Product to Platform Strategy: Transitioning COVID-19 Citizen Tracing Product to Centralized Personal Health Record (PHR) Platform in Indonesia

by Sabrina Woro Anggraini Listyo

B.S. Computer Science, Gadjah Mada University

Submitted to the
System Design and Management Program
In Partial Fulfillment of the Requirements for the Degree of

MASTERS OF SCIENCE IN ENGINEERING AND MANAGEMENT

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2023

Authored by: Sabrina Woro Anggraini Listyo
System Design and Management
May 12, 2023

Certified by: Michael A. Cusumano
Sloan Management Review Distinguished Professor of Management
Thesis Supervisor

Accepted By: Joan S Rubin
Executive Director and Senior Lecturer System Design and Management Program

This page is intentionally left blank.

Product to Platform Strategy: Transitioning COVID-19 Citizen Tracing Product to Centralized Personal Health Record (PHR) Platform in Indonesia

by

Sabrina Woro Anggraini Listyo

Submitted to the System Design and Management on May 12, 2023, in Partial Fulfillment of the Requirements for the Degree of Master of Science in Engineering and Management

ABSTRACT

Institutions are increasingly realizing the importance of transitioning from stand-alone digital products to platform-based models. This shift presents several challenges, as platforms need to build an ecosystem that involves multiple third-party partners. This study examines the Satu Sehat app ("Healthy United" in Indonesian) application from the Indonesian Ministry of Health. It serves as a health service platform that enables citizens to access their Personal Health Records (PHR) and improve the patient's journey. The app evolved from a stand-alone digital product, the previous national COVID-19 tracing app, Peduli Lindungi. Satu Sehat Mobile platform has a unique model compared to other commercial platforms developed by private companies, as it is created by a government institution, the Digital Transformation Team (DTO) from the Ministry of Health. As a result, its key metrics and success factors differ from those of commercial platforms. Through a combination of literature review and interview with the platform development team, this thesis explores why a product should evolve into a platform, what key factors drive a successful transition from product to platform, and how platform owners can effectively collaborate with third-party complementors. One key advantage of a platform-based model is the potential to create network effects, where the value of the platform increases as more users and third-party complementors join and interact with it. Effective collaboration with third-party complementors is also critical to the success of a platform-based model. This involves providing the necessary tools and resources to enable complementors to build on the platform and monetize their services. Drawing from the thesis findings, institutions can better assess whether adopting a platform-based model is necessary to remain competitive and relevant in today's market.

Thesis supervisor: Michael Cusumano

Title: Sloan Management Review Distinguished Professor of Management

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my late mother, Mama, whose unwavering love, care and unimaginable support have profoundly impacted my life and consistently motivate me to be a good person who brings a positive impact to my surroundings. I am truly grateful for her influence and the indelible mark she has left on my heart.

To my father, Papa Bear, whose guidance, words of wisdom, and unwavering belief in me have been instrumental in my life journey and inspired me to be the best version of myself. Your constant support has shaped me into who I am today.

To my sisters, Bia and Viera, for their constant encouragement and energizing memes that gets me through the day. I am grateful to have been born into our warm and loving family, the Listyo family.

I am grateful for the invaluable experience I received at MIT SDM program. Thank you for the MIT community, Indonesians at MIT, and friends in Boston and Cambridge that made my Masters experience truly memorable.

To my thesis advisor, Professor Michael Cusumano, for his guidance and invaluable insights throughout the process of writing my thesis. I am grateful to the Ministry of Health of Indonesia for granting me permission to use their project as the topic of my research.

I am grateful for the support provided by the LPDP scholarship, which enabled me to pursue my studies and achieve my academic goals.

Lastly, I would like to express my deepest appreciation to my husband, Mas Belva, whose unwavering support, care, and understanding have been my constant source of strength in my life. I am incredibly grateful for your presence in my life.

Thank you. I am truly grateful for this once-in-a-lifetime journey.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

1.1. Introduction

In Indonesia, access to healthcare is incredibly challenging due to the country's unique geography, with 17,000 islands separated by considerable distances and a large population of 270 million people. The fourth most populous country in the world, Indonesia has one of the lowest ratios of hospital beds to every 1,000 people, at only 1.49. The shortage of doctors aggravated this problem further, as Indonesia is around 160,000 doctors short of meeting the WHO standard of 1 doctor for every 1,000 people [1]. Additionally, healthcare spending in Indonesia is lower than in other countries, underscoring the necessity for innovative technology to tackle these challenges at scale [2].

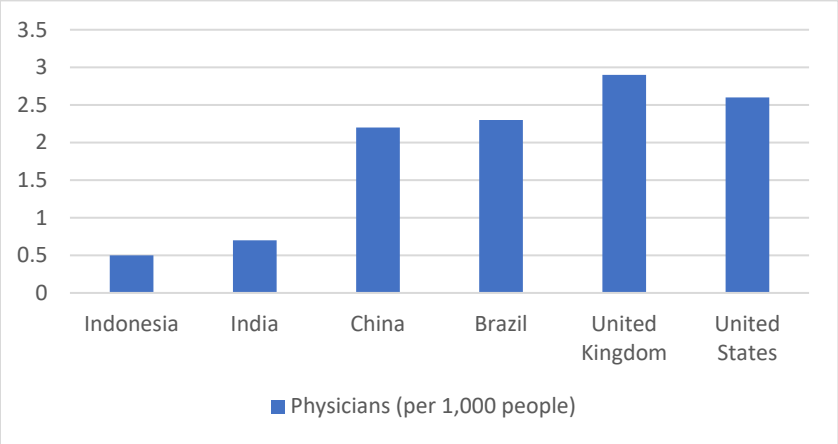


Figure 1 The ratio of physicians to every 1,000 people

The COVID-19 pandemic has hit the world since 2020 and has impacted many countries worldwide, including Indonesia. In response to the COVID-19 pandemic, the Ministry of Health in Indonesia introduced Peduli Lindungi (meaning "Protect and Care" in Indonesian), a primary COVID-tracing application for effective pandemic management across the country. With over 1.5 million users relying on it for contact tracing purposes, this app has gained widespread

popularity among Indonesians since its launch [3]. Over time, numerous features have been added to Peduli Lindungi that serves multiple purposes, such as pandemic mobility tracing by enabling citizens to check in at public areas, store vaccine certificate for travel purposes, and other tools related to COVID-19 pandemic management.

In 2022, the Ministry aimed to expand and transform the Peduli Lindungi application into a social health application called Satu Sehat (meaning "Health and Unite" in Indonesian). This platform aims to offer more significant benefits beyond pandemic management by serving basic healthcare needs that have yet to be fulfilled [4]. One of the features seeks to eliminate the need for patients to fill out new forms when transferring between health facilities and the repetitive nature of filling out forms and records at every healthcare facility visit by letting them access their Personal Health Records (PHR) transparently through the application. Ultimately, Satu Sehat seeks to improve the patient's journey beyond COVID-19 purposes, making it faster and more efficient for individuals receiving healthcare or undergoing health check services. The system eliminates the risks associated with lost or misplaced paper records by enabling patients and healthcare providers to access medical records through mobile devices. The availability of this data also helps hospitals with more information about patients, thereby improving and offering personalized healthcare services. It also enables the government to create evidence-based policy.

The transformation of an application from a single-function product into a multi-function platform is a significant shift in its product strategy. In this case, as a stand-alone product, Peduli Lindungi successfully garnered twenty-two million users, which is a remarkable achievement. However, this is attributable to its mandatory usage for all Indonesian citizens when checking in to public areas. As the COVID-19 pandemic has eased and the app transitions into a platform with extended features, the product team needs to maintain user retention and prevent existing users from churning, particularly since the usage has become more voluntary and ceases to be an everyday necessity.

Achieving a successful shift from a product-based offering to a platform-based one involves creating a multisided platform that accommodates the needs of various stakeholders to later generate fosters a network effect. As the platform evolves, the team must support multiple use

cases and user needs, which requires them to design a flexible architecture. Platforms are unable operate independently. They depend on complementary products created by third-party providers. This collaboration is essential because platform leaders often lack the necessary resources or capabilities to operate alone. [5]. A strategy that platforms can do for third-party companies include creating a modular platform and providing developers with Software Development Kits (SDKs). Additionally, the team should prioritize creating a seamless user experience that delivers tangible value to users. To achieve the goal of becoming a platform that provides Personal Health Records (PHR) and support healthcare solutions for Indonesia, the institution cannot rely solely on its own capabilities. Collaboration with other stakeholders are essential to bring together the necessary expertise and resources.

To achieve the vision of becoming a platform that provides Personal Health Records (PHR) for other institutions and addresses various unmet healthcare needs through digital means, the institution acknowledges that it cannot succeed on its own. The institution might not have the right resources to undertake all aspects of healthcare and recognizes that it is not necessary to cover the entire scope of healthcare like the government does. Intuit's CEO Brad Smith highlighted the importance of being a great product and platform company that encourages the contributions of others [6]. This philosophy holds relevance for institutions like the Ministry of Health, particularly their Digital Transformation Team.

Satu Sehat Mobile has a unique model compared to other commercial platforms from private companies. Satu Sehat is not developed by a private company but rather by a government institution. Its key metrics differ from that of commercial platforms. Revenues are not a part of the success metric, and its goal is not to gain profitability. These factors and limitations are what make this study case interesting. The success of Satu Sehat is measured by the number of users, the reach and impact of the app, and the effectiveness of the platform in improving public health outcomes, particularly healthcare programs in the country.

Furthermore, Satu Sehat does not aim to compete with other healthcare technology companies or replicate what existing healthcare technology companies are doing. Instead, it aims to cooperate with them as third-party complementors. The government’s approach recognizes the value of

collaboration in improving public health outcomes and avoids reinventing the wheel already created by health-tech companies.

1.2. Research Questions

This study aims to understand important success factors and approaches to transitioning from a product to a platform. Some questions that we would like to answer in this research are as follows:

1. Why should an organization's digital product become a platform?
2. What are the key success factors for a product-to-platform transition?
3. How should platform owners collaborate with third-party ecosystems?

1.3. Scope

The study centers around the Satu Sehat app, developed by the Digital Transformation Office (DTO) of the Ministry of Health, Republic of Indonesia. This case study was selected because the organization is currently transforming its product into a platform, a strategic direction that many institutions are pursuing in their respective fields.

1.4. Research Methodology

This study will conduct a strategic literature review of product-to-platform research. This study will review existing literature on platform strategy, Super Apps, platform governance, and architecture. The author will conduct stakeholder interviews with the Indonesian Digital Transformation Office (DTO) team from the Ministry of Health responsible for the development of the app. This work will also benchmark existing similar digital transformation initiatives in healthcare government institutions and ecosystems to identify successful growth approaches. The author then synthesizes the findings to identify connections in an examination of ecosystems, platforms, and platform strategies.

1.5. Thesis Structure

The following describes how the thesis is outlined:

Chapter 1

Introduces the personal motivations for the topic, research objectives, and the hypotheses or questions that need to be addressed.

Chapter 2

Provides a summary of the literature review on the topic, including research papers, case reviews, past theses, and published books. The topics covered include platforms, super apps, platform architecture, governance, platform competition, platform drivers, platform ecosystem design, and platform strategy.

Chapter 3

Summarizes deep dive analyses related to the health sector regarding digital transformation in health government institutions, healthcare ecosystems, and comparisons to platform implementation private sector, such as super apps. This includes comparing product development in other governments and analysis of platform strategy in super apps in different contexts.

Chapter 4

Provides an analysis from a case study derived from stakeholder interviews and examines the connections between ecosystems, platforms, and platform strategy.

Chapter 5

Proposes a general decision guidance schema for transforming a product to a platform based on Satu Sehat's learning.

CHAPTER 2
LITERATURE REVIEW

The current chapter presents a literature review that aims to provide insights into the development of conceptual frameworks for designing platform strategies. The review is grounded in extensive research on various aspects of platform strategy and design, including platform business models, ecosystem design, network effects, third-party complementors, and value creation.

2.1. What is a product?

A “product" refers to a digital product or single-purpose application that serves a specific purpose or function for a particular customer need [7]. An example of a single-purpose app is Duolingo, an American language-learning app that offers interactive lessons in various languages. Another example in a different industry is Headspace, a meditation app that provides users with guided meditation and mindfulness exercises. The emergence of single-purpose apps is largely attributed to the growth of digital product ecosystems, namely the Apple Store and Google Play, which provide developers with a platform and Software Development Kit (SDKs) to sell goods or services through their apps on the platform. As a result, more developers and companies are working to tackle and address problems in multiple industries through new digital models on the platform.

2.2. What is a platform?

A platform facilitates interactions connecting two or more stakeholder groups to create value, such as transaction exchanges and profit opportunities. Cusumano et al. described that “platforms bring together individuals and organizations so they can innovate and interact in ways not otherwise possible, with the potential for nonlinear increases in utility and value.” [8].

It is worth noting that platforms existed in varying forms many years ago. Traditional examples include models enabling exchanges between two customer sides, such as auction houses and

financial exchanges [9]. This evolves to more recent examples in the forms of software platforms (e.g., Apple Store and iTunes Store from Apple) and internet transactions (e.g., an e-commerce marketplace and travel services).

2.2.1. Classification of Platforms

Cusumano et al. identified two main types of platforms: innovation platforms and transaction platforms [8]. Innovation platforms stimulate demand by enabling third-party complementors to develop new products or services that add value to the platform.

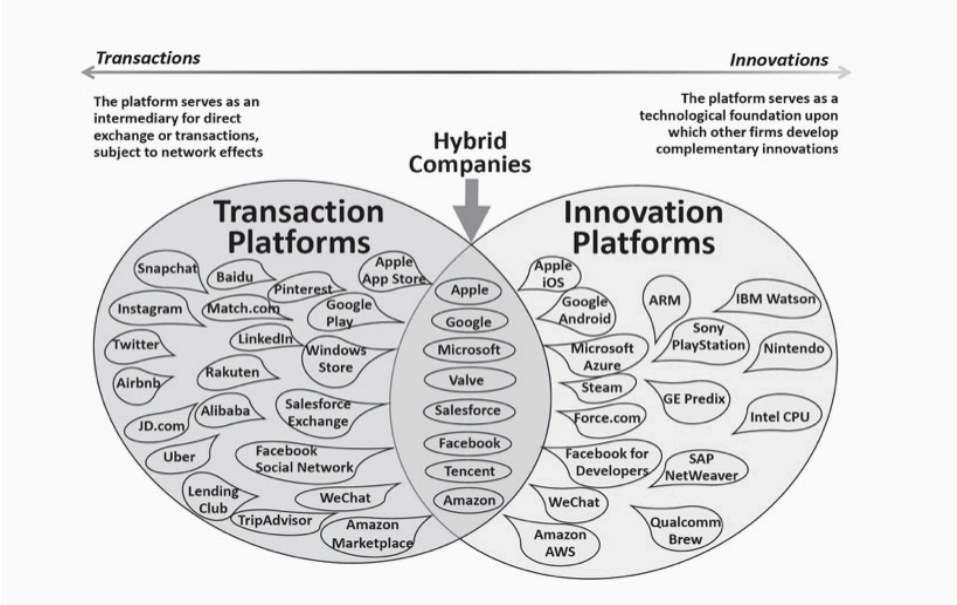


Figure 2 Classification of Platforms

For example, Apple's iOS platform provides free software development kits (SDKs) to enable developers to create iOS applications. Developers can also discuss best practices and toolkits on developer forums. The company also creates venture funds that incentivize third parties to design complementary products or services, thereby enhancing the overall value of the Apple iOS platform. Innovation platforms provide a technical foundation on which actors can develop complementary innovations [8].

On the other hand, transaction platforms primarily focus on becoming intermediaries that facilitate the exchange of goods, services, or information between parties. The primary function of transaction platforms is to match buyers and sellers while providing them with an efficient transaction process. Google Search is an example of a transaction platform that enables users to search in exchange for information, while Amazon enables transactions to purchase goods or services.

Overall, both innovation and transaction platforms have different objectives and approaches to serving their customers. Innovation platforms focus on driving up demand through the involvement of third-party complementors, while transaction platforms focus on facilitating exchanges between buyers and sellers [8].

Hybrid companies are a combination of both, which can often be seen in larger companies such as Apple, where they have transaction platforms (iTunes Store selling music from artists) to innovation platforms (Apple Store selling iOS applications developed by iOS developers).

We can further expand its classifications based on industry. For example, there are knowledge-based platforms such as Quora, an online platform that enables people to ask questions while other users provide answers voluntarily. This interaction facilitates the exchange of information between multiple groups. There are also platforms that also facilitate services through service-based platforms, such as Uber, an American ride-hailing that allows passengers to hail a ride from registered drivers. The platform itself has expanded to facilitate food deliveries from restaurants that are registered in the platform and delivered by an Uber driver, enabling transactions to happen [11].

2.2.2. Steps to Building a Platform Business

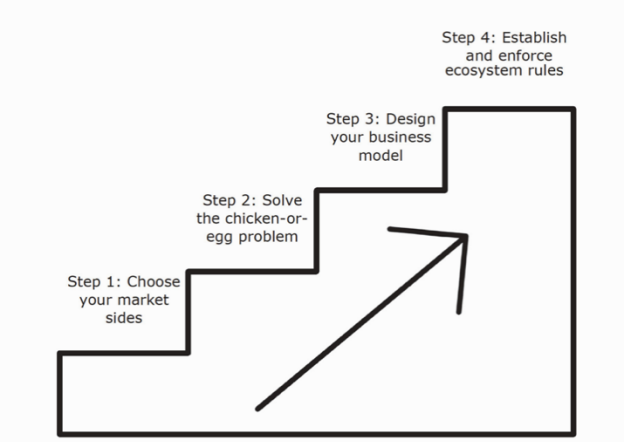


Figure 3 Four stages to building a platform business

catch up context

According to Cusumano et al., there are several critical steps that a firm must go through to establish a successful platform business model. These steps include:

a. Choosing the appropriate market sides for the platform

According to Boudreau and Jeppesen, the term "complementors" refers to actors who provide complementary goods to a platform. Organizations must incorporate complementors to harness innovation capabilities beyond the firm's own scope. Complementors can help create multisided markets. Multisided platforms facilitate value-creating interactions among participants. Rather than being organized with upstream suppliers and downstream buyers, it includes users on one side and complementary goods or service providers on the other [17]. In this multisided market, the producers of goods, or ("complementors") on one side, compete to sell to users on the other side. Other literature suggests that multisided platforms are a place where two interdependent groups of customers [18]. The definition of "group" means that each side might have different needs, resources, desires, or even interests.

b. Solving the "chicken-and-egg" problem by attracting both users and complementors to the platform simultaneously

The chicken-or-egg problem refers to the challenge of attracting users and producers to a new platform, where both groups depend on each other for the platform to be useful. On the one hand, users will not be interested in joining a platform if there is no producer to interact with, while it is going to be hard to attract producers to join the platform if there is no user to consume their products or services. Both sides need to reach a certain threshold number of customers, which creates uncertainty about where to start. In other words, the platform needs to have enough producers to create value for users and enough users to create value for producers.

A pricing strategy may serve as a viable approach for firms to effectively lower the cost of entry for customers situated on both ends of a given market. This, in turn, can facilitate increased participation among these customer segments, thereby bolstering the overall competitiveness of the company in question. In the shorter term, these sub-competitive zero prices will help avoid chicken-and-egg growth problems [18], but it is not going to be sustainable in the long run because it will not drive network effects [17]. In platforms that have a significant user base, signaling, and reputational motivations have been identified in the literature as factors that could encourage unpaid complementors to participate besides offering products at below-market rates. This approach can be useful in avoiding growth challenges related to the chicken-or-egg problem during the launch of a platform or in smaller platforms. This is because unpaid complementors are less affected by the scale and network effects of the platform [18].

c. Designing an effective business model that creates and captures value for all parties involved

While much of the existing literature on platform network effects assumes that complementors are primarily motivated by sales and profits, Boudreau et al. highlighted that not all platform business models incentivize complements based on profits. Hence there are other factors that drive participation in a platform ecosystem [17]. Even in the absence of a regulated price system or direct monetary payments, complementors may still be motivated to contribute to the platform.

The model for platforms has evolved from just traditional multisided markets with paid complementors. Boudreau et al. have classified four approaches to complementors as follows [17]:

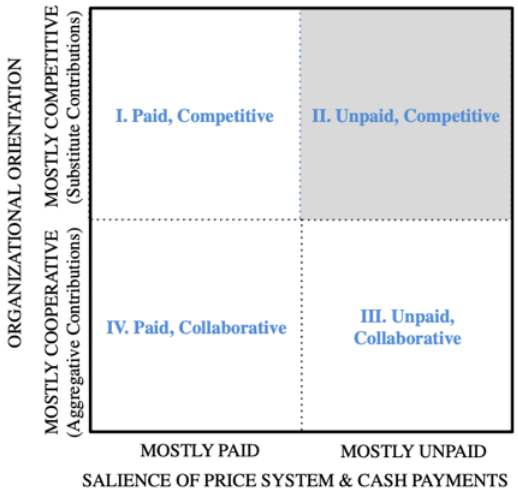


Figure 4 The spectrum of approaches to organizing complementors

The usual model in a transaction platform is "Paid, Competitive," where the complementors are motivated by direct monetary incentives to gain transactions from customers. This has a larger effect on network effects, only it reaches a certain threshold of high entry numbers [18] "Paid, Collaborative" occurs in platforms such as WordPress, a website builder platform where developers are incentivized to market paid plugins, collaborating with each other. An example of "Unpaid, Collaborative" complementors is Wikipedia, where users strive to contribute knowledge and content in exchange for credibility to their profile. The same goes for the Q&A platform Quora. The more a user gives high-quality answers to questions (often measured by upvotes or comments), the more their profile will gain credibility in the community. An emerging pattern shows people are willing to contribute to the platform without monetary incentive. Rather, users try to improve their affiliation and sense of identity in the community.

Most companies launch with unpaid complementors to later implement systems that enable complement monetization techniques. For example, platforms often start with User Generated Content (UGC), which is considered unpaid complementors, and later transition to multiple

business models, such as advertising, Professionally Produced Content (PPC), and other monetary incentives [19].

On the other hand, “Unpaid, Competitive” collaborators work independently. For example, Stata, a statistical software, uses competing unpaid complementors to incentivize them to build a bigger library of functions. However, they have so far failed to lock in market dominance with network effects. Based on this fact, how can we incentivize third parties to participate on the platform?

d. Establishing and enforcing ecosystem rules to ensure fair and efficient interactions between participants

Ecosystem rules can be referred to as platform governance rules that govern the behavior of third-party complementors. While platforms offer opportunities for creativity and innovation by third-party complementors, they can also lead to uncontrolled creations if unregulated. The platform must also ensure that its rules and compliance standards are aligned. As an example, the failure of LinkedIn Answers can be attributed to the lack of heavy moderation of content, leading to unreliable answers and spam. Everyone with different backgrounds can sign up and give answers even though it is expected to be a professional platform. This highlights the importance of effective platform governance and ecosystem rules to maintain the quality of services offered on the platform.

2.3. Product to Platform

2.3.1. What is a product-to-platform strategy?

As institutions seek to expand their reach and create a more holistic customer experience, transitioning from a traditional digital product model to a platform has become an attractive option. This strategy involves modifying the company's existing operating model, taking advantage of the characteristics of digitalization. A crucial element of the product-to-platform approach involves expanding to more niche use cases and even creating an ecosystem of complementary products and services. This shift in strategy requires platform owners to actively

attract and incentivize participants in a variety of complementary markets, and platform owners needs to systematically incentivize a range of complementary markets [11].

Hagiu et al. suggest that a product that wants to transition into a platform should already serve a foundational need for a large enough pool of customers while leaving room for partners to contribute to addressing heterogeneous customer needs [12]. The study then proposed four frameworks that firms can apply when developing platforms, which include:

- Making connections from customers to third parties. The third-party products can work in collaboration with the platform, such as selling complementary products to a platform's customer base and adding a variety of use cases to the main platform.
- Connecting customers with other distinct customer segments that complement each other (e.g., Intuit, a book-keeping accounting platform, connects freelance accountants to small businesses through their platform)
- Connecting products to connect customers. This framework aims to enable more value-added services between two or more of their current customer bases. For example, Nielsen, a market research company, usually sells viewing habits data to media companies and purchasing habits data to consumer-packaged goods companies. Nielsen can develop as a platform by connecting these two distinct customer bases, by, for example, connecting their consumer-packaged goods company clients to media company clients for advertising purposes.
- Supplying to a multisided platform, where the platform sells to a customer's customers. For example, Shopify, a digital e-commerce tools provider, can offer value-added services for their merchant's customers.

These four strategies can be adjusted to the platform based on their business objectives, available resources, and business model.

2.3.2. Complementors

When a platform wants to expand its function to more niche use cases, it will require expertise, resources, and rigorous development. This emphasizes the importance of engaging with a third-

party complementor. Hagiu et al. explain that platforms can create value by making a connection between customers and third-party complementors, who can then create new products or services that enhance the overall value of the platform. Intuit, for instance, created application-programming interfaces (API) and an app store within their platform that allows third-party developers to build and sell software products for Intuit's financial software, QuickBooks customers [12]. By doing so, Intuit was able to generate more profits by leveraging the complementary products and services developed by third parties while at the same time enabling third parties to generate profit.

2.3.3. Network Effects

Platforms have various groups of users interacting with them, which can result in network effects from each side. Network effects occur when the value of a platform increases as more users join the platform. This means more data will be available, increasing the chances of more resulting transactions. Boudreau et al. mentioned that for network effects to work, it would require one or some combination of:

1. The greater positive response of development rates to platform usage
2. A greater positive response of usage to growing numbers of compliments, or
3. Fewer negative responses of development rates to growing numbers of complementors [17].

2.4. Failures and Success in Platform Strategy

2.4.1. Failures in Platform Strategy

The reasons platforms fail vary across products, timelines, and market niches. A study analyzes various companies in Online Social Networking Platforms, Question & Answers Platforms, and Instant Messengers such as Orkut, Yahoo, and MySpace and highlighted the following reasons for platform failures [13]:

1. *Confused product positioning*

Before onboarding multiple parties, a platform needs to have a strong product positioning as an intermediary. One of the examples of a product that has confused product positioning is Orkut, a social networking platform founded by Google in 2004. One of the features of the social media platform allowed a user's connections to rate a user on a scale of one to three for how trustworthy, cool, and sexy they thought a person was through the "Trustworthy Cool-Sexy" feature. The product has a lack of foresight in its target users, as it eventually aims to be used by multiple user segments and not just target the young and tech-savvy ones [13].

2. *Closed platform/platform openness*

Platform openness is critical to markets with high rates of new use-case generation from the users, such as online social networking platforms [13]. In the past, Facebook has become a success for opening third-party applications, enabling other developers to create applications on top of the Facebook platform. This pushes users to spend more time on the platform. It can be argued that it is more critical to open the platform to third-party innovators in a market like social networking or e-commerce like Shopify, where use cases can be generated over time.

3. *Poor product design or user experience*

The success or failure of a platform is often determined by its user experience. As a mediator that connects multiple groups or facilitates interactions between customers, a platform that is difficult to use or understand or unable to adapt or release iterative updates may deter users and ultimately lead to failure. Enhancing user experience would need continuous product research to ensure the platform's model effectively addresses customers' pain points and remains relevant. For example, the failure of instant messaging platforms such as Yahoo Messenger and MSN Messenger was not due to the emergence of superior messenger alternatives but rather the convergence of email and instant messaging as a new solution that fits more to the needs of the user.

4. Weakening network effects

The eventual demise of a platform can also be linked to the weakening of the network effects, known as detrimental network effects. This is the opposite of network effects, where the value of a platform decreases as more users join. In the case of LinkedIn Answers, detrimental effects played a significant role in their failures, and it is extremely difficult to reverse these network effects once they happened.

LinkedIn Answers is a feature from LinkedIn that allows users to ask questions and receive answers from other professionals within the LinkedIn network. For LinkedIn Answers, without content moderation or governance from the platform, the pool of conversations is declining in quality because it is filled with low-quality content and even spam. This is uncontrollable as more and more people sign up for the platform for free. As a platform that expects professional conversations, credibility was damaged, which eventually led to the platform's failure.

5. Multihoming/Switching costs

As a new entrant in a market, a new platform has to have a strong value proposition in order to compete with incumbents. As an example, Google Plus' failure was due to the high multihoming costs, as it is hard for users who are already on Facebook to switch to another social media platform, requiring them to start a new profile and maintain a new social media account that requires a lot of work. Vardhan mentions that these are the following reasons for high multihoming costs [13]:

- The cost of reproducing the network.
- The cost of losing archived communication and content.
- The cost of switching to and learning a different interface experience.
- The cost of abandoning applications unique to the incumbent platform.

2.4.2. Successes in Platform Strategy

After examining the factors that contribute to failure, what can lead to success in platforms? A study analyzed the strategies employed by industry leaders such as Intel to become platform leaders. Some firms have managed to develop strategies and execute them in a way that would help them establish themselves as technology powerhouses and world-class companies.

- *Establishing trusting relationships with complementors*

Intel used three strategies to establish relationships with complementors; driving architectural progress on PCs, facilitating innovation on complementary products, and coordinating innovation outside of Intel in an effort to drive the development of new system capabilities.

- *Taking a gradual, lowkey approach in pushing innovations, keeping the implementation specifications of new interfaces open*

Intel tried to stimulate innovation on products that could connect the interface (USB) and create business possibilities for external companies. Helmond et al. mentioned a key learning from their observations on Facebook that a platform can derive power from its ability to create institutional dependencies among a network of partners [17].

- *Structure internal teams to support the innovation, create new departments if needed*

Intel formed Intel Architecture Labs (IAL) to lead the third-party complementors. This means that other than developing strategies that drive external relationships, Intel also structures its internal team to achieve platform leadership. Aside from IAL, other Intel constituents like the Computing Enhancement Group, the Content Group, and the Corporate Business Development Group played a major role in synergizing and helping the company realize its aim of platform leadership [15]. Intel provides another example of their approach by establishing a dedicated team known as the Intel Developer Relations Group, where the primary objective of the team is

to support external software developers in innovating software that complements Intel's latest microprocessors. [11].

- *Persuading external firms to accept new standards or innovate new ways that would support the platform*

Intel's strategy involved introducing new standards for their latest microprocessor line and PC platforms while also competing with their rivals. They managed to balance both roles effectively and persuade external firms to adopt their new standards. By managing both internal and external conflicts effectively, Intel demonstrated that companies that balanced multiple roles could become platform leaders in their respective industries.

2.5. Platform Governance

Cusumano et al. mentions that the platform needs to have ecosystem governance [8]. This means a set of rules that can:

1. Filter which third parties can work on top of the platform,
2. Ensure the quality of the complementors,
3. Incorporate ethics into the regulatory framework, and
4. Implement a systematic approach to address any potential issues that may arise.

Platform governance involves more than just establishing rules, it requires the platform owner to create and implement specific instruments and design features that align with the desired outcomes of platform governance [21]. Platform governance determines what value-creating activities (e.g., product development, transactions, and interactions) are encouraged on the platform, whom to include and when to engage in these activities, to what extent the activities can occur without interference from platform owners, and how platform owners can capture a share of the value jointly created with participants [22] [23]. When collaborating with another actor in the platform, both actors involved need to agree on exchanging and aligning certain elements of their architectures, called sharing its “boundary architecture”, by aligning standards,

processes, and interfaces. Setting the right foundational governance is particularly helpful, especially as the number of actors on the platform begins to grow.

Governance rules set by platforms are crucial as they directly impact platform performance. Effective governance rules for platforms can vary based on the complexity of information that the platform must manage and the size of its seller pool. When dealing with a larger set of sellers and complex information, multiple options for effective governance rules may exist [24].

In platform governance, the degree of openness is a key consideration. While greater openness can promote innovation among complementors, an overly open platform may become less useful over time [25]. Achieving the right balance of openness and distinctiveness can be crucial for fostering innovation and promoting success within platform ecosystems [26]. Parker et al. suggest that platforms create value by implementing rules or governance related to transactions, providing infrastructure, and reducing transaction costs [27].

2.6. Super Apps

When discussing platforms, it is also important to talk about Super apps. Super apps consolidate various app features into one application, serving as an umbrella for numerous services. This bundling of functionalities enhances the customer experience by providing personalized experiences and offers, thanks to the vast amount of customer data owned by the platform [7].

2.6.1. Examples of Super Apps

In order to evaluate Super Apps, it is important to see recent examples, particularly from the private sector. A study has observed WeChat as an example of a Chinese social media app that began as a messaging application. Over time, WeChat introduced additional features, such as shopping, travel, payment options, and even e-commerce capabilities.

The purpose of Super Apps branching out to other features is to serve multiple customer needs. Expanding to a platform required significant resource commitment. Hence, WeChat executed this scalable expansion through the creation of a comprehensive super app operating system that allowed third-party companies to develop mini-programs within the application. By utilizing the

WeChat APIs and SDK, developers can access and integrate the built-in functionalities of WeChat across various application types, including native mobile apps, in-app web-based apps powered by WeChat's in-app browser, and WeChat mini-programs. This strategic approach enabled WeChat to execute the expansion successfully. As a result, new competitors, such as Alibaba, entered the market to compete with WeChat to gain market share in the verticals where WeChat competes [7].

Similar to WeChat, LINE is a messaging platform originating from East Asia that has evolved into a multipurpose platform. LINE’s platform strategy enabled the company to go beyond transactional benefits and become a cultural production platform. For instance, designers can create and sell sticker content specifically tailored for the LINE platform. These stickers provide users with a unique way to communicate, adding a distinct flavor to conversations beyond traditional emojis. As a result, the LINE Friends characters are not limited to the app; they are also utilized in character merchandising campaigns that extend to physical stores. This exemplifies how platformized content expands beyond the app, forming a wider media campaign to attract new users to the platform [28].

Another example includes two similar competitors in the Super App market in South East Asia: Grab and Gojek. Both started as ride-hailing services and have expanded to multiple product lines within the app that covers various industries. Grab is based in Singapore, while Gojek is from Indonesia. Gojek’s transportation services started with cars and motorcycles and have expanded to include taxis. Gojek has also expanded to food deliveries, shopping, B2B Software as a Service (SaaS), entertainment (events, tickets), and payments (bills, insurance) [29]. Similarly, Grab has now offered services such as deliveries (food, express), mobility (rides), financial services (payments, insurance, investments), and hotels, positioning itself as "An Everyday Everything" [30].

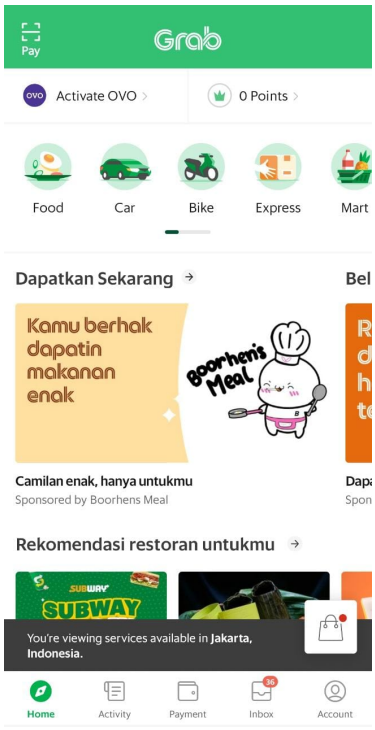


Figure 5 Grab Super App Homepage Interface

2.6.2. Super Apps vs. Aggregators

While discussing super apps, it is worth noting that a similar model also exists, which is called aggregators. A content aggregator website is a platform that collects data from various sources across the internet and consolidates the information in one place where users can access it. This enables access to third-party services, and the business model can vary, including pay-per-click models [31]. An example of an aggregator is an online travel agent that collects information from multiple airlines or travel agents and presents the data on one site, allowing users to compare price options and improve their overall experience.

CHAPTER 3
BENCHMARKS

This chapter focuses on similar initiatives in the healthcare space from neighboring countries' government institutions (i.e., Singapore) and more developed countries (e.g., U.K., Australia). This chapter aims to understand how other countries are utilizing digital transformation to create more democratized access to healthcare. Specifically, we will explore the different strategies of the highlighted countries in utilizing a platform vs. product approach in their digital healthcare solutions.

3.1. Government of Singapore

Health Hub

Under the Ministry of Health, the Singaporean government has created Health Hub, a nationwide digital health platform for Singapore citizens and residents through an online portal and mobile application, with the tagline "one-stop access to all your health services and records" [32]. Citizens can access public health records for themselves and their families, view and change doctor appointments, access compiled lab reports, access medications consumption and even request a refill, do health screenings, and perform transactions across public healthcare clusters.

Figure 6 HealthHub in Singapore

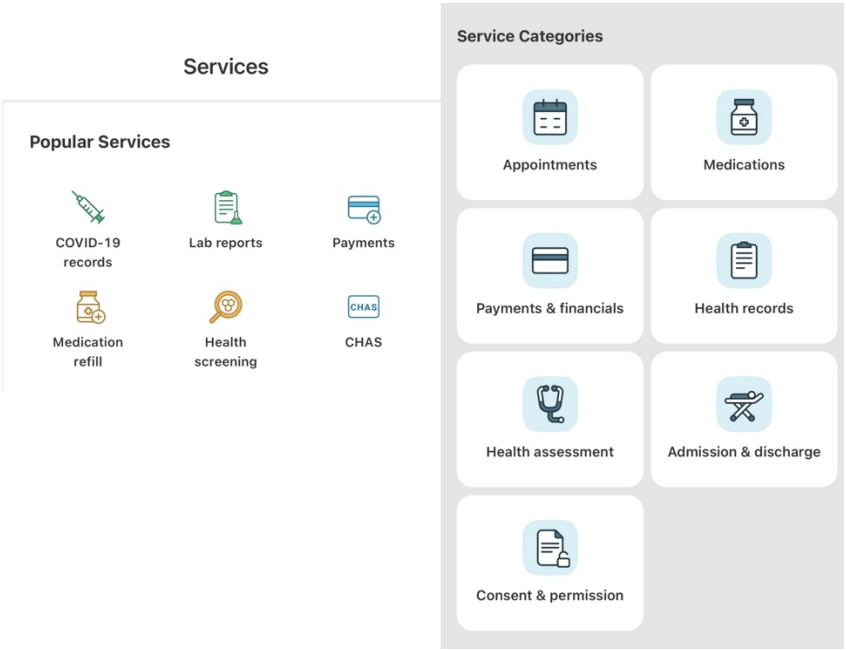
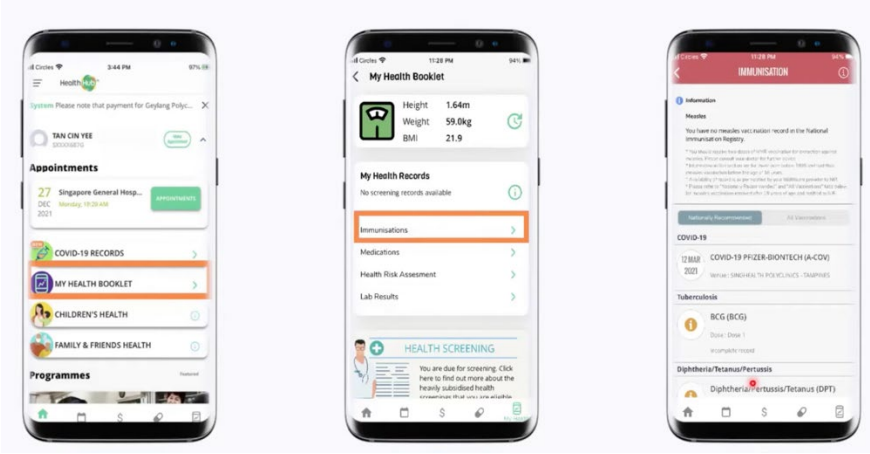


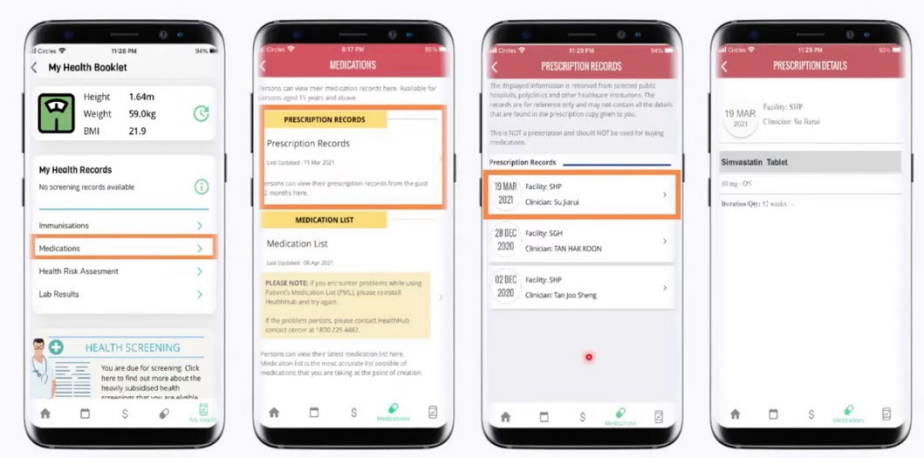
Figure 7 Health Hub Singapore's mobile application main interface

The web-based portal also provides articles, wellness information, and evidence-based health educational resources. People who want to use the app should log in using Singpass, a digital I.D. for Singapore citizens residents' access to secure transactions in everyday life. Outside the mobile application, HealthHub has a web page that has four main functions:

1. **Health eServices**: the web-based version of Health Hub's feature to track family's personal health record and upcoming medical appointments. Citizens can access information regarding personal, children, family, and friends' information.
    - Health Booklet



- Medication and Prescription Records



2. **Live Healthily:** articles with various health topics, from preventive healthcare to managing chronic diseases.
3. **A-Z Directory:** health glossary with information from specific diseases and conditions, medical care facilities, symptoms, and more.
4. **Rewards:** users can earn HealthPoints by sharing articles or events from HealthHub on their social media platforms. They can also earn it by participating in HPB programs like the Parent Hub and National Steps Challenge on the Healthy 365 app.

Is HealthHub a product or a platform?

A platform distinguishes itself from a linear product by connecting two sides of the market, thereby enabling the exchange of information or services. While HealthHub initially seems like a linear product due to its predominantly in-house features, further examination reveals features that emphasize its role as a transaction platform that facilitates the exchange of information between patients and healthcare institutions. The HealthHub platform involves two interactions: citizens (users) and healthcare institutions (hospitals or lab clinics). Citizens are the primary users of the platform, accessing their personal healthcare information and scheduling medical appointments. On the other hand, healthcare institutions receive patient input through the platform, such as appointment scheduling and access to their patient's medical records. Laboratory clinics also play a crucial role in the platform, performing necessary tests and providing test results to patients and healthcare institutions.

Aside from HealthHub, the Singapore Government also developed other applications in partnership with various Singaporean institutions, such as the National Healthcare Group, NUHS (National University Health System), SingHealth, Health Promotion Board, and Agency for Integrated Care (AIC). Most of these applications are free of charge. Below are some examples of the applications:

- Healthy 365: A health and diet tracking mobile application that incentivizes users to create a healthier lifestyle using gamification and rewards. Users can participate in in-app challenges and health programs in exchange for "health points," which they can redeem as vouchers in participating partner outlets. Some challenges include fitness tracking that helps users log their daily steps count and time spent on active exercises. The application is developed in partnership with the Health Promotion Board.

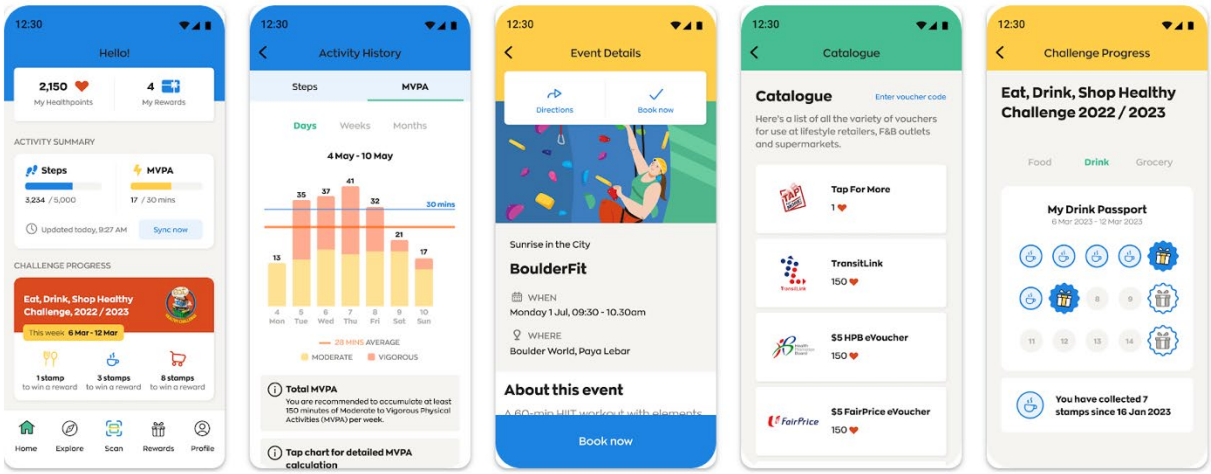


Figure 8 Healthy 365 application

- Health Buddy: An application for users to easily find information regarding healthy lifestyle tips on the SingHealth group of websites, developed in partnership with SingHealth.
- Trace Together: A mobile app equivalent of Indonesia's COVID-19 Tracing App, Peduli Lindungi. The application is created by GovTech Singapore.
- AI Care Link: A mobile app for seniors to check whether patients and family members are eligible for financial aid programs subsidized by the Singaporean government. Subsidized program includes Community Health Assist Scheme (CHAS), Seniors' Mobility and Enabling Fund (SMF), Caregivers Training Grant (CTG), and Foreign Domestic Worker (FDW) Grant. The application was created by Agency for Integrated Care (AIC), an organization that serves Singapore's seniors and caregivers to live and age well. This technology can be used by caregivers, grassroots volunteers, medical social workers, and community care professionals to find care services for their clients.
- Mobile E-care Locator (MEL): an application to find care services and CHAS GP and dental clinics nearby. The application was created by Agency for Integrated Care (AIC), which serves Singapore's seniors and caregivers to live and age well.
- Knee Buddy: an application for patients to learn about osteoarthritis (O.A.) of the knee. The app delivers learning materials through easy-to-follow exercises, a guide on knee replacement surgery post-surgery care, and topics on improving knee care. It also features

audio and visual resources. The app is not only assigned for patients but can also be used by physiotherapists for "exercise prescription," where they can assign exercises to patients and monitor their progress. This application is developed in partnership with IHIS.

Figure 9 Knee Buddy stand-alone Application under HealthHub in partnership with IHIS

3.2. Government of Australia

3.2.1. My Health Care Record

My Health Record (https://www.myhealthrecord.gov.au/) is a web-based portal created by the Australian government to keep key health information for patients and healthcare providers [33]. Features available on the application include:

1. Medicare integration (governed by Services Australia): access information regarding medical claims, pharmaceutical claims, and organ donor decisions.
2. Medications list: access information about prescribed medicines and allergy information

3. Medical appointment scheduler: schedule visits to the doctor
4. Vaccinations record: a repository of past and upcoming vaccinations received, recorded by the Australian Immunization Register
5. Clinical Records: a collection of documents of medical visits, hospital admissions, test results, and scans.
6. Advanced Care Planning: a portal to create planning type of healthcare patients would want if they experience disease.
7. My Childhood Development: a tool that provides observations about child growth
8. More personal health summary: a record of immunizations, allergies or adverse reactions and medicines to patient's personal health summary

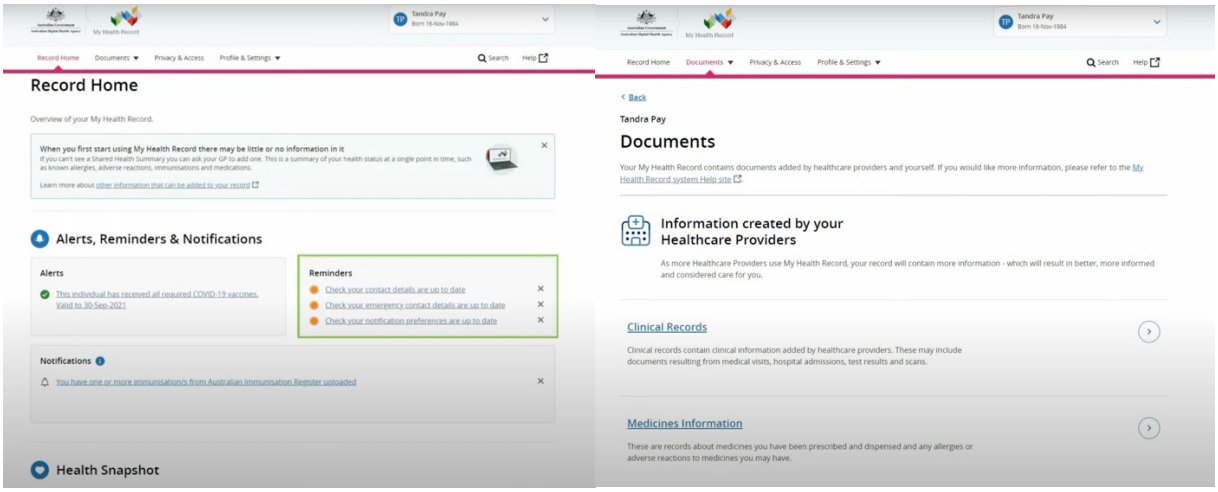


Figure 10 My Health Record desktop web from Australia Government

The Australian Government uses a desktop platform for My Health Record to provide comprehensive features for patients and healthcare providers to manage health information. Using a desktop platform allows for a more detailed view of the features that can be accessed from patients' desktop PC but may limit the mobility and convenience of accessing the platform.

3.2.2. Integrated Electronic Medical Records (iEMR) in Queensland, Australia

Integrated electronic medical record (iEMR) is an initiative from Queensland that combines medical and interchangeable data between hospitals for patients to access. The proposed solution

enables healthcare practitioners to efficiently access and modify patient information. It integrates vital signs into the patient records, which triggers timely alerts in case of a decline in the patient's condition. A study conducted by PwC in June 2018 states that ieMR garnered $181.9 million in financial and economic benefits due to improved patient quality in terms of safety and operational service improvement across hospitals in Queensland, Australia [34].

3.3. Government of the United Kingdom

The National Health Service (NHS) helps citizens by displaying the patient's input data without additional information or functionality that can improve the patient's journey [35]. The web portal helps patients use the website to find a pharmacy, dentist, G.P., and urgent care services.

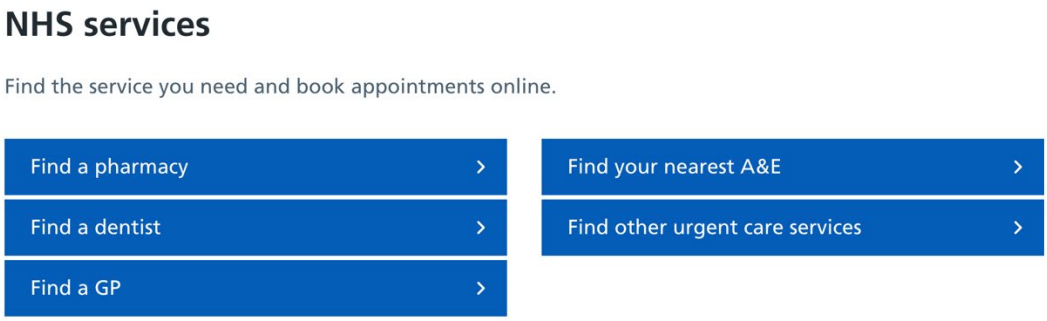


Figure 11 NHS Web Services

After reviewing various examples, it is considered ambiguous to see which platforms are considered transaction platforms. Are applications or sites that only redirect clicks to external sites considered a platform?

Learning from benchmark exercises

The HealthHub platform from the Singaporean government shares a similar vision to Indonesia's vision for the Satu Sehat mobile application. HealthHub provides citizens access to hospital records, including test results for chronic diseases, medical appointments, child immunization records, dental health, and referral letters from public healthcare institutions such as polyclinics and hospitals.

1. **Top-down instead of a bottom-up approach**

HealthHub appears to have been designed using a top-down approach, which has advantages in terms of providing a clear direction and focused use cases. However, this approach may not foster open innovation that can be enabled through a bottom-up approach and an open ecosystem. Despite this, HealthHub has been successful in onboarding multiple hospitals and services, including the ability to display information from mammography and x-ray.

2. **Third-party partnership to release multiple stand-alone applications**

In addition to its platform, the Singaporean government has also released multiple applications that address specific use cases. Although they have formed partnerships with numerous health institutions, these collaborations tend to be tailored to specific use cases rather than embracing an open platform approach.

Although the Singaporean government's strategy of releasing multiple applications that address specific use cases has advantages, such as more focused and efficient delivery of services and reduced memory usage, it also has its limitations. This approach requires all types of innovation to be driven and initiated by the government and related organizations, resulting in lower network effects. The success of the TraceTogether app, which was designed solely for COVID-19 contact tracing purposes, has been attributed to its clear and straightforward function, highlighting the benefits of a focused approach.

3. **Observe increase or declining user growth**

For a platform to be successful, it must experience non-linear growth that continues to increase as more users engage with the application. However, current data trends suggest that there is little to no exponential or non-linear growth driven by network effects. Instead, user growth appears to be either flat or possibly even declining. It is worth noting that the author has limited access to actual data and has had to rely on publicly available information, which may not be entirely accurate. At present, data available from sources such as Google Trends, Data.ai, and Similar Web indicate that there has been no significant increase in platform usage. These trends underscore the importance of continued efforts to improve the platform and promote user

engagement. By identifying and addressing any barriers to user adoption, the platform can potentially achieve sustained growth and long-term success.

Figure 12 HealthHub.sg website usage from similarweb.com

Data from Google Trends reveals that there was an upsurge in the use of HealthHub during the COVID-19 pandemic in 2020. However, the usage of the app decreased after the pandemic subsided. This suggests that the app's usage was not primarily driven by network effects and did not lead to a significant increase in the number of users. Instead, the app's usage appears to have been more closely tied to the pandemic and its associated health concerns. While the increase in usage during the pandemic was notable, it may not be sustainable over the long term.

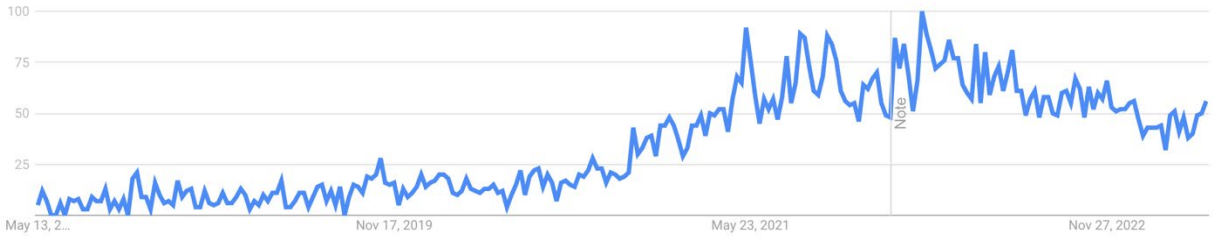


Figure 13 Google search volume for "HealthHub" in Singapore

4. **Actively incentivize both sides of the platform**

To enhance user engagement with the HealthHub platform, the organization can provide incentives to both users and service providers. On the user side, rewards are given for using the platform or participating in various programs or activities. These rewards are given in the form of points that can be redeemed for discounts or other benefits from participating merchants. Such incentives can motivate users to engage with the platform more frequently. For example, in the Health Promotion Board (HPB) rewards program, the app rewards users with "health points" for completing activities or clocking steps, which can then be redeemed for rewards in participating merchants. This approach encourages users to engage more frequently with the platform, improving the platform's usage levels and overall effectiveness.

By providing incentives to both sides of the platform, a win-win scenario can be created for all parties involved, thereby enhancing the user experience and promoting sustained engagement with the HealthHub platform.

CHAPTER 4
CASE STUDY

This section outlines how the Digital Transformation Office (DTO) from the Ministry of Health in Indonesia develops Satu Sehat Mobile, including its supporting systems: Satu Sehat Platform Database and Satu Sehat Dashboard. The challenges and expected impact of the project are also highlighted.

4.1. Engaging Stakeholders and Framing Discussion

A series of discussions were held with relevant stakeholders to deliberate on Digital Transformation Office's long-term plan to transition its product into a platform. The author had online calls and in-person discussions at the Ministry of Health in Indonesia's office. The interviews engaged a range of stakeholders to obtain multiple perspectives from a diverse range of roles, including:

- Product Manager of Digital Transformation Office
- Chief Operating Officer
- Chief Product Officer
- Medical Data Administrator

These roles were identified as crucial for a comprehensive understanding of the product, operations, and the institution's objective. The teams are heavily involved in the Digital Transformation Office development; hence their insights were instrumental in informing the research process. They each provided a minimum of one hour to discuss their respective perspectives and issues. The team was open to answering the author's questions about the institution's goals, future plans, the challenges they face, and the problems they want to solve through the Satu Sehat platform.

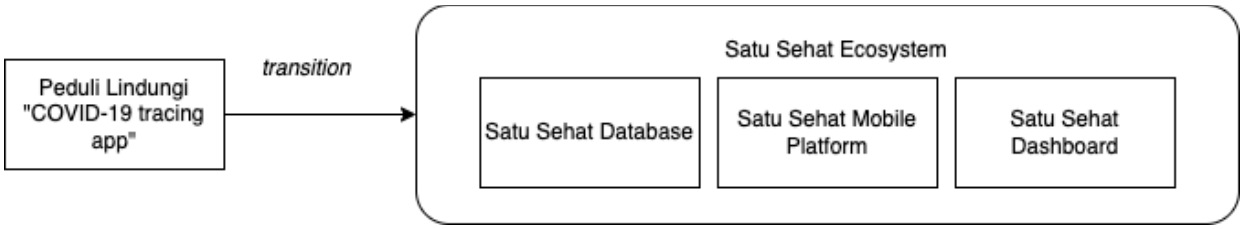


Figure 14 Transition from Peduli Lindungi to Satu Sehat

4.2. "Peduli Lindungi" The Ministry of Health in Indonesia's COVID-19 Citizen Tracing Product

PeduliLindungi, which means "care to protect" in Indonesia, is the official COVID-19 contact tracing app used for digital contact tracing in Indonesia. This application is developed by the Indonesian Ministry of Communication and Information Technology (Kemenkominfo) in partnership with the Committee for COVID-19 Response and National Economic Recovery (KPCPEN), Ministry of Health (Kemenkes), Ministry of State-Owned Enterprises (KemenBUMN), and Telkom Indonesia [36].

Peduli Lindungi offers several key features, such as the ability to check in to public spaces, including shopping malls, factories, and office buildings. The app is mandatory for individuals to enter public spaces and use public transportation. The app offers users the convenience of storing COVID-19 vaccination and test certificates that can be easily viewed or downloaded, eliminating the need for physical documents. This is especially useful for citizens traveling to other countries, as it allows access to important documents. In addition, the app is integrated with the Electronic Health Alert Card (e-HAC), which provides essential documents for users and reduces the need for physical contact when traveling.

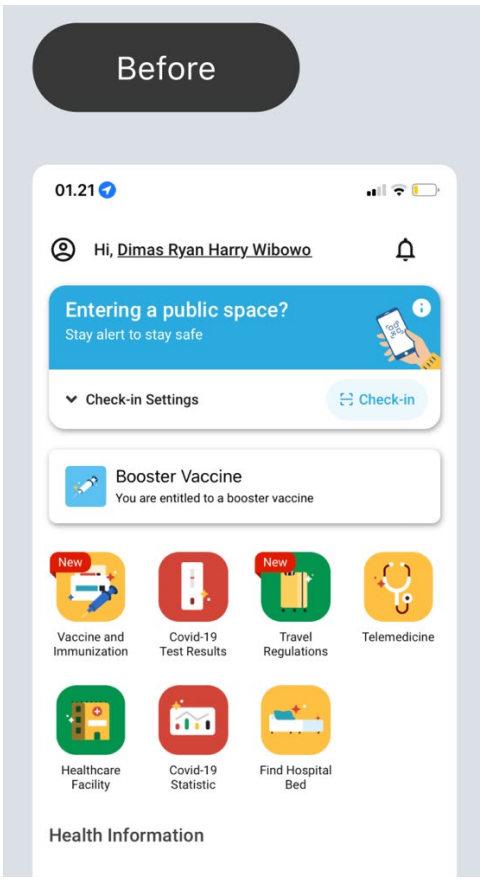


Figure 15 Peduli Lindungi application as a single-function application

The application has evolved and expanded its features beyond COVID-19. It now offers multiple health and telemedicine services, enables users to search for healthcare facilities, and even helps in finding available hospital beds.

4.3. Satu Sehat Mobile

4.3.1. The motivation behind the application development

To understand the rationale behind the development of this digital initiative, it is important to examine the motivation of the Ministry of Health. As previously discussed in Chapter One, the utilization of digital transformation is deemed advantageous in accelerating access to public health services. Indonesia, as a country, faces a low ratio of doctors to patients and hospital beds. Additionally, the COVID-19 pandemic has created an urgent need for a scalable solution in a country consisting of 17,000 islands geographically scattered throughout the archipelago. One

potential avenue to reach more citizens for equitable access to health care is through digital transformation.

4.3.2. Product Strategy and Approach

Keeping this in mind, the ministerial team opted not to start the initiative from scratch. Instead, their goal was to transform Peduli Lindungi, the existing COVID-19 nationwide application used to track citizens' movements during the pandemic, into a social health application with even greater benefits beyond pandemic management called Satu Sehat. Satu Sehat is an extended version, in the form of a platform, designed to be the national healthcare application in Indonesia. The new name of the social health application, Satu Sehat Mobile, reflects its expanded focus on fundamental healthcare needs that have yet to be addressed. The app features use cases that go beyond citizens' primary needs, which needed more voluntary adoption of the Citizen Health App rather than coercion, as seen in the COVID Tracing App. The ultimate objective of Satu Sehat Mobile is to enhance the patient journey, making it faster and more efficient when patients receive healthcare or health check services.

The features of Satu Sehat Mobile aim to streamline the patient journey and enhance the public health providers' performance. The primary objective of Satu Sehat is to encourage citizens and public health stakeholders to adopt digital means in pursuit of the following goals:

a. **Digitalization and integration.** The aim is to create a platform that connects all stakeholders in the health ecosystem, including hospitals, public health services, startups, labs, and the Indonesian Health Agency. The platform will make it easy for all public health stakeholders to participate, regardless of their own internal systems. This can be achieved by creating a specification and mechanism for information exchange between Satu Sehat and related public health facilities.
b. **Standardization of Public Health Data Information**. The information that needs to be standardized includes details about health diseases, prescriptions or medicines, and other related health information. The Satu Sehat platform will specify and create a standardized mechanism for the migration of information from multiple public health facilities.

c. **Platform Development Ease and Flexibility.** Developers and third-party providers have the flexibility to create modules on top of the platform with strictly regulated access to data as long as they follow the specified specifications and information exchange mechanisms.
d. **Storage and Analysis of Individual Data.** Information at the individual level in this context includes the journey of a patient from birth, childhood, adulthood to when they are of old age. What illness history did they have as a child? What supplements did the mothers consume when the babies were still in the womb? What immunizations and vaccines did they receive since childhood? And how did that change as they grew older? By having this data, doctors and public health practitioners can provide informed and personalized healthcare services. The Citizenship ID or *Nomor Induk Kewarganegaraan* will serve as a single unique identifier for health information.
e. **Ability to develop evidence-based policy.** Satu Sehat Dashboard will be created for the government to support evidence-based policymaking. By having complete historical population health data in a standardized form, it is hoped that the government can make more evidence-based policy decisions.

4.3.3. Team Structure and Job Description

The Digital Transformation Office team, operating within the Ministry of Health in Indonesia, functions like a technology startup with its own C-level. However, all decisions require approval from the Ministry of Health as the ultimate authority.

The Satu Sehat product is divided into three main components: the Satu Sehat Database, Mobile app, and Dashboard. Hence, the team is structured around the products. The Standardization team and Master Data team focus solely on database creation as it includes complex migration and standardization, while the Dashboard team and Satu Sehat Mobile product team work independently. Supporting functions include the Onboarding team and Governance team. The

organizational structure can be summarized as follows:

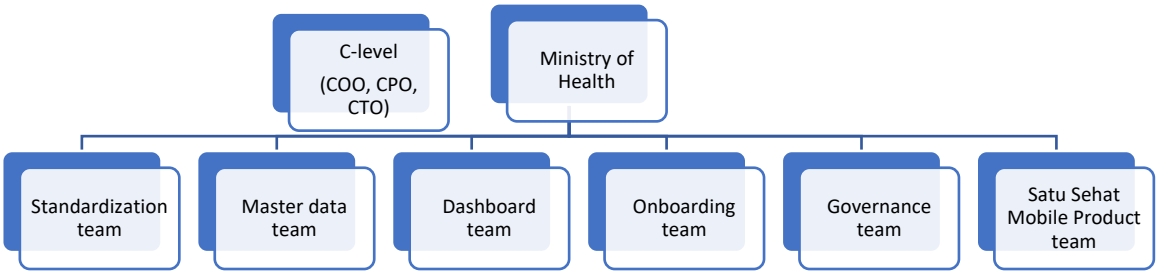


Figure 16 Team structure for the Digital Transformation Office

Department	**Job Description**
Standardization	Create the standard data terminology for telemedicine purposes to be deployed in Satu Sehat Database
Master Data	Prepare data reference for Satu Sehat Database
Onboarding	• Conduct the integration between Satu Sehat and public health facilities (e.g., hospitals, puskesmas) • Ensure that the hospitals and public health facilities comply with the agreements • Training hospitals and public health facilities the new standard by Satu Sehat,
Governance	• Oversee KYC, ensure consent is in mutual agreement,

	• Ensure data privacy scope. For example, one hospital cannot see the data from other hospitals • Oversee the legal activities
Dashboard	Product development for Satu Sehat Dashboard
Satu Sehat Mobile	Product development for Satu Sehat Mobile

4.3.4. Current Satu Sehat Product and Ecosystem

Before discussing the Satu Sehat App, it is worth discussing the ecosystem behind it. The initiative to make Satu Sehat a user-facing app started after they had already built the Satu Sehat database. The team has been working on the back-end data for quite a few years, as the development of this centralized database needed significant investment in time and resources as it requires a manual, laborious process when migrating data onto the database.

a. Satu Sehat Mobile

Satu Sehat Mobile is a patient-facing interface that integrates citizens' healthcare data and features Personal Medical Records (PMR), health lab test booking, scheduling, children's immunization cards, and more. It is a transition from the previous COVID-19 tracing application (Peduli Lindungi) and retains several features, such as check-ins to public places, vaccine and immunization documentation, and more. The app also includes new functionalities that align with its vision of creating a centralized health technology platform.

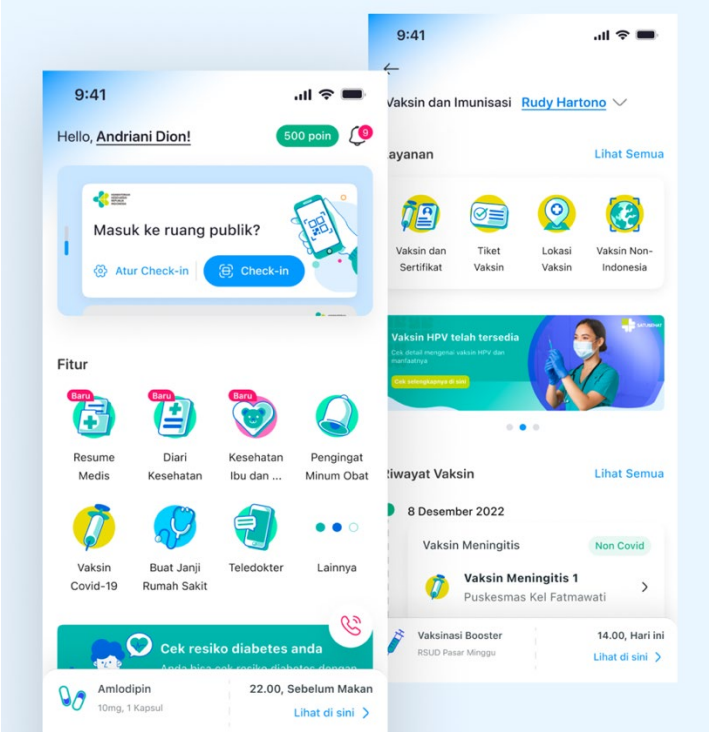


Figure 17 Satu Sehat Mobile

Satu Sehat has evolved into a platform that displays Personal Health Record (PHR) data for patients, which is pulled from the connected database. All data from hospitals stored in the "Satu Sehat Database" is reflected in the app and can only be accessed through the patient's account. The platform, which will collaborate with third-party complementors, will include features such as:

- Personal Health Record
- Personalized Health Education
- Medication Consumption Reminder
- Telemedicine
- Child Nutrition Tracker
- Wearable Device Integration
- Health articles and blog posts

4.4. Satu Sehat Platform Database

The Satu Sehat Database is a centralized repository of health information for Indonesian citizens sourced from authorized hospitals and public health services. Unlike a user-facing platform, the database facilitates data connectivity, analysis, and services to support the integration of inter-application use cases.

The Ministry has engaged a diverse set of stakeholders, including hospitals, laboratories, health-tech companies, pharmacies, private clinics, practitioners, and academics. Currently, the partnership includes all major regional hospitals, including government-owned and state-owned enterprise hospitals. The Ministry's goal is to onboard all health facilities in Indonesia by 2023 [37].

4.4.1. The data migration process from public health providers to Satu Sehat Database

1. **Creating a standardized terminology**

   Medical workers face the challenge of inconsistent terminology usage among healthcare facilities. For instance, some hospitals may identify cough with phlegm with the term "productive cough" while others may use the term "cough with mucus" or "mucus stone." Medical data curators will need to be skilled in identifying and resolving these variations to ensure that data are standardized across all public health services.

   In order to ensure that healthcare information can be exchanged between different computer systems, medical workers use the HL7 FHIR (Fast Healthcare Interoperability Resources 1) standard. This standard allows for information to be exchanged regardless of the vocabulary or storage methods used in each public health facility's systems [38]. To maintain consistent and accurate data, Satu Sehat has a team of medical data curators responsible for transferring information from public health services to the Satu Sehat system. The team ensures that data is properly structured and formatted in accordance with established standards. By centralizing and standardizing health data, Satu Sehat aims to provide reliable and comprehensive information to be used throughout the system, with the medical data curators serving as gatekeepers for the quality of the collected and analyzed data.

The following are several standard terminologies by the Digital Transformation Office of the Ministry of Health:

- ICD-10 is used to standardize medical diagnoses, created by World Health Organization (WHO), and is in continuous development.
- ICD-9-CM is used for standard procedures and medication treatments
- LOINC is used for lab tests and radiology
- SNOMED-CT is used for clinical standards

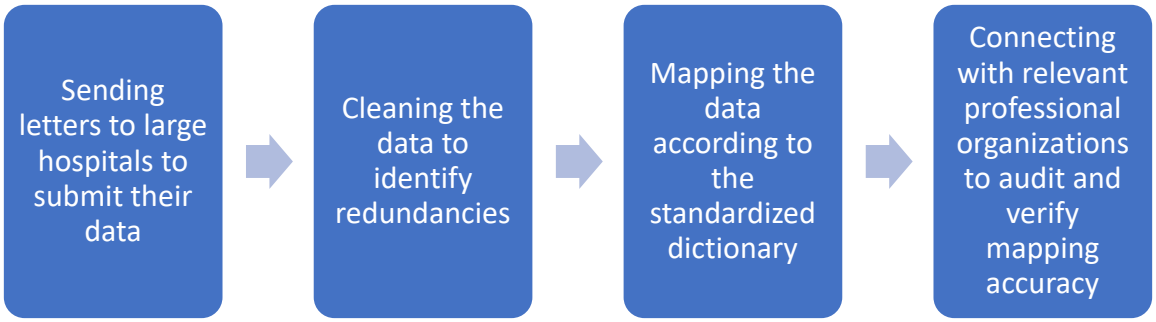


Figure 18 Process flow for data standardization in Satu Sehat

2. **Create standardized API for continual updates of health data going forward**
   Health facilities may have different operating systems or may still rely on manual paper-based methods to manage health information. To address this issue, Satu Sehat developed an API that allows for easier data transfer between different information systems and technologies used by public health facilities. This approach helps ensure that health data can be accessed and utilized regardless of the technology being used by a particular facility.

3. **Policy-supported transition**

   Public policy is a crucial factor that influences the participation of partners in the initiative. Public health providers are considered one of the "multisided users" of the platform. In the early stages, the platform faced the challenge of attracting partners versus users, known as the chicken-and-egg dilemma. However, this issue was resolved by the creation of a supporting policy that mandates healthcare facilities to transition to digital or risk losing their accreditation. Consequently, they are compelled to participate in the data migration process to maintain their accreditation.

   In addition, the DTO team reported a high level of enthusiasm from IT personnel about the initiative. Public health facilities are receptive to the benefits of digitalization and are eager to participate in the migration process. By incentivizing participation through policy and providing a user-friendly platform that meets the needs of healthcare providers, the Satu Sehat initiative has gained significant momentum and is well-positioned for success.

4. **Providing training to facilities**

   The approach taken by Satu Sehat involves providing training to public health providers to migrate their data from their internal systems to the Satu Sehat platform. The Digital Transformation Office (DTO) team has organized roadshows as a form of seminars to train hospitals or clinics' IT personnel on how to transfer their data to the Satu Sehat platform.

   Training and capacity building are crucial as they ensure that healthcare providers are equipped with the necessary skills and knowledge to effectively utilize the platform. The training programs provide a comprehensive understanding of the Satu Sehat system, its features, and practical guidance on how to migrate data and use the platform through hands-on workshops. By providing hands-on training and assistance, the DTO team aims to ensure that all health facilities can effectively migrate their data to the Satu Sehat database, regardless of their current technological infrastructure or level of digitalization.

This mechanism facilitates easy and flexible information exchange between Satu Sehat and related public health facilities, connecting all stakeholders in the health ecosystem and streamlining the patient's journey.

Figure 17 below displays the progress of public health centers' (referred to as "puskesmas" in Indonesian) training as of Week 4 in December 2022.

Province	**Vendors participated**	**Public health facilities (*puskesmas*) participated**	**Hospital participated**
Jakarta	7	315	76
Banten	3	248	21
West Java	7	762	42
Central Java	15	614	151
Yogyakarta	4	121	37
East Java	14	733	N/A
Bali	2	100	43

Figure 19 Progress of vendor, public health facilities, and hospital training

5. Create the database for the API to be integrated with the public health facility

To integrate the API with public health facilities, the IT personnel are responsible for inputting data into the system and creating the necessary database. Following the training and roadshows, seven hospitals have successfully completed the onboarding process and have gone into production as of May 2023. Going into production means that these hospitals are now fully integrated with the Satu Sehat platform and able to use its features to provide better care for their patients.

6. Comply with patient consent

During the implementation of Satu Sehat, there were concerns regarding patient consent since the medical data of each individual is owned by the patient and not the hospital. Hence, patient consent was categorized into two parts:

1. Sharing data with Satu Sehat
2. Sharing data with the hospital.

In order to gain patient's buy-in, the benefits of data integration were highlighted. These benefits include the ease of transfer when patients are referred to another hospital. Previously, the referral process involved the transfer of physical records between hospitals, which could be time-consuming and complex. However, with Satu Sehat, shared health data can be accessed through the mobile app, allowing the referred hospital to see the patient's previous medication data, making the referral process faster and more efficient.

4.4.2. Team Structure for Data Migration

To transition from a product to a platform, rethinking the team structure is crucial for the data transition process. This involves identifying roles and responsibilities for collaboration between healthcare providers, IT personnel, and data curators to meet user needs and deliver platform benefits. The team responsible for this effort performs the following tasks is as follows:

1. **Medical curator team.** Standardizing medical terminologies used in Indonesia by mapping them to existing standards. The team consists of medical doctors and industry professionals with relevant experience.
2. **Database team.** Creating the database and API for public health facilities by mapping all medical activities in Indonesia according to existing standards.
3. **Sales team.** A sales team is responsible for pitching the initiative to hospitals and other stakeholders to ensure its adoption and success

4.5.Satu Sehat Dashboard

The goal of the Satu Sehat dashboard is to provide the government with accurate and comprehensive health data that can inform policy decisions. With this Dashboard, the government can monitor health indicators, identify trends, allowing the government to track important health indicators, identify areas that need improvement, and evaluate the effectiveness

of health programs. By making data-driven decisions, the government can improve the overall quality of healthcare services and better meet the needs of the population.

The Satu Sehat dashboard will offer different levels of access to the government, healthcare providers, and the general public. The level of detail available on the Dashboard will vary between these user groups. With the public, the Dashboard will only provide limited access to certain health data, while for the government, the Dashboard will provide more detailed information that can be used to create evidence-based policies. Workers will also have access to more information to make decisions for patients.

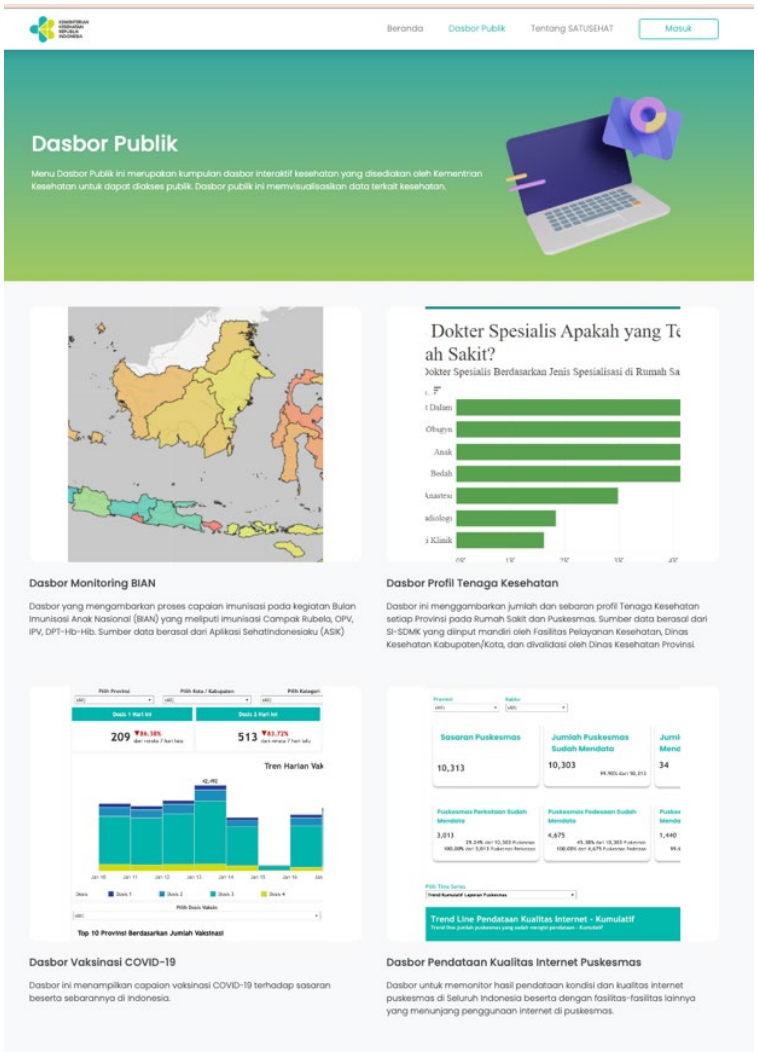


Figure 20 Dashboard Interface

Figure 12 displays the profile of public health workers, including the distribution of workers across different cities and the percentage of workers allocated to hospitals and public health facilities.

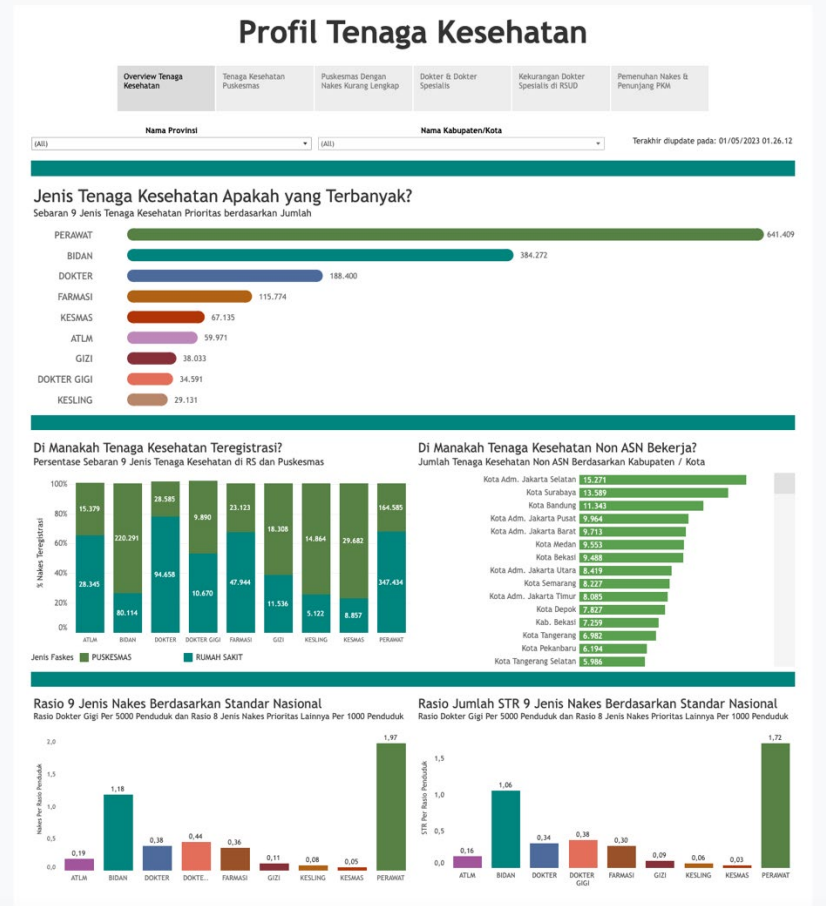


Figure 21 Public dashboard public health workers' profile

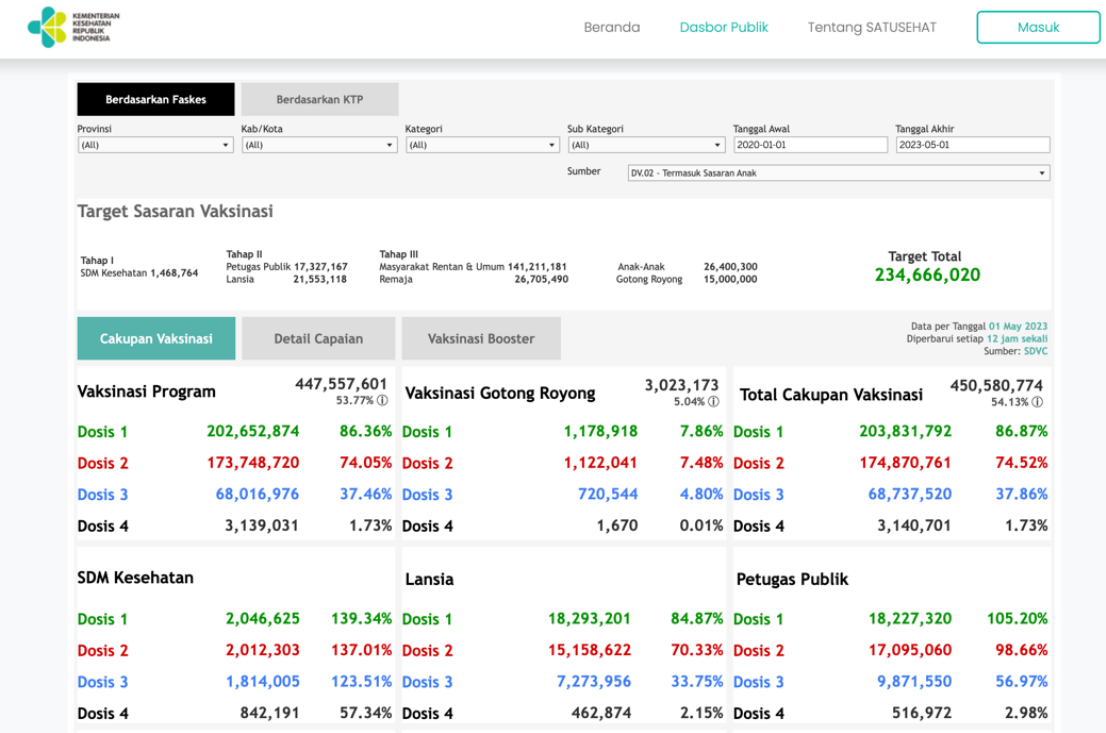


Figure 22 Public dashboard for vaccination report

CHAPTER 5
PRODUCT-TO-PLATFORM DECISION FRAMEWORK

In this chapter, the author will synthesize key points and conclusions from the case study and propose a framework to answer the three main research questions of this thesis below:

5.1. Why should an organization's digital product become a platform?

In the early phase of platform development, an institution should assess whether transitioning its product to a platform aligns with its organizational objectives. Not all products need to become platforms to be successful. Creating and maintaining a platform requires a solid strategy to make it sustainable in the long term. The suitability of becoming a platform also depends on the nature of the industry the institution operates in, its available resources, and its level of competence in the necessary areas.

There are two key questions that an organization needs to answer before determining if a platform strategy is suitable for its growth strategy:

1. Is platform transition aligned with the institution's goals and objectives?
2. Does the institution have the resources required to be a platform?

5.1.1. Is platform transition aligned with the institution's goals and objectives?

The benefits of an institution becoming a platform can be assessed based on how well they align with the institution's business objectives.

a. **The need to scale to target parties:** The Ministry's objective is to improve population-level health outcomes, which requires collaboration from stakeholders such as regional governments, hospitals, public health centers, pharma companies, private sector players, technology providers, and patients. There is a need to involve all the stakeholders involved to achieve the overall target of the Ministry. For example, storing patient records in a standardized form in Satu Sehat's database is challenging due to hospitals using different operating systems, some still relying on manual systems. The government

cannot develop all necessary information systems in-house nor rely on finding vendors for each hospital through a manual process. Thus, the support of hospitals, third-party complementors, and a network of platforms is necessary. Transitioning to a platform allows Satu Sehat to leverage third-party applications and services to achieve its objective.

b. **The ability to extend to more specific use cases:** The Ministry of Health has a range of programs, and collaboration with external experts is necessary as the Ministry cannot develop solutions for every program, such as children stunting prevention, telehealth, and specific disease programs. To provide tailored solutions, the Ministry needs to partner with third-party institutions and developers as complementors. By leveraging their capabilities, the Ministry can work more efficiently towards achieving its goals.

c. **Provide integrated solutions to customers.** Cross-referencing different health services, such as laboratory services, hospitals, pharmacies, personal health record storage, and others, can enhance the healthcare experience. The Ministry expects a potential network effect with more third-party complementors joining in. For instance, a comprehensive set of health articles contributed by various hospitals, doctors, and the private sector can enrich the app's user experience. Patients receiving care for a specific disease can also benefit from seeing information about other types of diseases that they might be prone to but do not pose an immediate risk. Satu Sehat serves as a platform to connect these stakeholders and their data to provide better health services for the community.

5.1.2. Does the institution have what it takes to be a platform?

Based on the case study of Satu Sehat in Indonesia, it can be inferred that a digital product should transition into a platform if it meets the following criteria:

1. The ability to solve the chicken-and-egg dilemma, some of the following methods can be employed:

- ***Utilizing an existing user base***

Satu Sehat can leverage the existing user base of the previous COVID-19 tracing application, Peduli Lindungi, to develop the platform for other niche use cases and attract third-party applications. Peduli Lindungi's success as a stand-alone product can be attributed to its ability to meet the daily needs of its users during the pandemic. For example, it allows users to check in when entering public spaces or traveling by public transportation during the COVID-19 pandemic and access their vaccination cards when needed. This can break the chicken-and-egg problem and will provide Satu Sehat with a large, engaged, readily-available pool user base.

- ***By having a core feature***

To succeed as a platform, Satu Sehat needs to identify its "Core Feature" or "Coring" - a fundamental technology, product, or service that drives the platform's technological system and market [39]. This feature needs to solve a fundamental problem that provides a competitive advantage for the product. For instance, Google has successfully implemented "coring" with its search feature as the main core, which enabled the company to generate a large user base and create opportunities for monetization through advertising in web search results.

Satu Sehat must determine its core feature to extend its monetization models and attract complementors. The previous version of Satu Sehat, Peduli Lindungi's COVID-19 tracing app, had a core feature attributed to the check-in feature that is essential for factories to store people’s information for entry into public spaces. What is the core feature of Satu Sehat?

A core feature of a platform can also refer to a technical standard that has been standardized by the team, such as the Satu Sehat technical standard discussed in Chapter 4. For Satu Sehat, the core feature determined is "Personal Health Records." In addition to defining a clear value proposition and business model, it is crucial to consider the business side of the platform for its success.

However, a single core feature may not be sufficient to drive the platform's growth and attract complementors. Satu Sehat may need to consider additional core features, such as data analytics or telemedicine services, to drive growth and attract complementors aligned with the platform's goals and user needs.

- ***By instituting a supporting policy***

Satu Sehat has implemented a policy requiring hospitals to adopt digital systems and use its platform to go "digital." Failure to comply may result in decreased accreditation. This policy has encouraged hospitals to collaborate with external IT vendors and information systems providers or startups like Zi-care (https://zicare.id/) to meet Satu Sehat's technical standards and ensure compatibility with the platform. The policy has also attracted vendors and companies to participate in the ecosystem, promoting growth and innovation.

5.2. What are the key success factors for a product-to-platform transition?

1. *While utilizing the existing user base, ensure the new use cases remain relevant for them*

To ensure that the existing user base is the right target audience for the extended platform, it is important to consider the relevance of the new features and how they fit within the new user journey. For example, Peduli Lindungi catered to a broad user base that included individuals who were not on medication or were in the pre-medication stage and used the app on a daily basis almost by coercion to get into public places. This is in contrast to Satu Sehat, which is more voluntary in nature and may be more relevant to individuals who have already been diagnosed with an illness and are seeking treatment, hence the need to see their Personal Health Records as reference. Therefore, it is essential to understand the concerns and needs of existing users and tailor the features of Satu Sehat accordingly. The large pool of user base will need to go through re-education to properly utilize the application with the new use cases.

2. *Define platform boundaries*

In Gawer's research, the concept of digital platform boundaries encompasses several aspects. This includes defining the scope of the platform firm, which involves determining the assets owned, labor employed, and activities performed in-house [40]. This creates the need for Satu Sehat to create a mapping regarding what is the scope of the government as policymaker, rules

provider and platform provider; as well as setting the stage what can be done by third-party as complementors. Institutions can internally produce the technological foundation that serves as a basis for third-party development of complementary innovations. However, platforms excel at this process by adopting an iterative approach, releasing updates and evaluating the outcomes gradually rather than attempting to accomplish everything at once.

3. *Have enough ecosystem of complementors*

a. Create compelling incentives for both the platform and potential partners

Satu Sehat incentivizes hospitals to digitize their operations and earn accreditation by using the platform. This policy has encouraged hospitals to collaborate with information systems providers, such as vendors or startups like Zi-care (www.zicare.id), to meet Satu Sehat's technical standards for compatibility with the platform. Vendors and startups can benefit from this new market opportunity, while hospitals are motivated to invest in digital systems and receive accreditation.

By standardizing the data from each hospital's information system and integrating it into Satu Sehat's platform, patient data fragmentation across different healthcare providers can be solved. This integration also provides companies with cost reductions due to the efficiencies gained from the platform's standardized processes and access to a wider network of users. This concept is similar to how Intel microprocessors decreased hardware costs for Linux by providing a more efficient and standardized technology that could be adopted by a larger number of users [15].

b. Convince third-party to be able to join the platform

The Ministry of Health has the advantage as it can mandate compliance as a government institution. Even so, they still need to address skepticism from third-party stakeholders. It is crucial for Satu Sehat to demonstrate the benefits of using the platform and create a strong incentive for adoption. For example, hospitals can increase their accreditation, decrease waiting times for services, and improve the overall patient-service experience by adopting the platform.

By highlighting these advantages, Satu Sehat can build trust with potential complementors and encourage them to collaborate on the platform.

In the case of WideSky, an end-to-end system that caters to the data and advanced analytics requirements of the energy industry, the product effectively addressed the challenge of managing expanding information systems that stored mission-critical and private data. However, it encountered difficulties in the form of competitors' reluctance to adopt its proprietary standards. Competitors such as H&P decided to create their own open-standards platform and manage it through an industry group, the Storage Networking Industry Association, without the involvement of WideSky. This example highlights the importance of establishing partnerships and coalitions of providers and users in platform strategy [39].

c. Alignment of clear vision as an institution and measurable Objective Key Results (OKRs)

From this case study, we can conclude that it is imperative that the institution is clear on the vision of the platform and operationalize that into measurable Objective Key Results (OKR). The Ministry team has defined very clear short, medium, and long-term objectives for the platform, as explained below:

- **Short term: Integration and Development of Health Data Systems**

In the short term, the Ministry aims to improve the quality of evidence-based health policies by providing accurate and complete data through the following initiatives. The projects supporting this goal are as follows:

  - ***National Health Data:*** Implement an Individual-based National Health System (Single Identity Health Record)
  - ***Integration of Health Data Systems***: Integrate electronic service systems between government agencies and the health industry

- ***Development of Health Big Data Analysis System***: Building an ecosystem of big data systems at the central and regional government levels

- **Medium term: Integration and Development of Health Service Application Systems**

In the medium term, the goal is to create efficient health service delivery at the level of health centers, clinics, hospitals, labs, and pharmacies. The projects supporting this goal are as follows:

- ***Integrated Health Applications***: Digitization and integration of health service information systems (health centers, clinics, hospitals, labs, and pharmacies)
- ***Integration of Business Processes and Capacity Building***: Integration of business processes and capacity building related to health informatics
- ***Health Application Helpdesk*****:** Availability of Helpdesk and Customer Management System for Health Applications

- **Long term: Development of Health Technology Ecosystem**

In the longer term, it is hoped that it will create a collaboration and digital health innovation ecosystem between government, industry, and other relevant stakeholders. The projects supporting this goal are as follows:

- ***Expansion of Telemedicine Technology:*** Expansion of telemedicine implementation from health facilities to the public
- ***Ecosystem for Health Information Technology and Biotechnology:*** Regulation and implementation of Regulatory Sandbox with a priority on 4.0 technology-based products
- ***Integration of Health Biotechnology Research:*** Integration of research and development of biotechnology products with health service providers.

d. Lowering the barrier to entry for users and third-party applications

Providing training and support for developers.

Hands-on training sessions have been conducted through roadshows in various provinces across the country. The training session is offered for developers to help them learn how to use the platform effectively and troubleshoot any issues they may encounter. This approach is similar to the one used by Google, which held its first developers' conference in 2007 with 1,000 programmers in attendance and another 5,000 joining remotely. The conference focused on Google's application programming interfaces (APIs) across its products and discussed how developers could integrate Google's products into their own sites. By providing training and resources, Satu Sehat can support third-party developers and encourage the development of complementary products and services on its platform. Additionally, a helpdesk is available to facilitate asynchronous questions and provide manuals, which can be particularly useful for third parties.

e. Public Education or Brand Equity

Gradual releases can be an effective strategy when introducing new features to a platform. In the case of Peduli Lindungi, the digital transformation office team implemented this strategy by gradually releasing non-COVID-19 related features to the app, moving away from the initial focus of universal usage in healthcare during the pandemic.

- **Introduction of new features.** To expand the usage of the platform beyond its initial purpose, the digital transformation office team of Peduli Lindungi implemented a strategy of using gradual releases to introduce new features that are non-COVID-19 related. These features include getting reminders for taking medicine and other use cases that allow users to see the value of the platform in other areas of healthcare.s

- **Do targeted marketing campaigns.** The "Be Healthy with Satu Sehat" campaign was launched to position the platform as a comprehensive healthcare solution rather than just a COVID-19 tracing app. The campaign highlights the platform's ability to assist users in managing their overall health and wellness beyond the pandemic. To further support this effort, a hashtag called #GakCumaCOVID19 (Indonesian for "Not Only COVID-19")

was introduced, emphasizing additional features such as the ability to record personal health information (diary) and access medical records, including laboratory test results.

Figure 23 Visuals for Satu Sehat Transition Campaign

5.3. How should the platform owner collaborate with third-party complementors?

1. *Bottom-up approach for innovation within third-party despite standardization*

In a bottom-up approach, a platform is open for anyone to join and contribute, while in a top-down approach, an institution chooses the vendor, limiting the sectors or potential candidates who can contribute to the platform. The DTO's approach to the digitalization of public health services is a bottom-up approach. The policy created by DTO incentivizes public health services to digitize their operations and earn more accreditation, creating a new market for third-party complementors or startups that can comply with the standards to create the solution for the hospital. This use case is just one among many potential programs and use cases that can be developed by the Ministry of Health. The new policy creates opportunities for startups to innovate and provide IT solutions for public health services that lack IT personnel.

2. *Strong monitoring and regulated use of data*

With respect to a bottom-up approach, the platform should still ensure the quality of complementors, Satu Sehat should establish platform governance. This involves setting rules and processes to ensure the quality of output and deter bad actors. The current offline training programs can continue, but Satu Sehat should also consider implementing scalable online training to reach more stakeholders efficiently as the number of complementors grows. The Ministry should set strict rules and consequences for fraud or violations and take feedback from stakeholders to continually improve governance.

4. *Form an internal team dedicated to researching third-party complementors*

Developing a successful platform requires a focus on balancing two key aspects: the internal team and the evolution of the complementors' ecosystem [15]. Institutions can learn from Intel's Architecture Lab, which concentrates on researching Intel's interactions with complementors and ensuring that third-party innovators can flourish. Platform owners must not only create open programming interfaces but also consider how they can guide complementors in their ecosystem continuously.

Several key factors need to be considered. The dedicated team can start by defining how third-party products will communicate with other platform components, such as the Satu Sehat database, dashboard, and mobile app, to ensure that all elements work seamlessly together. Second, incentivizing third-party complementors can encourage them to design innovative products and contribute to a dynamic ecosystem of complementary products that add value to the platform. Third, continuous maintenance support and training beyond the onboarding stage are crucial to assist complementors in working effectively with the platform. Lastly, actively seeking and partnering with third-party complementors that can provide additional value can be facilitated by developing a dedicated partnership team that identifies and establishes partnerships with complementors capable of offering unique and valuable products or services.

CHAPTER 6
CONCLUSION

It is evident that a platform strategy requires a long-term game plan with an iterative approach, continued investment, maintenance, and data-driven long-term planning. The question then arises: how can the ministry sustain and evolve its platform model strategy? There are several key areas and strategies to accomplish this.

1. **Refine long-term measurements of success**

How do you measure the success of the platform? One key indicator of a platform's success is network effects, which refers to the phenomenon where the value of a platform increases as more users join and use it. If a platform does not experience growth through network effects, it could be an indication that it needs to pivot, which should trigger an entire re-evaluation of the platform's value proposition and overall strategy.

Therefore, the Ministry might want to add a set of success metrics or indicators that specifically measure if network effect is indeed taking place into its current list of Objective Key Results. This set of metrics can measure both network effects that happen on the patients/end customers and its third-party complementors. The success metrics can measure both leading and lagging indicators. Leading indicators can be in the form of retention cohort metrics, which compare engagement levels of the different cohorts of users or third-party complementors that go into the platform. If a network effect is present, the engagement level of the later cohorts of users or third-party complementors should be higher than that of the earlier cohorts. Lagging indicators can be in the forms of overall resulting Daily Active Users, Monthly Active Users, and the number of overall transactions, which should increase in a non-linear manner over time.

It is also important to note that network effects might not be binary, and the intensity of which can increase or decline over time. While the Ministry should monitor these metrics, it should allow enough time and invest enough resources for the platform to grow before deciding that it needs to pivot from its current strategy.

2. **Complement the bottom-up, open approach to third-party complementors with a top-down guided approach to tackle the most pressing needs of patients**

The ministry is currently planning to open the platform to all types of third-party complementors, ensuring that there is the freedom to innovate and boost divergence of use cases on the platform. This, coupled with guardrails to prevent fraud and ensure the integrity of data access, can indeed lead to a flourishing ecosystem on top of the platform.

In addition to the bottom-up approach, the ministry can consider deploying a top-down guided approach to tackle what it identifies as strategic and can further fuel user engagement. For example, one of the issues that the Ministry is currently concerned about is child stunting. Having identified such an issue, the Ministry can strategically invite third-party organizations that can contribute to creating solutions for stunting. The Ministry can hold information workshops inviting relevant stakeholders and dedicate a team to help with onboarding, development, and integration of the solutions onto the platform to further accelerate innovation around this issue.

The Ministry can also learn from the experience of the Singaporean government's HealthHub app as they have integrated specific use cases such as access to mammography and X-ray results from laboratories, as this typically is a starting point that a user has to go through in their medical journeys, and can serve as a springboard for further engagement with the platform.

The Ministry should continue to rethink and refine the platform strategy based on user feedback and emerging trends. By identifying and prioritizing key features, the platform can evolve and become a more valuable resource for its users, taking advantage of both top-down and bottom-up approaches in its growth. Through these iterations, the platform can continue to grow and serve the needs of its users more effectively for years to come.

3. Ensure platform continuity through careful long-term budgeting and maintenance

Developing and maintaining a platform is a long-term game. To ensure the platform's sustainability, the government must not only allocate resources for the short term but also forecast and secure funding and budget for future iterations and maintenance. Nurturing a platform takes significant time, and it is highly probable that the Ministry will need to adjust its course, rethink its direction, and re-execute new strategies and tactics to finally achieve true network effects through a fully-functional platform with all of its sides growing healthily. Over the medium and longer term, this also means providing funding for technical support, server maintenance, and all types of feature enhancements. It is necessary to consider and accurately forecast the amount of effort, organization structure, team size, resources, and budget required to maintain and improve the platform's features, as well as resources to retain the growth and development of the third-party ecosystems. The Ministry can also explore partnerships with other organizations to co-fund some of its activities and seek for external expertise to sustain the platform and guarantee its ongoing success and continued expansion.

BIBLIOGRAPHY

1. Hospitals (per 1,000 people), World Bank, 2017 https://data.worldbank.org/indicator/SH.MED.BEDS.ZS?locations=ID

2. World Development Indicators: Health Systems, http://wdi.worldbank.org/table/2.12

3. Ministry of Communication and Information Technology, Indonesia, "Aplikasi Peduli Lindungi Dibuat Telkom Terinspirasi Dari Trace Together", 2021 https://aptika.kominfo.go.id/2021/09/aplikasi-pedulilindungi-dibuat-telkom-terinspirasi-dari-aplikasi-tracetogether/

4. Satu Sehat to be Indonesia's Main Health, Platform, Antara News, 2023 https://en.antaranews.com/news/274038/satu-sehat-to-be-indonesias-main-health-platform-ministry
5. Cusumano, Michael, and Annabelle Gawer. "The Elements of Platform Leadership." MIT Sloan Management Review, vol. spring 2002.
6. Intuit QuickBooks: From Product to Platform
7. Baquero, Andrea Patricia Diaz. 2013. "Super Apps: Opportunities and Challenges."
8. Cusumano, M., Gawer, A., & Yoffie, D. B. (2019). The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power. Harper Business.
9. Evans, D. S. (2003). Two-Sided Platforms and Analysis of Single-Firm Conduct.
10. M. A. Cusumano, Y. D. B., and A. Gawer, "The Future of Platforms," MIT Sloan Management Review, 2020. https://sloanreview.mit.edu/article/the-future-of-platforms/ (accessed Mar. 11, 2020).
11. Gawer, Annabelle, and Rebecca Henderson. "Platform Owner Entry and Innovation in Complementary Markets: Evidence from Intel." National Bureau of Economic Research, 2005.
12. Hagiu, Andrei, and Elizabeth J Altmann. "Finding the Platform in Your Product." *Harvard Business Review*, 2017.
13. Vardhan, H. Platform Failures: Lessons for Strategic Management. 2015

14. Ceccagnoli, Forman, Huang, & Wu, Co-Creation of Value in a Platform Ecosystem: The Case of Enterprise Software, 2014
15. Gawer, Annabelle, and Michael Cusumano. Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation. Harvard Business Review Press, 2002.
16. Helmond, A., Nieborg, David B. & van der Vlist, Facebook's evolution: development of a platform- as-infrastructure
17. Boudreau, K. J., and L. B. Jeppesen. "Unpaid Crowd Complementors: The Platform Network Effect Mirage." Strategic Management Journal, vol. 36, no. 12, 2015, pp. 1761-1777. ResearchGate,
18. Rochet, Jean-Charles, and Jean Tirole. "Platform Competition in Two-Sided Markets." Journal of the European Economics Association, vol. 1, 2003, pp. 990.
19. Ching, Kenney. " The Clone Wars: Competitive Dynamics in the Internet Video Industry." Rotman School of Management, University of Toronto, 2013
20. Lerner, Josh, and Jean Tirole. "The Economics of Technology Sharing: Open Source and Beyond,", Journal of Economic Perspectives, vol. 19, no. 2, Spring 2005, pp. 99-120.
21. Chen, Liang, et al. "Governance and Design of Digital Platforms: A Review and Future Research Directions on a Meta-Organization." Journal of Management, vol. 48, no. 1, January 2022, pp. 147-184.
22. Hagiu, A., Wright, J., 2019. The Status of workers and platforms in the sharing economy. J. Econ. Manag. Strategy. 28 (1), 97–108.
23. Wareham, J. Fox, Paul B., Giner, J. L. C. Technology Ecosystem Governance, 2014
24. Islam, Habib A., et al. "Understanding Transaction Platform Governance and Conflicts: A Configuration Approach." Technological Forecasting and Social Change, vol. 189, April 2023, 122382.
25. Gawer, Annabelle. "Bridging Differing Perspectives on Technological Platforms: Toward an Integrative Framework." Research Policy, vol. 43, no. 7, September 2014.
26. Inoue, Yuki. "Indirect Innovation Management by Platform Ecosystem Governance and Positioning: Toward Collective Ambidexterity in the Ecosystems." Technological Forecasting and Social Change, vol. 166, May 2021, 120652.
27. Eisenmann, Tom, et al. "Strategies for Two-Sided Markets." Harvard Business Review, vol. 84, no. 10, October 2006, pp. 92-101.

28. Steinberg, Marc. "LINE as Super App: Platformization in East Asia." Social Media + Society, vol. April-June 2020, pp. 1-10.
29. Gojek, 2023 https://www.gojek.com/en-id/products/
30. Grab, 2023 https://www.grab.com/sg/.
31. Gelici, A. A. "Super Apps: Super Desired or Not? An Explorative Study into the Commercial Potential of an Asian Type 'Super App' within the Netherlands." University of Twente, 2022.
32. Health Hub Singapore Official Website https://healthub.sg
33. Australian Government, My Health Record Official Website (https://www.myhealthrecord.gov.au/)
34. Queensland Government, Integrated Electronic Medical Record, https://www.health.qld.gov.au/clinical-practice/innovation/digital-health-initiatives/queensland/integrated-electronic-medical-record-iemr]
35. National Health Service https://www.nhs.uk/
36. Rizkinaswara, Leski, "Aplikasi PeduliLindungi Dibuat Telkom Terinspirasi dari Aplikasi TraceTogether". Ditjen Aptika (Accessed March 15th 2023).
37. "Health Ministry Launches Satu Sehat Platform." https://setkab.go.id/en/health-ministry-launches-satusehat-platform/ (Accessed March 15th 2023).
38. HL7, Fast Healthcare Interoperability Resources, https://hl7.org/fhir/
39. Gawer, Annabelle, and Michael Cusumano. "How Companies Become Platform Leaders." MIT Sloan Management Review, vol. 49, no. 2, Winter 2008.
40. Gawer, Annabelle. "Digital platforms' boundaries: The interplay of firm scope, platform sides, and digital interfaces." Long Range Planning, 2020