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The Rise and Fall of App Stores: How and Why Product Platforms Pivot

Completed Research Paper

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Abstract

Established product companies increasingly embrace platforms in the form of app stores to enhance their products through digital services. However, succeeding with such endeavors and introducing a successful product platform poses significant challenges and puts managers responsible under considerable pressure. Over four years, we have accompanied three product companies in establishing profound product platform businesses. In doing so, we derived insights into how and why product platforms pivot in realizing an app store on top of their physical products. Our research emphasizes how these companies shifted from embracing a broad ecosystem of third-party developers to forming strategic partnerships and focusing on established products as innovation foundations. Moreover, we present actionable managerial recommendations for managers venturing product platforms. Thereby, we guide managers being confronted with managing the ambidexterity involved in establishing platform business in addition to product business.

Keywords: Strategic pivots, Product platforms, App stores

Introduction

In the last decade, product companies heavily invested in platforms and services, envisioning novel value propositions on top of their physical products (Cusumano et al. 2020; Hodapp et al. 2022; Nerbel and Kreutzer 2023; Zhu and Furr 2016). Examples include consumer brands such as BMW or Toyota establishing app stores on top of their vehicles to provide and enable novel software-enabled features (i.e., BMW Connected Drive Store, Toyota Connected Services) but also industry heavyweights such as Siemens or Schneider Electric introducing platforms providing analytics, maintenance, or fleet management services for industrial machinery (i.e., Siemens MindSphere, Schneider Electric Exchange).

Venturing such product platforms, these companies ultimately envisioned flourishing app stores that provision third-party apps and services, generating additional revenue streams and business profits on top of their existing products (Cennamo et al. 2022; Eisenmann et al. 2006; Essen et al. 2023; Haki et al. 2024; Schreieck et al. 2022). As a result, these companies focused their business activities on establishing an ecosystem of third-party apps and services (Gawer and Cusumano 2014; Hukal et al. 2022; Stonig et al. 2022). Accordingly, guided by scientific literature across the business and management, strategy, and IS domains, these companies profoundly invested in opening their established products, making them platform-ready. Thereby, the companies significantly invested in providing collaboration resources. Exemplary collaboration resources (boundary resources in scientific terms) encompass standardized

interfaces (i.e., APIs, SDKs, libraries) that enable others to provide complementary innovations (i.e., apps and services) on top of their products (Boudreau 2017; Gawer 2021; Hein et al. 2020a).

Nowadays, having exceeded the peak of inflated expectations, most product platforms and the respective managers in charge face significant challenges as the hoped and planned-for third-party value co-creation did not substantiate accordingly (Hawlitschek and Hodapp 2024; McKinsey & Company 2023; Wlcek et al. 2023). In concrete, companies venturing product platforms profoundly invested into the product platform itself, collaboration resources, and adjacent supporting activities (e.g., legal, marketing, sales). Yet, they are (still) lacking the expected business profits, ultimately putting the product platforms under intense pressure (Boston Consulting Group 2020; Hawlitschek and Hodapp 2024). Some product platforms even had to pay the price the hardest, ultimately being forced to discontinue their services altogether (e.g., Siemens MindSphere). While platform business failure and underlying reasons have been investigated across domains in certain detail, ranging from general managerial mistakes (Hodapp et al. 2022; Van Alstyne et al. 2016; Zhu and Furr 2016) to industry-specific analyses of single or multiple cases (Hodapp et al. 2022; Jacobides 2022; Skog et al. 2021; Wlcek et al. 2024), scientific research in that regard so far has focused on ex-post analyses of digital platforms. Such ex-post analyses predominantly focus on learning from failure and deriving strategic guidelines (e.g., Jacobides 2022; Van Dyck et al. 2024; Wlcek et al. 2023).

Our research now reveals rich insights into how product companies that conduct 'traditional business' embrace platform business (i.e., app stores) to enhance their physical products through digital services. In concrete, we outline how and why product companies pivot away from the app store concept. Thereby, pivoting is understood as a significant shift in a company's strategy through altering key elements of the business model (Kirtley and O'Mahony 2023; Ries 2017; Teece 2010). Our insights further encompass rethinking the role of the underlying product as the innovation foundation (Haki et al. 2024; Schreieck et al. 2022; Stonig et al. 2022). Hereby, we introduce novel perspectives on platform strategy and open the discussion for the so far underrepresented notion of value co-creation through modularization and opening of the innovation foundation (i.e., the product). In concrete, we aim to investigate: *How do product platforms pivot and what can we learn about it? (RQ1)* as well as the underlying reasons for doing so, thus: W*hy do product platforms pivot and what does this imply for platform strategy of product companies? (RQ2)*. Thereby, we focus on identifying fundamental challenges of implementing an app store for product platforms.

Answering these two research questions, we outline the following parts of this paper. First, we introduce product platforms in detail before describing our research approach in chapter three. Subsequently, we introduce our case companies in certain detail and provide background information. Following, we introduce how the three case companies pivoted (RQ1) and showcase the underlying reasons for doing so (RQ2). Finally, we present managerial recommendations for product platform strategy and provide concluding remarks.

Product Platforms

The term product platform emerged in practice to describe platforms that build on physical products already being useful to certain customers. Consequently, product platforms combine certain notions of transaction platforms (i.e., marketplaces) and innovation platforms (Haki et al. 2024; Schreieck et al. 2022; Stonig et al. 2022). Transaction platforms and innovation platforms resemble two fundamental types of platforms in scientific research (Cusumano et al. 2019). Transaction platforms such as Airbnb or Uber serve as intermediaries facilitating interactions between buyers and sellers (Cusumano et al. 2019). Innovation platforms such as Apple iOS or Force.com facilitate the development of third-party complements such as apps (Cusumano et al. 2019; Gawer 2014).

We conceptualize product platforms as a concretization of innovation platforms that contextualize the innovation foundation others may innovate upon to a specific type of existing (physical) product (Haki et al. 2024; Schreieck et al. 2022; Stonig et al. 2022). In this role, product platforms facilitate third-party complement development, which in practice are distributed through app stores that serve as transaction platforms. Nevertheless, the locus of value creation of product platforms is bound to the underlying (physical) product (i.e., the innovation foundation). Based on this understanding, we manifest product platforms as a subtype of innovation platforms. Companies venturing product platforms ultimately envision orchestrating a flourishing app store as it is known from Apple or Google.

Preceding the manifestation of such a vision, several challenges must be overcome before the product platform and its app store flourish (Björkdahl et al. 2024; Büge and Ozcan 2021; Gawer and Cusumano 2008; Stonig et al. 2022; Zhu and Furr 2016). Hereby, scientific research agrees on the importance of collaboration or boundary resources that encompass tools and practices to enable third parties to provide complementary innovations (Boudreau 2017; Gawer 2021; Hein et al. 2020a). In practice, exemplary resources include APIs, libraries, documentation, or SDKs.

Per our preliminary definition, product platforms incorporate multiple layers (Haki et al. 2022; Hein et al. 2020b). First, the underlying product as the innovation foundation. Second, the product platform encompassing a digital interface layer in between, and third, the app store on top of the product platform, granting centralized access to complementary apps and services. Consequently, product platforms combine multiple value creation mechanisms (Hein et al. 2020a; Marheine et al. 2021). In practice, managers typically focus on the app store being most visible, eventually neglecting other value creation mechanisms equally or even more important. In the following, we present an in-depth analysis of three exemplary case companies embracing product platform business.

Research Approach

Our research encompasses a multiple case study (Eisenhardt 1989; Eisenhardt 2021; Yin 2018) of three companies within different industries. From the beginning of our data collection, all companies already showcase substantial revenues (i.e., > 10 million US-Dollar annual revenue) leveraging their product platform. Over three years, we received access to almost all company levels, ranging from strategy workshops with C-level executives to operational customer or partner ticket handling. Incorporating the principles of building theory from case study research (Eisenhardt 1989), we briefly introduce our cases and provide details on our case selection, data collection, and analysis.

Case Selection

Producing generalizable and robust insights into our topic under investigation requires multiple carefully selected, heterogeneous, yet comparable cases (Eisenhardt and Graebner 2007). Furthermore, employing an embedded case study design focusing on product platforms and inherent dynamics encompasses several units of analysis, eventually promoting founded and accurate theory building (Martin and Eisenhardt 2010; Yin 2018). Hereby, ensuring validity, we established distinct case selection criteria relying on purposeful sampling (Patton 2014). For several reasons, we deliberately selected cases that showcase substantial product platform revenues. On the one hand, this minimizes the risk of investigating cases showcasing eventual start-up tensions. Additionally, such cases incorporate noticeable platform ecosystems that promote a better understanding of the vivid dynamics involved (Fuller et al. 2019).

Data Collection and Analysis

Initially, we started our research conducting a thorough web search on each case company. In doing so, we gained a preliminary understanding of each product platform, the involved partners, and the available apps and services. Building upon that, we engaged in frequent and regular exchanges with each case company. Overall, our data collection ranges from August 2020 to April 2024.

We followed established guidelines (i.e., Junglas 2024) and engaged with C-level executives, directors, and senior managers, as well as innovation, product, and sales managers, within joint workshops on product platform strategy or product platform ideation. Furthermore, we scheduled pre- and follow-up interviews to gather preparation information and follow-up insights after each workshop. All senior managers and higher-ranked executives worked in the company's product business before becoming senior personnel at the product platform. While we initially only targeted senior executives to gain first-hand strategic insights (Junglas 2024), in the course of our research, we also engaged with less senior personnel at operational level. These exchanges emphasized valuable insights into actual complementor and partner behavior and shortcomings hereby.

Overall, we engaged in 50 expert interactions involving (1) designated strategy or ideation workshops and (2) focused interviews. This results in 7.410 minutes of interactions (cf. Table 1). We held each workshop according to business practices and applied respective documentation practices. Business practice

encompasses thorough knowledge documentation, including visuals, protocols, and presentation slides. In addition, all documents were sent to the workshop participants as part of the follow-up to each workshop.

Moreover, we documented, recorded, and transcribed interviews upon the interviewee's agreement. All displayed expert interactions were held by at least two researchers familiar with the topic, who took notes and shared them. Strategy workshops and interviews were structured three-fold, answering three core questions: Where are we now, where do we want to go, and what is a credible path to get there? Ideation workshops focused on improving the overall value proposition of the platform and involved a moderated discussion on the competitive landscape and available complements.

We analyzed this diverse set of data scanning and reflecting commonalities, differences, and peculiarities eventually promoting rich insights. We embarked on this research summarizing all secondary data from our initial web search to establish common ground in understanding of each product platform's strategy, core value creation mechanisms, and fundamental value propositions prior to engaging with the companies in-depth.

Data context			**Data collection**		
ID	**Industry**	**Interviewee**	**Context**	**No.**	**Scope**
M1	MedTech	Senior product manager	Interview	7	30 min
			Strategy workshop	3	500 min
M2	MedTech	Innovation manager	Interview	16	30 min
			Strategy workshop	3	500 min
M3	MedTech	General manager	Strategy workshop	3	500 min
M4	MedTech	Senior product manager	Strategy workshop	1	90 min
A1	Industry automation	Director	Interview	3	60 min
			Ideation workshop	1	300 min
A2	Industry automation	Product manager	Ideation workshop	1	300 min
C1	Automotive	Senior vice president	Interview	5	30 min
			Strategy workshop	3	330 min
C2	Automotive	Senior manager	Interview	1	30 min
C3	Automotive	Innovation manager	Interview	1	60 min
C4	Automotive	Sales director	Interview	1	60 min
C5	Automotive	Sales director	Interview	1	60 min
			Sum	**50**	**7.410 min**

Table 1. Data collection overview

Three Product Platform Strategies

Over the last eight to ten years, the three case companies heavily invested in building their product platforms. Thereby, the respective product platforms matured from being nice-to-have to generating substantial revenues. To understand and make sense of the case companies' actions and strategies, we illustrate each case in certain detail below. Moreover, we highlight their embarked strategies, inviting managers and executives to reflect upon. In concrete, we elaborate on three case companies within the industrial technology, automotive, and medical technology (MedTech) industry. Table 2 below introduces our case companies accordingly.

Description		Cases		
		AutomationInc	**AutomotiveInc**	**MedTechInc**
Platform company	Industry	Industrial technology	Automotive	Medical technology
	Size	> 33.000 employees	> 5.000 employees	> 200.000 employees
	Market	Challenging player in balanced oligopoly	Established player in fragmented market	New player in balanced oligopoly
Platform status quo	Core	Drive technologies & automation systems	Driving features & vehicle operating system	Diagnostic devices & medical test cartridges
	Complements	> 200 apps and third-party services	> 40 apps and third-party services	> 15 medical tests
	Complementors	> 130 partners	> 15 partners	Not publicly announced

Table 2. Case overview

Strategy of AutomationInc

AutomationInc's roots lie within the industrial technology industry. Over the last 30 years, the company has established comprehensive expertise in the automation business. This expertise includes a diverse portfolio of automation technologies serving customers in over 20 industries across the globe. Leveraging a global network of production facilities, R&D locations, and service centers, AutomationInc employs over 33.000 people on all continents. Its core business of industry automation, homing ten different product lines, centers around drive technologies (e.g., electric motors, sensors, or actuators) and automation software (e.g., IoT gateways, motion control systems, or industrial PCs). Despite its extensive hardware and software portfolio, AutomationInc faces strong competitive pressure from established industry giants from Europe and the United States, resulting in a consolidated but highly competitive global market.

Tackling the industry giants and disrupting the automation industry's status quo ultimately gave birth to AutomationInc's product platform, which consists of its hardware (i.e., drive technologies) and the respective automation software. The automation software encapsulates an operating system and app store. While the OS kernel is proprietary software, almost all other software components are open source, thus promoting low adoption barriers and tackling industry skepticism in the form of software lock-in right ahead. Leveraging the connectivity of its hardware and the subsequently generated data and intelligence of the equipped automation processes, AutomationInc provides additional apps and services such as machine monitoring, no- or low-code services, and factory device tracking. These apps and services are accessible via a centralized app store with extensive documentation, libraries, and APIs available. Furthermore, more than 130 external partners provide additional apps and services complementing AutomationInc's product platform through simulation environments, process modeling tools, or PLC and HMI generators. While the company could not yet disrupt the automation industry's status quo, it envisions to provide the 'smartphone of industrial automation' as the Chief Sales Officer (CSO) expressed:

> ***"Our solution is a modular automation system with an ecosystem and app technology, effectively the 'smartphone of industrial automation'."***
>
> *Chief Sales Officer AutomationInc (2022)*

Strategy of AutomotiveInc

AutomotiveInc engages globally in the automotive industry. Founded in 2020, the relatively young company emerged out of a recognizable automotive manufacturer and key player within the global automotive industry. Currently, over 5000 employees across three continents work together to develop and establish an unified automotive software platform across multiple models. Ultimately envisioning data-based services for smart mobility and autonomous driving, such as chauffeur services or remote parking, AutomotiveInc aims to build and establish the most sophisticated vehicle operating system. Despite being

backed by a large automotive manufacturer, thus accessing expertise across all vehicle domains, AutomotiveInc faces tremendous challenges posed by new automotive players (e.g., BYD and Tesla) as well as from established technology players (e.g., Apple or Google).

Accompanied by AutomotiveInc's roots within a recognizable automotive manufacturer, the product platform envisions unifying the automotive in-vehicle technology stack across three layers. These three layers are: hardware, software, and applications. At the core, the product platform incorporates existing or newly added cameras, sensors, and actuators of the vehicle, as well as control units that ensure interoperability between the different vehicle systems. This hardware is complemented by a centralized software layer accessible via the cloud. This software layer is company proprietary, and as our interviews revealed, there is currently no intention of opening this software layer to third parties in the near future. Finally, AutomotiveInc's product platform incorporates an application store, allowing third parties to provide complementary apps and services. End-customers can access these apps from the in-vehicle infotainment as well as via the complementary smartphone application. Such apps and services encompass driving features such as on-demand seat heating or performance. Ultimately, leveraging their product platform, AutomotiveInc aims to provide a novel automotive experience and refers to, as the CEO states, the 'mobile phone on four wheels'.

> ***"The car is becoming a 'mobile phone on four wheels' because customers also want the functionalities and connectivity in their vehicles that they have everywhere in their private lives."***
>
> *CEO AutomotiveInc (2020)*

Strategy of MedTechInc

MedTechInc is a MedTech manufacturing company. For multiple years, the company has developed and manufactured a diversified portfolio of medical test cartridges. These tests only run on MedTech's products (i.e., analyzers). Once a medical test is equipped with the respective human sample, the cartridge is connected to the analyzer, which processes the sample with laboratory precision. Such products and the inherent services are valued by customers across the globe. Also, MedTechInc's products have been approved by medical authorities across all continents. Despite employing over 200.000 people, MedTechInc acts as a novel player within the MedTech landscape, competing against established players from the pharmaceutical and biomedical industry.

MedTechInc's product platform builds upon its proprietary products (i.e., analyzers), which are complemented by medical test cartridges and valued by customers such as laboratories, hospitals, or medical practices, and a diversified set of other use cases that require handling highly fluctuating crowds of people. The product platform is complemented by a cloud solution provisioning, complementing services such as remote monitoring and asset tracking of both the medical test cartridges and the analyzer devices. This cloud solution is company-proprietary. Again, our interviews revealed no intention of opening this to third parties in the future. Interestingly, however, certain competitors adopted these practices and now offer similar cloud services to those contributed by third parties to their customers. Reflecting on these dynamics, MedTechInc might eventually adopt these practices in the future. Currently more than 15 highly sophisticated mutual exclusive medical tests run on the product platform available for purchase. As the business activities within this novel industry are relatively young, the company aims to gain traction and set ambitious goals, as the general manager of MedTechInc expressed:

> ***"With this [product] platform, we aim to become the 'Apple of diagnostics'."***
>
> *General manager MedTechInc (2021)*

How Product Platforms Pivot

Each of the three product platforms endeavored a unique journey. Despite being fundamentally different in terms of industry, size, market, and product platform, we experienced all three case companies to adopt comparable strategic pivots. These strategic pivots encompassed a significant shift in the company's strategy which substantiated through changing key elements of their business model (i.e., value creation) (Kirtley and O'Mahony 2023; Ries 2017; Teece 2010). Table 3 below depicts these strategic pivots and

illustrates our key findings answering RQ1. In concrete, the three product platforms abandoned their strategic objectives (i.e., becoming the smartphone of industrial automation, mobile phone on four wheels, or Apple of diagnostics) towards adopting altered value creation mechanisms. Based on closely examining each product platform and the inherent dynamics over time, we identified fundamental challenges of implementing an app store for product platforms and derived managerial recommendations for overcoming those. Prior to elaborating on those two, we present our cases' strategic pivots in certain detail to settle common ground in understanding. Thereby, we invite managers embracing product platforms to reflect upon.

Case	**Product platform pivots**	
Description	**From**	**To**
Automation platform	**"Smartphone of industrial automation"** • Providing an industry wide app store for digital services • Orchestrating an ecosystem of developers, manufacturers, and suppliers • Engaging thousands of external developers by providing designated SDKs, APIs, libraries, and documentations	**"Multi-home automation OS"** • Reassessing existing app and complementor landscape • Removing majority of apps and digital services in app store due to inactivity • Engaging in strategic partnerships with other automation platform providers • Fostering multi homing of proprietary platform core
Automotive platform	**"Mobile phone on four wheels"** • Provisioning an automotive app store for connected services and driving features • Orchestrating a developer ecosystem within all vehicle domains • Leveraging novel monetization strategies based on subscription or commission fees	**"Multi-model software platform"** • Acknowledging that the app ecosystem did not develop as expected • Strengthening inhouse development to provide competitive software features • Focusing on reuse (software platforms) and efficiency (software factories) to spread the significant development costs over multiple brands and models
MedTech platform	***"Apple of diagnostics"*** • Envisioning an app store for medical tests • Providing a diagnostic analyzer ("smartphone") that can process test cartridges ("apps") • Fostering an ecosystem to develop tests, pushing for the platform longtail (i.e., every laboratory can develop a test for the platform)	**"The Tier 1 of diagnostics"** • Engaging in selected long-term strategic partnerships for test development • Establishing expert project teams guiding the integration of new medical tests into platform • Engaging in strategic partnerships with established test providers to scale business, i.e., offer white label solution rather than act as an OEM

Table 3. Strategic pivots of product platforms

AutomationInc, ultimately envisioned 'the smartphone for industrial automation'. This encompassed a flourishing app store of automation and automation adjacent applications and services. Thereby, AutomationInc aimed at targeting the automation industry as a whole. In pursuing this, AutomationInc heavily invested in making their established product (families) platform-ready while also developing designated SDKs, APIs, libraries, and documentations inviting and enabling third parties to co-create. In

doing so, by the end of 2022, AutomationInc implemented over 20 publicly available partner how-to libraries and APIs.

Reflecting on these notions as of today, AutomationInc stands at a very different pathway. Initially orchestrating complementary apps and services of 130 partners, AutomationInc pivoted towards own and co-development of apps and services at arms-length. As a result, AutomationInc now must engage in reconfiguring their portfolio of apps and services while engaging in more collaborative partnerships. Furthermore, AutomationInc ventured into strategic hardware partnerships with no more than five competing industry players (i.e., automation providers) offering their product platform to be homed on other proprietary hardware (i.e., competitor products). In essence, AutomationInc retracted their focus from diversity of apps providing an industry wide app store (i.e., becoming the 'smartphone of industrial automation') towards increasing diversity in complementary products homing the product platform. Thus, AutomationInc engaged in establishing their product platform as an innovation foundation others may innovate upon. This innovation foundation, however, substantiates for both, apps and services and (physical) products. Today, leveraging foremost licensing fees rather than subscriptions or transaction fees, AutomationInc aims to become a 'multi-home automation operating system'.

AutomotiveInc initially settled on pursuing their manifestation of transforming automotive vehicles to 'mobile phones on four wheels'. Hereby, the company envisioned provisioning the equivalent of the Apple App Store or Google Play Store within the automotive realm. This strategy not only encapsulated the better-known domain of automotive infotainment but also other vehicle domains such as advanced driver assistance systems or the chassis control systems making AutomotiveInc's strategic goals comprehensive and fairly ambitious. While some managers might argue for abysmal strategizing, one should not forget the origins and the substantial footprint in the global automotive industry AutomotiveInc relates to. Nevertheless, AutomotiveInc committed to pursuing this ambitious strategy and focused on realizing so far unprecedented monetization strategies such as subscription and commission fees for automotive apps and services. Facing harsh customer rejection on just these novel monetization approaches while being confronted with strong competition starting with Apple Car Play and Android Auto at the very top, AutomotiveInc was forced to adapt.

Ultimately, AutomotiveInc acknowledged that the envisioned application ecosystem did not substantiate as expected. They also acknowledged, that adopting value creation mechanisms of better known B2C app stores wasn't applicable in inherently complex domains such as the automotive industry. Yet, given their strong position within the global automotive industry, their efforts weren't worthwhile. Recognizing the progresses and the investments made, the company now focuses on the internal usage of the apps and services within all models rather than inviting other automotive companies to join. As a result, the product platform now contributes towards realizing efficiency gains via spreading the significant development costs over multiple brands and models. Today, AutomotiveInc aims to establish a 'multi-model software platform'.

MedTechInc, initially, pursued a similar strategy. Building upon their established analyzer products which are complemented by medical test cartridges, the company envisioned offering an app store for medical tests. In doing so, MedTechInc pictured their ambitious goal to become the 'Apple of diagnostics' leveraging commission fees of every test sold. This strategy inherently encompasses leveraging the platform longtail which incorporates apps and services being contributed by independent complementors with limited coordination effort of the platform owner (Cusumano et al. 2019; Lakhani and Boudreau 2009). Consequently, MedTechInc focused on enabling third parties to develop complementary medical tests fostering an ecosystem of laboratories and medical companies around their product platform.

Now, in contrast to aiming to orchestrate the platform longtail, MedTechInc engages with selected strategic partners realizing complement provision in close collaboration. This involved the setup of key account managers managing such strategic partnerships. This also involved recognizing the significance of product platform integration costs and establishing expert project teams guiding the integration of the partners' complements onto MedTech's product platform. Thereby, MedTechInc recognized the need to enable its complementors more deliberately in order to mature their app store. Consequently, MedTechInc nowadays operationalizes project business on the platform shorttail. In doing so, the company incrementally increases the availability of apps (i.e., medical test) on its product platform. Furthermore, the company offered their analyzers products to other diagnostic companies as white label solutions leveraging licensing fees. Committing to this, MedTechInc deliberately decided on leaving the role of the original equipment

manufacturer (OEM) towards becoming the Tier 1 supplier of other diagnostic companies. Today, MedTechInc aims to become 'the Tier 1 of diagnostics'.

In essence, all three cases underwent vivid dynamics. Thereby, the case companies now focus on strategic partnerships more deliberately realizing own or collaborative complement development. Furthermore, in pivoting, our cases reveal the companies to alter their value creation mechanisms fundamentally. This involves rethinking the value of their underlying products. As a consequence of offering the product platform to be homed on competitor products, the locus of value creation shifts from complementary apps and services towards complementary hardware (i.e., products).

Why Product Platforms Pivot

Repositioning from the 'smartphone of industrial automation' to becoming a 'multi-home automation OS', from the 'mobile phone on four wheels' to becoming a 'multi-model software platform', and from the 'Apple of diagnostics' to becoming 'the Tier 1 of diagnostics' are by far no decisions taken unreflected. These pivots accompany drastic changes of the companies' value creation which echoe throughout the entire organization and the adjunct platform ecosystem. Acknowledging that, we now highlight the identified reasons for pivoting. In doing so, we answer RQ2.

In concrete, we identified six underlying reasons why product platforms pivot. These are summarized in Table 4 below. In order to facilitate managers in linking these pivoting reasons to their real-world challenges, we adopted well-established platform concepts by Van Alstyne et al. (2016). Thereby, we map the reasons why product platforms pivot to the product platform itself, its end-customers, and its co-creating partners.

Case	**Strategic pivot**
Dimension	**Reasons to pivot**
Product platform	R1: Product platforms' inherent specificity
	R2: Product platforms' complex complement approval processes
End-customers	R3: End-Customers' biased aversion of platform innovation (lock-in)
	R4: End-Customers' resistance against industry-unprecedented practices
Co-creating partners	R5: Partners' diminishing faith in plug and play
	R6: Partners' skepticism embracing coopetition

Table 4. Product platform pivoting reasons based on Van Alstyne et al. (2016)

R1: Product platforms' inherent specificity

As depicted, product platforms, per default, incorporate high complexity due to their inherent coupling to (physical) products. Furthermore, all three case companies operate in high-tech industries in which the value chains are widely distributed and fragmented. As a result, AutomationInc, AutomotiveInc, and MedTechInc made profound investments into collaboration resources to better enable others to contribute complementary apps and services. Thereby, our cases revealed that promoting exemplary collaboration resources such as APIs, SDKs, or libraries are indeed helpful, but they do not sufficiently promote the emergence of a platform longtail. Rather, the inherent specificity of the product platform requires arms-length co-development to manage the complexity involved. Consequently, to overcome this specificity, our case companies entered strategic partnerships to not only enable but rather support, guide, and manage complement development deliberately.

One manager expressed this accordingly:

> ***Initially, we thought that upon reaching a certain stage of maturity, we can easily onboard everybody who wants to provide a test. To some extend we thought of democratizing test development through our platform. In reality, however, we had***

> ***to deploy designated project teams in order to handle and ultimately realize the complement onboarding together with our partners. This was a significant investment from our side.***
>
> *General manager (M3) (2024)*

Furthermore, heavily investing into third-party enablement through collaboration resources, ultimately rooted the picture of plug and play complement development. As the product platforms' inherent specificity evidently showcased the limitations of low-touch app and service provision, reality showcased another major challenge manifesting the product platforms' pivots. Integrating third-party apps and services gave birth to highly complex and evenly sophisticated legal discussions centering around liability exposure. Operating in certainly non-trivial industries, the case companies' products typically are embedded in larger production systems, for instance. Adding another level of complexity (i.e., third party apps) on top of the embedded products manifested unprecedented complexities which handling in larger numbers (i.e., along the platform longtail) led the companies to pivot.

R2: Product platforms' complex complement approval processes

Another reason why product platforms pivoted away from orchestrating a flourishing app store are complex complement approval processes. In addition to the complexity involved in contributing apps and services (R1), seamlessly integrating those into the product platform is a multifaceted endeavor. The product platform hereby must engage in complex, lengthy, thus costly approval processes guaranteeing system quality and safety (i.e., product, product platform, and complement interplay). The associated costs of complement approval add to the investments into the product platform collaboration resources, which are complemented by supporting activities such as marketing and sales of the product platform.

Although being familiar to approval processes of authorities from each company's established product business, the case companies faced challenging times realizing approving complements of the product platform. In concrete, approving complements mandated separate independent approval processes legitimating the interplay of each complement in combination with the product platform altogether. AutomotiveInc, having numerous partners providing apps and services, thus had to engage in countless approval processes prior to their apps and services becoming accessible to customers. Furthermore, as the cases of AutomotiveInc and MedTechInc revealed, these approval processes additionally occur at market level. Thus, each derivative of the product platform in combination with each complement must be approved by national authorities such as the Federal Drug Administration (FDA) in the United States or the European Medicines Agency (EMA) in the European Union separately. While these complex, costly, and foremost lengthy complement approval processes do not hinder the app store concept, they significantly slow it down.

One manager articulates this accordingly:

> ***"We must provide a comprehensive portfolio of tests that large customers adopt our product platform. But the authorization processes for each test in the past took several months each. With that speed we are going nowhere. Thus, we reached out to the authorities showcasing all future tests will have the identical foundation and only the complements must be tested again. In doing so, we hope to cut down the authorization times."***
>
> *Senior product manager (M4) (2024)*

R3: End-customers' biased aversion of platform innovation (lock-in)

Managers, in general, know about the well-trodden lighthouse platform companies (e.g., Amazon, Airbnb, Uber). Consequently, managers acknowledge the importance of network effects but also reflect winner-takes-it-all dynamics and the resulting bargaining power of platforms. As a result, each product platform faced significant adoption challenges as the reasoning for joining another company's platform, eventually even being an industry competitor, to gain additional business, appeared strongly counterintuitive.

Our cases highlight certain details on the end-customers' manifested fear of entering a platform lock-in. AutomationInc's end-customers, for instance, still depreciate investments into (Industrial) Internet of

Things platforms, and consequently, were more than reluctant to adopt platform innovations of any kind. MedTechInc faced similar challenges. Their archetypical end-customers such as clinics, hospitals, or laboratories, which typically characterize having limited budgets and certain monetary constrains, enacted averse to adopting a novel platform of an industry entrant. AutomotiveInc, however, did not need to argue in favor of platform innovation, the company rather needed to differentiate against existing prominent offerings, namely Apple Car Play or Android Auto.

Yet, despite characterizing different in reality, customers' reluctance to adopt any platform innovation made product platform adoption fairly challenging and increased the importances of dedicated and strategized platforms sales. One manager expressed the company's reaction as follows:

> ***"We must establish ourselves on the larger market and are currently working on establishing our product platform as an own brand. Thus, we are stepwise reducing the established brand and removing corporate logos and brand names wherever we can. This is what we want to do in the first half of the year so that our strategic partners feel more comfortable advertising the product platform and can leverage the product platform brand."***
>
> *Director (A1) (2024)*

R4: End-customers' resistance against industry-unprecedented practices

On top of introducing novel value propositions, all three case companies adopted platform-typical digitally enabled business models and monetization strategies (e.g., subscriptions or, licensing fees). Ultimately, this nurtured another pivoting reason as their end-customers expressed strong aversion against such industry-unprecedented practices. The following examples substantiate this accordingly.

AutomationInc and AutomotiveInc, both, received profound resistance of their end-customer as they introduced novel monetization practices. This included subscription services and a broker model for certain apps and services. Such unprecedented monetization practices stand against the fundamental notion of purchasing a machinery or automotive one time and depreciating the investment over years, which typically involves bilateral price negotiations. Consequently, even if the respective decision-makers adopted the novel monetization practices, the operational handling in the accounting and ERP legacy systems introduced novel challenges even after convincing end-customers to adopt the product platform.

Furthermore, AutomotiveInc had to overcome fundamental customer distrust introducing novel driving features such as on demand seat heating or on demand performance for monthly payment. Despite offering driving features, which are completely different to better-known infotainment applications (e.g., Google Maps, YouTube, or even games), AutomotiveInc's end-customers harshly rejected monthly payments after purchasing the vehicle as a whole.

Interestingly, our case companies revealed that their end-customers rejected unprecedented monetization approaches but not the novel value proposition the product platforms provide. AutomationInc and MedTechInc, for example, introduced licensing fees which were well received by their end-customers instead.

After pivoting away from exemplary industry-unprecedented practices, one senior manager expressed:

> ***"Our customers have the feeling that they have paid twice when using our service on a subscription basis – which is actually not true"***
>
> *Senior manager (2023)*

R5: Co-creating partners' diminishing faith in plug and play

Each product platform advertised their product platform to attract co-creating partners contributing apps and services in addition to the end-customers adopting the product platform. The main argument used resolved around promoting novel business opportunities upon contributing apps and services. Such novel business opportunities could either substantiate as completely new (greenfield) in adjacent industries or substantiate as intensified business in the current industry through cross selling of existing products and services. While both options promote comprehensible upside potential, the case companies faced

challenging times in evidently showcasing such. The latter business opportunity faced several challenges as the product platform only slowly attracted end-customers, thus postponing immediate return on invest of the partners' complement development costs. While better known digital platforms such as Uber and Airbnb scaled rapidly, the product platforms, despite also being partially digital, scaled much slower. This contrast fueled the co-creating partners' diminishing faith in plug and play.

Furthermore, the hoped-for business opportunities in leveraging cross-selling did not substantiate either as the existing end-customers adopted apps and services conservatively which did not meet the partners' expectations of plug-and-play as we know it from smartphones or tablets. Rather, complement adoption from an end-customer perspective were real projects rather than straightforward software installations. Nevertheless, there were successful apps and services that held up to that promise, but not as many as the case companies initially hoped for.

Confronted with diminishing partner engagement one case manager described their reaction accordingly:

> ***"Initially, we had many partners contributing apps and services to our platform. Even more presented promising concepts, just to be part of it. However, many partners show little activity today. We are currently looking for the active ones and we want to double down on collaborating with them."***
>
> *Director (A1) (2024)*

R6: Co-creating partners' skepticism embracing coopetition

Establishing and maturing a product platform requires adapting to the established industry environment (Björkdahl et al. 2024). Moreover, given the product platforms' specificity and inherent coupling to a certain product, the addressable end-customer segment is limited as is. Similar, given the industry specificity, the number of available partners is limited too. What adds to this even further is, that most companies eventually becoming partners acted as competitors for a very long time. Consequently, overcoming the partners skepticism inviting them to co-create based on a proprietary product is utmost challenging.

One case company advertises their platform as follows, aiming to reduce partner skepticism:

> ***"We provide an open ecosystem for consumers and partners […]. Partners introduce their long-established strengths and services to co-create. With that, everybody involved profits from a wide range of services"***
>
> *AutomationInc (2024)*

Also upon contributing to the product platform, many partners apply certain long-established industry practices and behaviors. This involves lengthy contract and pricing negotiations, tender management practices or even exclusivity claims. All of these industry practices fundamentally contradict the initially strategized notion of platforms in democratizing apps and services. As a consequence, MedTechInc, for instance, matched their partners practices and engaged in bilateral discussions and individual negotiations. However, MedTechInc also recognized that continuing exemplary behavior upon further maturement of the product platform is no viable option future-looking.

Managerial Recommendations

Each of the three depicted product platforms envisioned orchestrating a flourishing app store. For several reasons (e.g., R1-R6), the product platforms pivoted in realizing this vision. Reflecting on our three case companies, we derived managerial recommendations guiding product platform managers. These managerial recommendations are particularly valuable for product platforms with high specificity that operate in contexts in which platform dynamics, such as network effects, are difficult to initiate and foster. In highlighting key reasons why product platforms pivot (RQ2) and reflecting on the dynamics of the pivot (RQ1), we support product managers and product platform managers in setting their course right to succeed.

As depicted in Figure 1, product platforms incorporate different layers (Gawer and Cusumano 2014; Hein et al. 2020b). The product platform itself, the underlying foundation (i.e., the products), and the app store on top. The product platform is typically provided by one focal company. However, the underlying

foundation (products), as well as the apps on top, can be provided by the focal company, selected strategic partners, or a larger group of complementors. AutomationInc's product platform, for instance, connects underlying drive technologies such as electric motors, sensors, or actuators with complementary software such as process modeling tools or simulation software. Thereby, neither the drive technologies nor the software must be provided by AutomationInc itself. As a result, the products and the app store both resemble broader ecosystems to which partners contribute complementary hardware or complementary apps and services. In both ecosystems, the extent of value creation to provide complementary apps or products can range from mere enablement in providing collaboration resources (loosely coupled) to co-development in close collaborations leveraging (strategic) partnerships (tightly coupled). Also, apps and services or products can be own developments (platform owner).

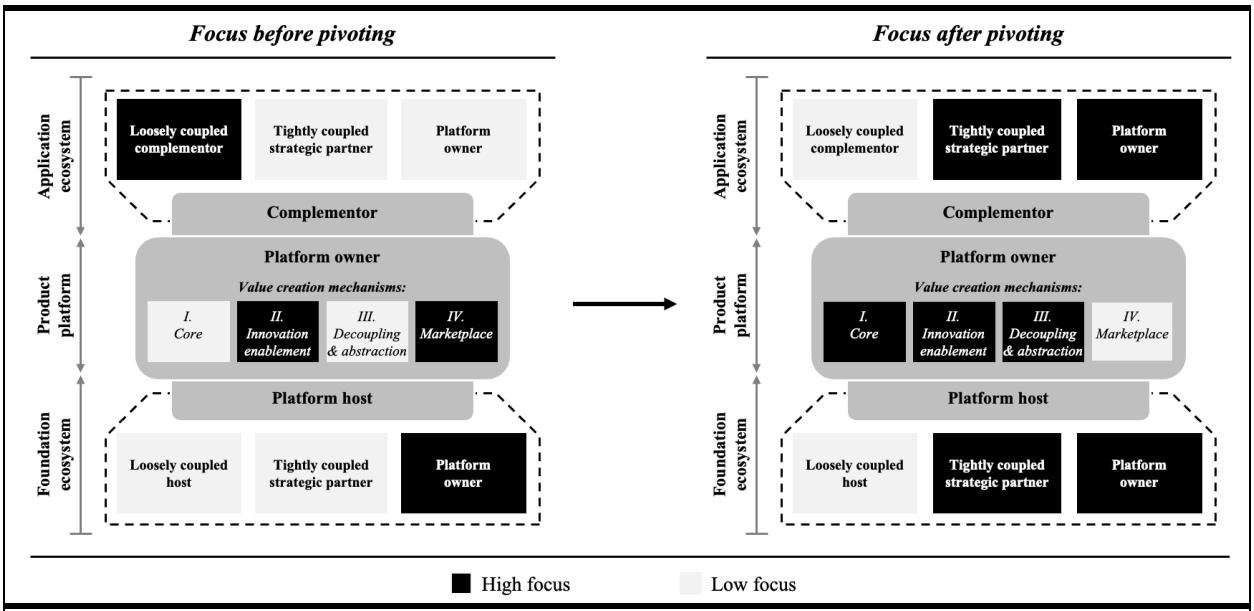


Figure 1. Product platform strategy conceptualization based on Hein et al. (2020)

Focus before pivoting - Strategic focus on the application ecosystem. Hereby, the case companies envisioned apps and services being provided by complementors that are enabled by the platform. Put into other words, the companies provided the products and the product platform (including the tools to facilitate app development) and expected the missing parts (i.e., apps and services) to follow. Thereby, the case companies simultaneously acted as the platform owner and host.

Focus after pivoting - The case companies took matters into their own hands. In concrete, the case companies co-developed apps and services with partners or developed them themselves. At the same time, they deliberately opened the foundation ecosystem and integrated partner products. In doing so, partner products also became platform hosts. Consequently, the case companies fundamentally changed their locus of value creation to generate momentum and facilitate the dynamics they expected before pivoting.

Reflecting on the pivoting reasons and the conceptualized strategic pivots, we derived managerial recommendations guiding managerial decision-making.

M1 – Create application ecosystem momentum with own complements

Acknowledging the pivoting reasons (i.e., R1 and R2), the case companies engaged in developing apps and services on their own. AutomationInc, for instance, developed more than ten apps in-house. Own developments ensure a higher level of control over the complements and facilitate the development of effective quality management and approval processes. Furthermore, the product platform owner can integrate these apps and services directly into the platform core, ultimately strengthening the product platform's inherent value creation and ensuring seamless operability. While developing own complements

is challenging and requires specialized software engineering capabilities, it provides invaluable insights into complement provision, quality management, and approval. This knowledge fundamentally changes future interactions with co-creating partners as the pain points of, e.g., leveraging the provided collaboration resources, are understood more thoroughly (R2). At the same time, selecting the right complements for own development is crucial. Therefore, understanding customer needs and developing a rather selective number of apps and services that tackle the most pressing needs is key.

M2 – Increase application ecosystem momentum through careful partnering

Upon providing own complements, increasing the application ecosystem momentum through careful partnering and co-development is crucial. This means engaging in (strategic) partnerships at arms-length that involve sharing resources and costs and guiding, supporting, and managing the partnership deliberately. While close collaboration between two organizations substantially increases the costs of providing complements, it is vital to overcome industry skepticism and the fear of coopetition (R3, R4, R6). Showcasing co-development with (renowned) partners holds great signaling power for other players joining the product platform (R3, R6). Engaging in more and more partnerships for co-development also has the potential to learn and accelerate growth by successively reducing own efforts while increasing the number of collaborations. However, collaborating too early with too many partners can be a major reason for losing momentum.

M3 – Develop a vital foundation ecosystem to overcome specificity

Succeeding with product platforms and the app store concept forces managers to rethink the role of their own products. The case companies initially focused on building their product platform on top of their own products in order to drive product sales. In essence, they followed a 'single home' platform approach that is well-known from Apple's iPhone business. However, the case companies learned that their installed product base is too specific and small to drive network effects. To overcome these limitations, product platforms must develop a vital foundation ecosystem. More specifically, the case companies opened up their product platforms to third-party products. Thereby, they became 'multi home' platforms aiming to increase the product platforms' installed base (R1, R3). AutomationInc, for instance, developed its product platform to be hosted on automation technology of a strategic partner that operates in the energy industry. Similar, AutomotiveInc opened its product platform internally to be hosted across all its derivatives.

M4 – Open up the foundation ecosystem cautiously

Developing the foundation ecosystem and including third party products requires considerable investments and comes with significant complexity in realizing. Unlike apps and services, traditional products typically aren't designed to be third-party accessible. Most often, they are very different from one another, even though end-customers might perceive them as somewhat similar. As a consequence, opening the foundation ecosystem and adopting a new product is a lengthy and costly process that most often takes longer and requires more resources than initially planned. Consequently, product platforms must deliberately target and prioritize new platform hosts (R1, R6). Furthermore, opening the foundation ecosystem and increasing the number of platform hosts may also involve cannibalizing the underlying products. In this case, cautious and well-reasoned communication with internal and external stakeholders and shareholders is crucial.

Concluding remarks

Overall, our research adds to the evolving body of scientific research on platform strategy and platform competition while emphasizing the perspective of established product companies adopting platform business models to generate novel business. In practice, establishing product platforms on top of existing (physical) products holds great business potential but characterizes highly complex and fairly ambiguous. Yet, the vision of orchestrating an app store of complementing apps and services on top of the own product and profiting from it, intrigues many managers in embracing this strategic ambition.

To guide managers pursuing such endeavors, we extended previous work on platform management, focusing on product platforms that build upon established (physical) products. For multiple years, we have accompanied three companies within the automation, automotive, and MedTech industry. In doing so, we

provide a rich and diversified foundation to derive generalizable insights into product platform dynamics. In concrete, we were able to describe and reflect on all three case companies pivoting. In pivoting, we understand a significant shift in a company's strategy through altering key elements of the business model. Despite being fairly complex and case-specific, we have conceptualized the strategic pivots and identified underlying reasons, inviting managers to reflect upon. In highlighting key reasons why product platforms pivot (RQ2) and reflecting on the dynamics of the pivot (RQ1), we support product managers and product platform managers in setting their course right to succeed. Hereby, we outline the importance of intensifying the value proposition of the product platform standalone while simultaneously focusing on the development of a vital foundation ecosystem. Reflecting these managerial recommendations within their own contexts, we enable managers to take part in the rise rather than the fall of their app store.

Looking ahead, we invite researchers to intensify research from the perspective of established product companies, acknowledging their unique role and importance for overall welfare. Hereby, we spotlight to reflect upon the importance of the underlying foundation ecosystem, eventually rethinking the notion of a platform's installed base and recognizing the specificity of established products in doing so. Furthermore, we emphasize a closer look at established platform value creation mechanisms, eventually reassessing such in the context of product platforms.

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