promoting social inclusion and environmental responsibility [7]. For instance, the Agri-Robot for Crop Health in Insect Control or ARCHIE, has been developed to help the farmers in Benguet [8]. Cordilleran innovators from Baguio City and Benguet develop innovative solutions using readily available material and expertise, encouraging self-reliance and empowering communities to take charge of economic development [9]. Despite the region boasting an increasing spirit of entrepreneurship fueled by community, resilience, and innovation, there exists a limited growth of startups in the Cordillera. The researcher explores the distinct challenges faced by startups in the region, such as financial concerns [9], [10], limited market reach, lack of awareness of intellectual property rights and inadequate digital infrastructure [11]. Startups in the Cordillera region often struggle to obtain funding, which can lead to their being put on hold or terminated. Several factors contribute to their suspension or cessation, including the limited availability of venture capital [9], the perceived riskiness of startups [12], and the absence of a track record of successful exits [11], [13]. The National Economic Development Authority (NEDA) [12] emphasized that the lack of venture capital is the main culprit in the termination of most startups. Similar sentiment has been evident in the studies conducted by Alyobi et.al (2020) [13], Hoegen, et.al (2018) [14], and Lerner, et.al (2020) [15]. Startups often experience a limited market reach, remaining hidden gems to potential customers. Startups fail to tap into wider regional or national markets where their unique offerings could resonate with a broader audience [11]. The absence of effective digital footprints poses a challenge for startups to establish connections with their ideal customer segments [11]. Insufficient visibility for startups translates to limited brand recognition, which presents a formidable obstacle for them to establish a foothold in their respective industries and attract new clientele. Without market access, startups struggle to generate revenue and gain traction, which hinders their ability to invest in building a more substantial online presence and expanding their reach.

Manuscript received on 02 April 2024 | Revised Manuscript received on 08 April 2024 | Manuscript Accepted on 15 April 2024 | Manuscript published on 30 April 2024.
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The lack of access to mentorship and support exacerbates the challenges entrepreneurs face in the region. There is a limited pool of experienced mentors, making it difficult for startups to get the guidance and support they need to succeed [11], [18].

Many startups in the Cordillera region are unaware of the importance of intellectual property protection, which can result in them missing out on potential revenue and investment opportunities. Additionally, the lack of access to legal and technical expertise can make it difficult for startups to protect their IP rights [14], [16]. These are some of the challenges faced by startups in the Cordillera region.

An e-commerce mobile platform could help address these challenges by providing startups with a digital platform to showcase their products and services [4]. Unlike physical stores, a mobile platform transcends geographical limitations and startups can reach customers across the region and beyond, regardless of their location, overcoming the challenges of remoteness and limited digital infrastructure [17], [19]. Users can access the platform anytime, anywhere, using their smartphones [20], eliminating the need for computers or fixed internet connections, which increases customer engagement and simplifies transactions for both vendors and buyers [19].

This research paper examines the potential of an e-commerce mobile platform to act as a catalyst for innovation within the technological ecosystem of the Cordillera region. Through the use of an e-commerce mobile platform, the researcher proposes a solution that empowers entrepreneurs by (a) expanding market access through connecting local startups with broader audiences; (b) bridging the digital divide through fostering digital literacy and providing a digital storefront to showcase their products and services; and (c) establishing a collaborative environment by fostering communication and transactions among startups, enablers, investors, mentors and stakeholders within the digital platform.

The Cordillera's entrepreneurial spirit aligns perfectly with the core principles of Sustainable Development Goal 9 by promoting innovative sustainable technologies [21], [24]. By nurturing a culture of innovation and collaboration [22], the e-commerce platform empowers communities to address local challenges and develop solutions that benefit the wider Filipino community. The e-commerce platform acts as a digital infrastructure [23], bridging the gap between Cordillera's entrepreneurs and regional and national markets, facilitating wider access to goods and services. By supporting local businesses and creating employment opportunities [25], the platform empowers individuals and communities by promoting inclusive and sustainable industrialization.

Based on the literature above, the researcher proposes an e-commerce mobile application to innovate the technological startup ecosystem of the Cordillera region. In this research paper, the researcher aimed to determine the design considerations in terms of the architecture framework and features of the proposed e-commerce mobile platform that address the problems encountered by startups in the region.

II. RESEARCH METHOD

This research paper employed a descriptive analysis approach to investigate the potential of an e-commerce mobile platform for innovating the Cordillera region's technological startup ecosystem. A case study research is a type of descriptive research that focuses on a single individual, group or event, which involves collecting information on the subject through a variety of methods such as interviews and examination of documents [26].

Through the use of a literature review and a series of interviews, the researcher gathered data for the study. A literature review from government and non-government organizations' reports documented by the Department of Trade and Industry (DTI), Department of Information Communications Technology (DICT), Department of Science and Technology (DOST) and National Economic Development Authority (NEDA) in partnership with private organizations such as Gobi-Core Philippines Fund, Startup Village PH, and Impact Hub Manila about the technological startup ecosystem in the Philippines were analyzed to understand the current state of the technological startup ecosystem in the Cordillera region. This included studies and reports on challenges faced by startups not only in the area but nationwide. A series of interviews with a diverse group of stakeholders to gain deeper insights into challenges and opportunities related to the proposed e-commerce platform. This included local incubator-accelerators, such as the University of the Cordilleras Innovation and Nurturing Space Technology and Business Incubator (UCIANS TBI), which provided insight into the local startup ecosystem and a detailed explanation of the processes a startup would go through, from pitching to incubation stages. This helped in identifying processes to be automated and integrated into the e-commerce mobile platform. Another stakeholder interviewed was technology experts and developers from the Google Developer Group Baguio (GDG Baguio) to gather insights into the technical feasibility and functionalities of the platform, as well as identify salient features in the design and development of the e-commerce mobile application.

The researcher utilised Scrum methods, specifically the Initiate and Planning phases, to identify the architecture framework in the design considerations of the proposed e-commerce mobile application. In the initiation phase, the project vision has been created, stakeholders have been identified, and a prioritised product backlog has been established. In the planning and estimation phase, user stories have been made, approved, estimated, and committed to, and a sprint backlog has been established. Scrum is an iterative and incremental agile software development methodology, with the key principle being the volatility of requirements. Scrum is focused on user engagement in each phase of the method, responding to the emerging requirements of users and adapting to evolving market technologies. The Scrum phases involved in this research paper produced deliverables, including an architecture framework consisting of class, activity, deployment, package, and use case diagrams.

III. RESULTS AND DISCUSSION

Through the data gathering techniques employed, this research identified the design considerations for determining the architecture framework and relevant features of an e-commerce mobile application that address the

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challenges faced by startups in the Cordillera region.

A. Architecture Framework

The researcher adopted the 4+1 view model to present the architecture framework of the proposed e-commerce mobile application from different stakeholder perspectives. The view model provided multiple views that addressed the concerns of the stakeholders with the corresponding features of the proposed e-commerce mobile application. The view model provided essential views, including logical, development, process, and physical views of the application. The view model is extended by adding one more view called the scenario view for end-users of the proposed mobile application. This aligns with the other views and is used to illustrate the architecture of the mobile application, serving as a "plus one" view, resulting in a 4+1 view model. Fig. 1 describes the software architecture using five concurrent views.

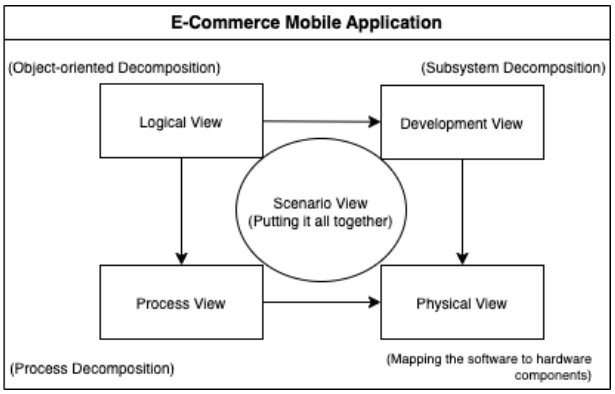

Fig. 1. The 4+1 View Model Presents the Architecture Framework of the E-Commerce Mobile Application.

The logical view describes. The object component, considering the functional requirements, of the proposed mobile application. This view shows that the startup person-in-charge object is the core functionality of the e-commerce mobile application. The startup person-in-charge object interacts with specific objects for specific functionality. The startup person-in-charge object can create, update, and delete one or more product-service objects, as well as create one or more pitch deck objects. The startup person-in-charge object can apply for one or more commercialisation initiatives from one or more enabler objects. The enabler object extends to either an incubator-accelerator or an angel investor who views and evaluates one or multiple pitch deck objects for commercialization. The startup person-in-charge can apply for one incubation program from one enabler object at a time, while the enabler can assess one or more startup objects for an incubation program.

The process view describes the activities of the proposed mobile application, capturing the concurrency and synchronization aspects of the software design. The activity diagram in Fig. 2, considering non-functional requirements, illustrates the workflow of the commercialisation and incubation processes for the startup person-in-charge communicating with an enabler through the use of the e-commerce mobile application.

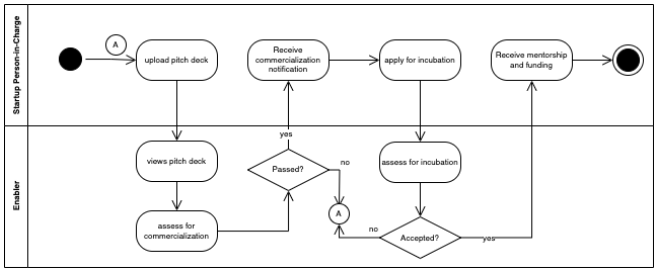

Fig. 2. The Activity Diagram Shows the Commercialization and Incubation Processes in the E-Commerce Mobile Application

The development view describes the static organisation or structure of the mobile application in its development environment, considering the software module organisation and the constraints of the tools. This view is illustrated from a programmer's point of view, showing the building block views of the mobile application. The mobile application and its components interact with the Firebase console and Google Cloud Server through their respective Application Programming Interfaces (APIs). Data collection through storage and retrieval operations occurs via these connection interfaces.

The physical view describes the mapping of software onto hardware components, reflecting its distributed nature and considering non-functional requirements related to the underlying hardware—the deployment diagram in Figure. Figure 3 shows the installation, configuration, and deployment of the proposed e-commerce mobile application. The mobile Android device serves as the host for the e-commerce app, which can run on the Android operating system. The components within the e-commerce mobile application provided intended functionalities and interaction with the Google server. The Google server comprises the Google Cloud Console and Firebase Console.

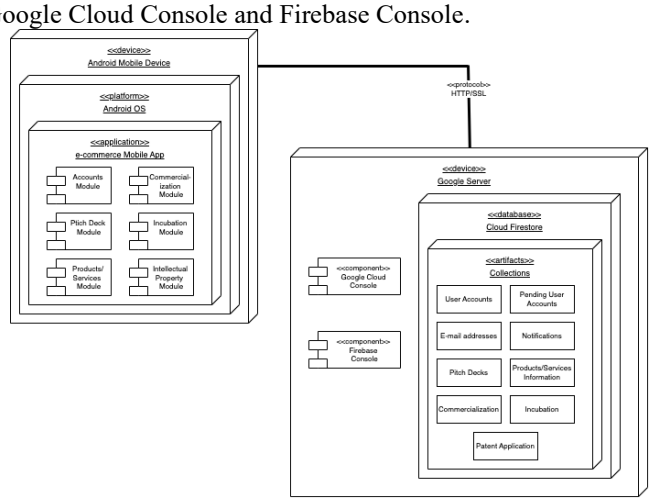

Fig. 3. The Deployment Diagram Shows the Mobile Device Interaction with the Google Server

The scenario view describes that the design is complete by validating and illustrating the system's consistency. The use case diagram in fig. 4 shows the leading actors with their corresponding actions in the e-commerce mobile application. The startup person-in-charge can manage the startup company accounts, including creating, editing, and deleting the startup company information. They also

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manage their pitch deck, which includes uploading and deleting video pitches, as well as managing product and service information. The startup person-in-charge can apply for incubation, as well as view information on property rights and apply for patents. On the other hand, the enabler, who can be either an incubator-accelerator or an angel investor, can view the pitch deck, assess the commercialisation potential of the startup company's product or service, review the application for incubation, and assist with the startup company's patent application.

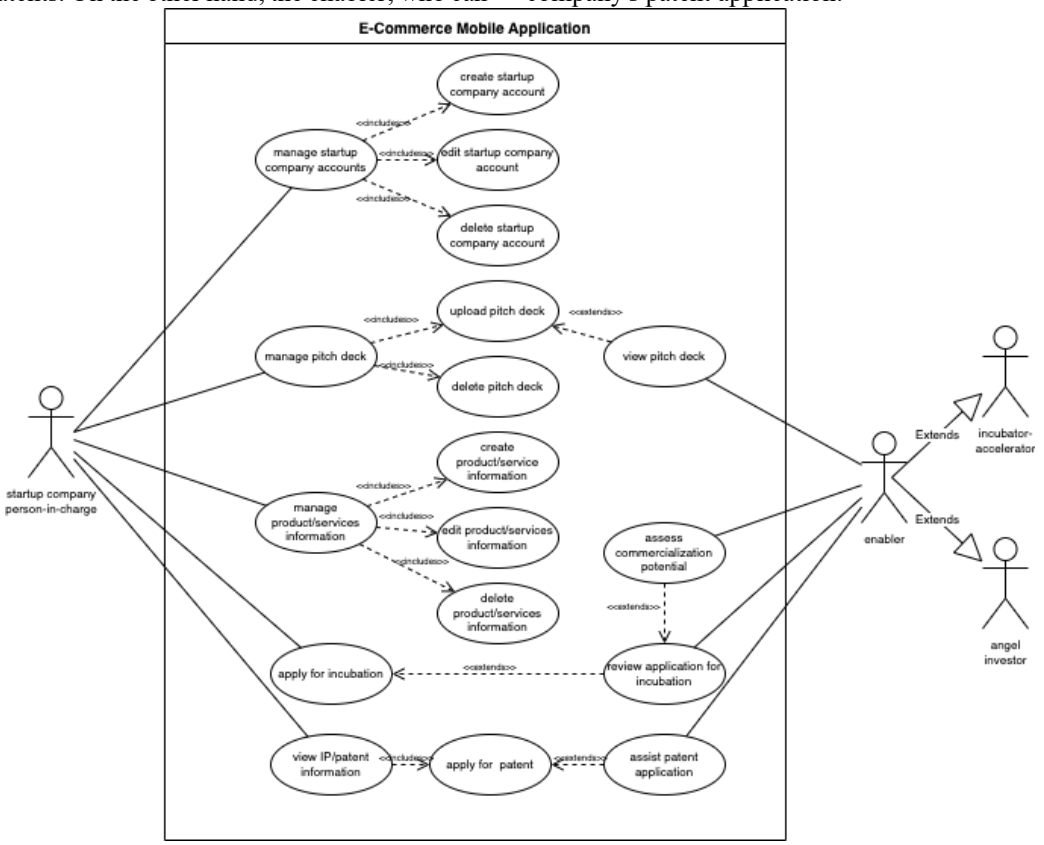

Fig. 4. The Use Case Diagram Shows the Actors and their Corresponding Actions in the E-Commerce Mobile Application

B. Features of the Proposed E-commerce Mobile Application

From the architecture framework, features were identified to address the challenges faced by startups in the Cordillera region, including user account management, product-service management, commercialisation management, incubation management, and intellectual property awareness.

User account management. This feature enables a startup person-in-charge to manage their user accounts by creating an account that allows them to create, edit, and delete their startup company information. This will serve as a security measure for the application, providing access to specific users.

Commercialization management. This feature enables the startup person-in-charge to manage their product or service information, including creating, updating, and deleting product and service information. This feature allows the startup person-in-charge to manage their pitch deck, including uploading a pitch deck that showcases the minimum viable product they intend to offer to customers, ultimately attracting interest from prospective enablers, such as incubator-accelerators or angel investors. This feature provides an enabler, such as an incubator-accelerator or an angel investor, with a platform to assess a startup company's pitch deck for commercialisation purposes. If the pitch deck passes the given criteria, the startup company will receive mentorship and funding from the enabler.

Incubation management. This feature allows the startup person-in-charge to apply for an incubation program, which includes mentorship and funding from reputable enablers such as incubator-accelerators and angel investors. After careful assessment of the application for incubation, the enablers either accept or deny the incubation request. If the request is accepted, the startup will receive mentorship and funding from the enablers.

Information Property (IP) management. This feature enables the startup person-in-charge to be aware of existing policies and guidelines regarding Intellectual Property (IP) rights, which protect the product or service offered by the startup company. This also allows the startup person-in-charge to ask for assistance from enablers for a patent application to the Intellectual Property Office of the Philippines (IPOPHIL).

IV. CONCLUSION

The use of the 4+1 view model, which provides a logical view, a process view, a development view, a physical view, and a scenario view, illustrates the architecture framework for the design considerations of the proposed e-commerce mobile application. This view model represented multiple views specifically targeting the intended viewer as an end-user, developer, project manager, or system engineer.

The features that were identified from the design consideration and shall be integrated into the development of the proposed e-commerce mobile application were able to address the challenges of the startup technological community in the Cordillera region such as providing a digital mobile platform to showcase their products and services, pitching their minimum viable product for commercialization purposes to the enablers to be able to reach market access, requesting incubation program from enablers to access mentorship and funding, and asking for assistance in protecting their product through Intellectual Property (IP) awareness and patent application. The identified architecture framework and features of the e-commerce mobile application will serve as the backbone for its development. They will be further extended to study the usability of the mobile application among its intended stakeholders.

DECLARATION STATEMENT

Funding	No, I did not receive.
Conflicts of Interest	No conflicts of interest to the best of my knowledge.
Ethical Approval and Consent to Participate	No, the article does not require ethical approval or consent to participate, as it presents evidence that is not subject to interpretation.
Availability of Data and Materials	Not relevant.
Anthors Contributions	I am the sole author of the article.

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