

The Digital Platform as Digital Innovation: A Study from the Perspective of Dynamic Capabilities

Marcelo Tsuguio Okano^{*,†}, Henry de Castro Lobo dos Santos^{†,§}
and Edson Luiz Ursini^{†,¶}

**Paula Souza Center and University of Campinas
Rua dos Bandeirantes 169, São Paulo, SP 01124-010 Brazil*

*†College of Technology, University of Campinas
Rua Paschoal Marmo 1888, Limeira, SP 13484-332, Brazil*

‡marcelo.okano@cps.sp.gov.br

§h190839@dac.unicamp.br

¶ursini@ft.unicamp.br

Received 5 July 2021

Revised 27 September 2021

Accepted 29 September 2021

Published 16 November 2021

The objective of this study is to examine how digital platforms digitally innovate companies and organizations, using the business model for dynamic capacity in three Brazilian companies. To achieve the proposed objective, a case study research method was used, with theoretical models of digital platforms, digital innovation and dynamic capabilities. The empirical research results proved that the three companies have a digital platform for business transactions as their main component, and that this model connects customers and suppliers through services.

Keywords: Digital innovation; digital transformation; digital platform; dynamic capabilities.

1. Introduction

Digital technologies present new capabilities and functionalities when launching new versions and updates of their products and services, such as the benefit of integrating different types of tests (immunoassays, chemistry, coagulation and other emerging tests such as molecular tests) in a single platform [Sista *et al.* (2008)]. The out-performance of digital platforms compared to non-digital platforms for the T790M mutation is identified in advanced non-small cell lung cancer (NSCLC) patients [Thress *et al.* (2015)]. In turn, digital media platforms have revolutionized marketing, offering new ways to reach, inform, engage, sell to, learn about and provide service to customers [Lamberton and Stephen (2016)]. While these cannot always be considered a type of innovation, in the vast majority, they represent digital innovation.

For Hinings *et al.* [2018], digital innovation is about creating and implementing new products and services; by digital transformation, we understand the combined

[‡]Corresponding author.

effects of various digital innovations bringing new actors (and constellations of actors), structures, practices, values, and beliefs that change, threaten, replace, or complement the existing rules of the game within organizations and fields. According to Behne *et al.* [2021], growing competitive pressure as well as more mature and increasingly advanced products are making successful innovation and digitalization process of a company, one of the most important competitive factors. Digital innovation is indispensable for organizations that want to remain competitive [Kaiser *et al.* (2021)].

One of the main digital innovations is the digital platform, which is a business model that allows producers and consumers to exchange value [Mancha *et al.* (2018)], such as the identification of the change in the tourism digital behavior, which pointed to a need for rethinking the tourism and hospitality firms' digital presence [Tiago *et al.* (2021)]. In addition to transforming business models, digital innovation also leads to a change in corporate culture: digital ventures can grow at a massive rate and scale [Huang *et al.* (2017); Ciriello *et al.* (2018)].

In addition to generating dynamism in companies, digital innovation innovates all aspects and scenarios of companies and organizations quickly and efficiently through digital technologies.

To answer the research question, "How do digital platforms digitally innovate in companies and organizations", we will use a business model for dynamic capacity.

The dynamic capability method highlights the importance of incorporating the role of environmental dynamics in determining competitive advantage, especially in the way the company responds to such dynamics over time [Helfat and Peteraf (2003)].

The concept of dynamic capacity is defined as the ability to reconfigure, redirect, transform, model and adequately integrate the existing essential competencies with external resources and strategic and complementary assets, to face the challenges of a competitive and imitation world, pressed by time, and rapidly change, as defined in the seminal paper by Teece *et al.* [2007].

The objective of this paper is to verify how digital platforms innovate digitally in companies and organizations under the theoretical lens of dynamic capabilities.

To achieve this objective, the following theoretical models were used:

- Digital platform: Elements of the Platform Business Model [Mancha *et al.* (2018)],
- Characteristics of digital platforms [Mancha *et al.* (2018)], Platform business models [Morvan *et al.* (2016)] and Platforms according to their main objective [Gawer (2014); Evans and Gawer (2016)].
- Digital innovation: Framework with the company's products, its digital environment, and organizational properties [Nylén and Holmström (2015)].
- Dynamic capabilities: Business model for dynamic capabilities [Teece (2018)].

This paper presents the importance of the digital platform as a digital innovation to carry out digital transformation, which qualifies as companies and associations creating new business models and providing new value propositions such as social and sustainable, in addition to economic, thus allowing new areas of activity, types

of business and organizational scenarios. For example, data are increasing in importance for firms trying to create and maintain a competitive advantage. As value creation is highly dependent on this key resource, data, the necessity of redesigning firms' business models arises [Mosig *et al.* (2021)].

These transformations are creating unprecedented forms of business, which would be impossible to implement without digital platforms, or would take a long time to be made possible, such as the digital inclusion of segments of society that were excluded or marginalized, as reported by the company Alpha, while Beta's platform combines technology and information to optimize the research, evaluation, and management of companies' social investment to help civil society organizations (CSOs). This is similar to Gamma's proposal to make the urban passenger transport system more flexible and versatile, integrating different cities, systems and modals through technology.

2. Theoretical Reference

2.1. Digital innovation

Innovating digitally means to innovate products, processes, or business models using digital technology platforms as a means or an end within and between organizations [Ciriello *et al.* (2018)]. According Ballestar *et al.* [2020], digitization, innovation and robotization bring productivity-augmenting effects.

According to Ciriello *et al.* [2018], digital technology has three main characteristics that change the nature of innovations. First, once digitalized, information can be stored, transformed, transmitted and tracked by any digital device, regardless of its content [Yoo *et al.* (2010)]. Second, digital information is editable through reprogramming, making digital solutions liable to change after implementation through interaction with external systems [Kallinikos *et al.* (2013)]. Third, inherently self-referential, digital technology is necessary to create digital technology [de Reuver *et al.* (2018); Yoo *et al.* (2010)].

Nambisan *et al.* [2017] considered that the definition of digital innovation is intended to capture three important and simultaneous phenomena. First, digital innovation includes a range of innovation results, such as new products, platforms and services, as well as new customer experiences and other value paths; as long as these results are possible through the use of digital technologies and digitized processes, the results themselves need not be digital. Second, digital innovation includes a wide range of tools and digital infrastructure (for example, 3D printing, data analysis, mobile computing, etc.) to make innovation possible. Third, digital innovation includes the possibility that the results can be disseminated, assimilated, or adapted to specific contexts of use such as those typically experienced with digital platforms.

Nylén and Holmström [2015] proposed a framework that identifies the following five key areas to be measured and evaluated in the search for managing the innovation of digital products and services:

- First, digital products and services must not only be efficient and easy to learn, but also provide a rich user experience. This user experience can be measured in terms of usability, aesthetics and involvement.

- Second, companies need to clearly articulate the value proposition of each digital product and service. The quality of such value propositions is assessed in the dynamics of customer segmentation, product and service packages and commissions to channel owners.
- Third, scanning the digital evolution involves collecting intelligence on new devices, digital channels such as web services, mobile operating systems, social media and app stores, as well as standards and application programming interfaces (APIs), to identify and explore opportunities for innovation in emerging usage contexts and new user behaviors.
- Fourth, as digital innovation requires new skills, companies need to assess their mechanisms to support the continuous learning of the unique properties of digital technologies in order to establish dynamic innovation teams.
- Fifth, and finally, how digital innovation processes are often initiated when members of the organization improvise with digital technology in the form of learning by doing, assessing the space and time available for improvisation, and the mechanisms for coordinating these efforts, are critical.

Table 1 presents the framework of the company's products, digital environment and organizational properties.

Nylén and Holmström [2015] developed a diagnostic tool that helps companies take the first step in implementing the structure (see Appendix A). Based on the structure, the tool consists of 15 Likert-type questions. Here, members of the organization are asked to score the company's current operations, assigning a value on a scale of 1–3 for three questions in each key area. For each area, the participants were asked to calculate and complete the composite score.

2.2. Digital platform

According to Mishra and Tripathi [2020], a digital platform is a web-centric platform for delivering content (such as, Facebook, Twitter, blogs, websites and, sometimes, SMS) and a significant portion of the world's population spends time online every day using these digital platforms [Yee *et al.* (2007)]. The paper by Vardarlier and Ozsahin [2021] demonstrates the digital transformation of human resource management by digital platforms, through the use of modern communication tools (LinkedIn, Workplace, Microsoft teams and so on), digitally connecting employers and candidates in the recruiting process. Further, digital platforms also help diffusing innovation [Claussen and Halbinger (2020)].

This contrasts with an analog platform, including billboards, direct mail, tele-marketing, events and word of mouth. A promotion is the message you would use on platforms to communicate. This could sponsor manufactured goods or facilities, and interconnect them on digital and analog platforms.

On the other hand, a digital technology platform is “a building block, providing an essential function for a technological system — which acts as a basis on which other companies can develop complementary products, technologies or services” [Gawer (2014); Yoo *et al.* (2012)]. Digital business platforms are being developed

Table 1. Framework with the company’s products, its digital environment and organizational properties [Nylén and Holmström (2015)].

Dimension	Area	Scope	Element
Product	User experience	Digital products and services must offer high levels of usability, possess carefully designed aesthetic properties and evoke engagement.	Usability Aesthetics Engagement
	Value proposition	Digital innovation involves an articulated value proposition, i.e. a customer segmentation including strategic pricing and positioning of the product portfolio, dynamic bundling of product units and carefully negotiated commissions to channel owners.	Segmentation Bundling Commissions
Environment	Digital evolution scanning	In order to identify opportunities for innovation, firms need to scan their digital environment. This involves gathering information on new digital devices, channels and associated user behaviors.	Devices Channels Behaviors
Organization	Skills	In order to reap the benefits of digital innovation, firms need to acquire new skills both internally and externally while establishing new digital roles. In doing so, firms should promote continuous learning of the unique properties of digital technologies in order to secure dynamic innovation teams.	Learning Roles Teams
	Improvisation	The malleability and low cost of digital technologies affords a higher degree of improvisation. As a consequence, managers need to ensure that they provide organizational members with an improvisational space where structure and flexibility is balanced in such a way that the constraints maximize creativity, dedicated time is given, and improvisational efforts are coordinated to deal with overlaps and waste.	Space Time Coordination

with the aim of pleasing and satisfying users, and being user friendly [Gomes and Okano (2019)].

For Mancha *et al.* [2018], a digital platform is a business model with enabled technology allowing producers and consumers to exchange value. In a platform business (Fig. 1), producers and consumers create and exchange value through the platform in the form of information (for example, reviews, behavioral data) and products or services (e.g. use of a good transportation service).

The main characteristics of digital platforms are as follows:

- (1) They are external platforms based on software and hardware.
- (2) Applications offer services or systems to end users.
- (3) Through the Internet, they allow the interaction of different groups of people, companies and organizations.
- (4) They innovate with new business models that are intrinsically based on information and technology features.
- (5) They create value by allowing direct communication and interaction between groups.

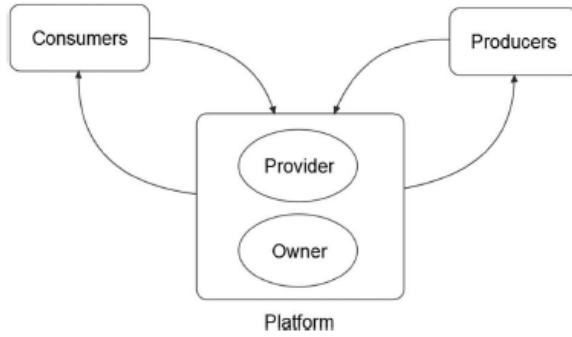


Fig. 1. Elements of the platform business model [Mancha *et al.* (2018)].

Morvan *et al.* [2016] classified digital platforms according to the platform business models, that is, according to collaboration, orchestration, creation and correspondence:

- Collaboration is a type of platform business model that allows internal and/or external partners in the business ecosystem to work together in new ways. For example, FirstBuild allows instructors to share inventions with a community, and obtain feedback. Collaboration can also take place within the same ecosystem (such as the government), or between different ecosystems (such as the government and financial services).
- Orchestration is a business model that allows business processes in a business ecosystem. Orchestration platforms can also integrate with the platforms of other partners in the business ecosystem, such as supply chain partners and suppliers. For example, PokitDok allows seamless transactions to take place between healthcare providers, producers and consumers. It orchestrates and connects activities such as scheduling, identity management, connectivity and payments to the business ecosystem.
- Creation is a type of platform business model that allows partners in the business ecosystem to create new applications, products/services, resources and business models. For example, Apple HealthKit provides APIs for developers who can take advantage of the health and activity data from iPhones and Apple Watches. Developers can create mobile apps for iOS and watchOS. YouTube allows providers to create and share content with consumers. In this way, consumers can become suppliers.
- Match is a business model that allows providers to find consumers. For example, Uber connects users with drivers. Airbnb connects owners with people who need a place to stay.

Regarding the classification of digital platforms, Evans and Gawer [2016] and Gawer [2014] classify them according to their main objectives, identifying three different types of platforms:

- (1) Transaction platform, sometimes called multi-sided markets or trading platforms. Its main objective is to facilitate transactions between different

organizations, entities and individuals such as connecting buyers with sellers, drivers with passengers, composers with music companies, etc.

- (2) Innovation platform. Innovation platforms are formed by technological blocks that provide a basis for the development of services and products. A typical example of an innovation platform is the Android mobile operating system, which allows third-party developers to build applications on top of the operating system. Innovation platforms provide third-party developers with their own set of tools and resources that developers combine and use to enable new applications for commercial or other uses [Evans and Gawer (2016)].
- (3) Integration platform. Integration platforms combine aspects of the two main types of platforms: transaction and innovation platforms [Evans and Gawer (2016)].

2.3. Business model for dynamic capacity

Teece's definition [2010] emphasizes the value creation function of a business model:

- A business model describes the design or architecture of the mechanisms for creating, delivering and capturing the values employed. The essence of a business model is that it crystallizes customer needs and ability to pay, defines the way in which the company responds and offers value to customers, attracts customers to pay the value, and converts those payments into profits through the project and operation of the various elements of the value chain [Teece (2010, p. 179)].

Identifying customers' unmet needs, specifying the technology and organization that will serve them, and finally, capturing the value of activities are important functions of the business model. Without the right balance between creation, delivery and capture, the model will not be in operation for long, at least not by for-profit companies. While the model is similar to that of Osterwalder and Pigneur [2020], it is later compiled into three main categories [Teece (2018)]. Slightly adapted, the list is as follows:

- Value proposition: Product and service; Customer needs; Geography.
- Revenue model: Pricing logic; Channels; Customer interaction.
- Cost model: Essential assets and capabilities; Main activities; Partner Network.

Teece [2018] considered that dynamic capabilities include the detection, apprehension and transformation necessary to design and implement a business model. They can allow a company to update its common resources and direct them, as well as partner resources, to high-return ventures. This requires developing and coordinating, or "orchestrating" the resources of the company (and partner companies) to address and shape changes in the market or in the business environment in general.

The strength of a company's dynamic capabilities determines the speed and degree (and associated cost) of aligning the company's resources, including its business model (s) with the customer's needs and aspirations. To achieve this alignment, organizations must be able to seize opportunities continuously, by periodically

transforming organizational and cultural aspects to proactively encounter threats and opportunities Teece [2018].

According to Teece [2018], “strong dynamic capabilities” generally mean strong (in relation to competitors) in all relevant areas of detection, seizure and transformation. A company with strong dynamic capabilities will be able to profitably build and renew common resources, assets and capabilities, reconfiguring them as needed to innovate and respond to (or bring about) changes in the market. The company’s resources must be smartly orchestrated and coordinated with the activities of partner companies to deliver value to customers. Dynamic capabilities are supported in part by organizational routines and processes, the gradual evolution of which is punctuated by non-routine management interventions.

The dynamic capabilities structure is a multidisciplinary model of a company with dynamic capabilities at its core, reflecting this interdependence. A simplified version of the structure, omitting feedback channels, such as that between the organization’s design and dynamic capabilities, is shown in Fig. 2. Dynamic capabilities and strategies combine to create and refine a defensible business model, which guides organizational transformation. Ideally, this leads to an adequate profit level to allow the company to sustain and improve its capabilities and resources [Teece (2018)].

Business models are enabled by dynamic features in the sense that an organization with dynamic capabilities will be able to quickly implement, test and refine new and revised business models. Successful implementation is based on architectural management design, asset orchestration and learning functions, which are essential dynamic resources. At the same time, dynamic capabilities depend in part on the

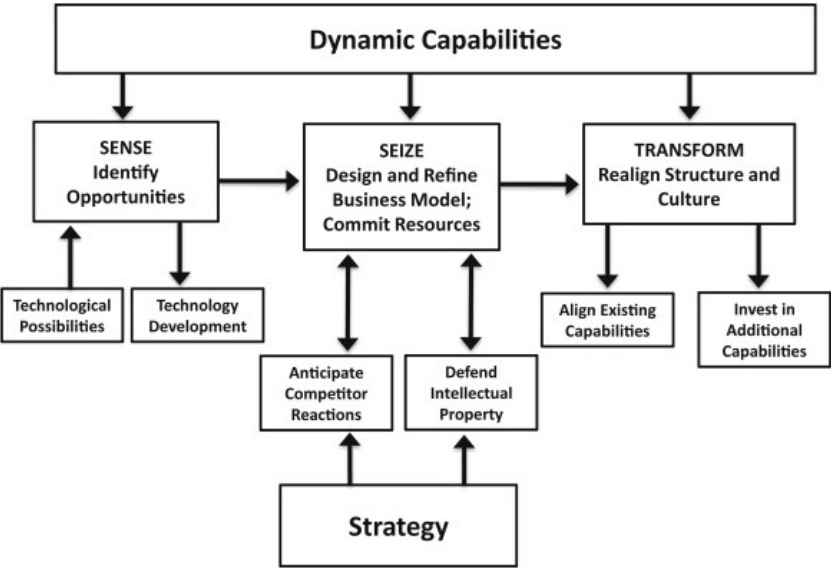


Fig. 2. Simplified scheme of dynamic capabilities, business models and strategy [Teece (2018)].

organizational flexibility allowed or denied by business model choices, such as outsourcing the manufacturing of a new product, or building a factory [Teece (2018)].

Management’s ability to develop and refine business models is a central micro-foundation of dynamic capabilities for both the original model, and to replace and recombine elements of the model over time [Teece (2007), (2018)].

An initial step for the innovative company is to note the existence of customers with unmet needs who are willing and able to pay for a product or service that can correct their situation. A successful business model provides a solution to the customer, which can afford a price high enough to cover all costs and leave a satisfactory profit [Teece (2018)].

3. Methodology

The research method chosen was the case study, because it has increased chances of addressing the proposed research question, meeting the research objectives and the study can be conducted with the necessary methodological rigor [Dresch *et al.* (2015)]. As noted by [Yin (2018)], the case study is suitable for research scenarios that aim to answer questions such as “how” and “why”, with a low possibility of controlling the event observed by the researcher. Furthermore, according to Miguel [2007], the case study is an empirical study that investigates a certain phenomenon, usually contemporary, within a real life context, when the boundaries between the phenomenon and the context are not clearly defined.

Mainly, all types of case studies try to clarify why certain decisions were made, how they were implemented, and what results were achieved [Yin (2018)].

The research evidence points were documents provided by companies and organizations, websites and Internet documents, and interviews with a semi-structured script with open questions extracted from the theoretical models of the literature review.

Data collection was carried out from July 2019 to June 2020, with six respondents from three companies. The details of the interviewees are listed in Table 2.

3.1. Companies and organizations

(1) Alpha

Alpha was born out of the need to provide peripheral neighborhoods in the Brasi-lândia region with a transport service (São Paulo neighborhood with an HDI of

Table 2. Characteristics of the interviewees.

Interviewee	Company	Role
E1	Alpha	CIO (founder)
E2	Alpha	CFO
E3	Beta	CFO (founder)
E4	Beta	Project manager
E5	Gamma	CIO
E6	Gamma	Developer

0.762, according to the Municipality of São Paulo [[Prefeitura de São Paulo \(2017\)](#)]. When the popular transport apps decided to block these regions for lack of security due to robberies and thefts, the founder saw an opportunity and created an app for this region about two years ago. The service started simply through a landline and a WhatsApp mobile phone, with drivers awaiting calls in a waiting room. The service accepts credit and debit cards as well as cash as payment.

The calculation system is much more rudimentary than that of Uber. The price of the drive is determined only by the distance measured between the start and finish points on Google Maps. The prices charged by Alpha at the beginning were similar to those charged by Uber. Each kilometer traveled was charged R \$2.00, against R \$1.80 for Uber, which also charges a municipal fee.

According to Alpha's founder, the driving requirements are similar to those of other transport applications: A 2010 or newer car model, with four doors and five seats, clean and with air conditioning. However, even when it comes to cleaning, it is necessary to consider the particularity of Alpha, whose cars are required to travel through streets usually without asphalt.

Alpha currently has 400 registered drivers and a fleet of approximately 60 cars. Of these, about 20 work only for Alpha, while the rest are also divided into other transportation apps.

(2) Beta

Beta was born from the feelings of uneasiness and frustration of its founding partners, who saw relevant social proposals being shelved by the lack of resources. Through the Access to Information Law, they analyzed investment data via incentive laws, especially the Rouanet Law, from 1991 to the present day. They found that in practice, 71% of the 182 000 projects that requested incentive funds in Brazil remained on paper, and 50% of the resources that could be made available by companies were not directed.

Beta provides a platform that combines technology and information to optimize the research, evaluation and management of a company's social investment. With an intelligent data management system related to more than 30 000 social initiatives, it is possible to have a complete view of the ecosystem of cultural, sports and health projects approved in incentive laws in Brazil since 1992. Thus, the company contributes to the strategic decisions of sponsors and social projects, connecting the ends efficiently, and generating a positive impact on society.

The startup's clients include companies such as Bayer, Kroton, Facebook, Heineken and Via Varejo, among others. Entrepreneurs generate the potential to target \$ 250 million for projects. With a team of 17 employees, Beta currently has 33 corporate clients, and more than 80 social organizations have received resources via the platform, including the Choir of Small Singers of Camaçari, Virada Sustentável and UNAS — Union of Nuclei, Associations of Residents of Heliópolis and Region.

(3) Gamma

In 2015, one of Gamma's founders read a story that showed eight types of industries that could disappear by 2020. Two of them were credit cards and wallets. This initiated the idea of a payment means capable of integrating the urban

transport system as a whole, allowing the user to access various modes and services through a single device, the smartphone. With this platform, people can buy credits and manage them using cell phones in a simple and fast way. The idea turned into a final course work at college, and became a real project.

“I looked at my wallet and only the bus pass card was left. Why is this not yet on my phone?”(E6)”

Gamma is a startup that provides exclusive means of payment for public transport, and can integrate the urban passenger transport system on a global scale. The proposal is to make the urban passenger transport system more flexible and versatile, integrating different cities, systems and modes through technology.

The company’s project aims to replace money, cards, tickets and passes through the mobile application. By creating an account within the system, the user purchases and manages credits and uses the smartphone itself in the transport validator. All public means of transportation will be available in the program, such as buses, subways, trains, bicycles, ferries and trams, in any city that operates with it, including in other countries.

The application eliminates the need for the population to go to a ticket window, terminal, or machinery to purchase or load credit cards for tickets. This also reduces public expense. In addition, it promises to be a safer system than the current one, since the chances of fraud decrease.

4. Results and Analysis

4.1. Digital platform

To characterize the technological products of the companies surveyed as a digital platform, the following theoretical models were used, as presented in Table 3.

The results of the interviews indicated that the three companies use digital platforms, connecting customers to suppliers to obtain a value proposition. While Alpha’s platform is developed by another company, the others are self-developed; the platform owners are the companies themselves.

The three platforms are composed of hardware and software, offer services to end users and organizations, creating value for customers and suppliers, and the business model works under the platform.

What all three companies have in common are being transaction platforms and a business model of platform as correspondence (match); that is, they connect customers and suppliers. The business models innovate in their respective areas, the products offered are services and companies have clearly mapped the values and segments of customers.

4.2. Digital innovation

The framework of Nylén and Holmström [2015] allowed the diagnosis of the companies surveyed in five key areas: user experience, value proposition, scanning digital evolution, skills and improvisation. The answers are provided in Appendix B.

Table 3. Digital platform.

	Alpha	Beta	Gamma
(a) Elements of the platform's business model [Mancha et al. (2018)]			
(a.1) Consumers	Residents of Vila Brasília	Are the companies (sponsors) that want, or that usually donate part of the resources for payment of taxes.	Public transport users
(a.2) Producers	Drivers	Organizations (proponents) that struggle to raise money with projects	Public transport concessionaires
(a.3) Supplier			
(a.4) Owner	Outsourced companies Alpha	Beta Beta	Gamma Gamma
(b) Characteristics of digital platforms [Mancha et al. (2018)]			
(b.1) Are they external platforms based on software and hardware?	The company uses business platforms based on software and hardware	The company uses business platforms based on software and hardware	The company uses its own digital platform for one of the applications and also has a chatbot on Facebook
(b.2) Do the applications offer services or systems to end users?	The company offers a transport service through an application for residents of the Brasília village	A system that manages to connect the need for social projects from all over the country to the capital of large companies and searches for projects that are relevant to their investment through the platform that collects and analyzes data through robots allocated in different public bases involved with the incentive laws, at the federal, state and municipal levels	intelligence so that users can purchase credits for their transport cards without having to download applications or spend a data plan. (E6)"

Table 3. (Continued)

	Alpha	Beta	Gamma
(b.3) Does it allow the interaction, through the Internet, of different groups of people, companies and organizations?	Yes	Yes	Yes
(b.4) Do you innovate with new business models that are intrinsically based on information and technology features?	Yes	Yes	Yes
(b.5) Creates value by allowing direct communication and interactions between groups.	Yes	Yes	Yes
(c) Platform business models [Morvan <i>et al.</i> (2016)]	Match	Match	Match
(d) Platforms according to their main objective [Gawer (2014); Evans and Gawer (2016)]	Transaction platform	Transaction platform	Transaction platform

In relation to the user experience, companies are concerned with offering customers a pleasant and friendly experience with an application design that has the ability to adjust and optimize, that considers the characteristics and format of each device, speed of use, ease of use and attractive and captivating look. The three companies agreed to use user experience in their products, as can be seen from the experience and role of the interviewees, see Table 2.

As for the value proposition, customer segments are well defined and digital profits are obtained according to the value proposition of the three companies described below. Alpha offers decent transport to Vila Brasilândia residents, as other applications avoid the area, which is considered a risk area. Beta strengthens the connection between the first, second and third sectors by developing a new way of thinking and directing resources through incentive laws. Gamma is bringing competitiveness to the country's public transport, adding value and facilities to customers. The value propositions are clear, and aligned with the goals of digital platforms.

The digital evolution scan is used in its entirety by two companies, and partially by the third to identify and explore opportunities for innovation in emerging contexts of usage and new user behaviors. At Alpha, in the beginning, the technology used by customers was the free multi-platform instant messaging application WhatsApp. Currently, WhatsApp continues to be used, but the platform and application are being used for customer relationships and social networks such as Facebook, Twitter and Instagram. At Beta, the digital platform collects data through robots distributed in different public places related to incentive laws at the federal, state and municipal levels. For this, the team of developers is looking for new technologies and solutions for AI, deep learning, etc., and Gamma is always looking for new payment methods to be introduced on its own or third-party platforms.

Digital innovation requires new skills; the three companies considered it important to continue looking for new technologies and stated that they are always evaluating their mechanisms to support the continuous learning of the unique properties of digital technologies, in order to establish dynamic innovation teams.

Regarding improvisation, respondents from the three companies agreed that the first technological products started in the form of learning by doing, where the available resources had to be managed and improvised.

The companies Alpha, Beta and Gamma demonstrated a high commitment to digital innovation, and it was possible to diagnose that the companies are investing in the five areas surveyed.

4.3. *Dynamic capabilities*

To analyze the dynamic capabilities, Teece's [2018] business model for dynamic capabilities was used, as a successful business model provides a solution to the client that can support a price high enough to cover all costs and leave a satisfactory profit [Teece (2018)]. Business models are enabled by dynamic features in the sense that an organization with dynamic capabilities will be able to quickly implement, test and refine new and revised business models.

4.3.1. *Simplified scheme of dynamic capabilities, business models and strategy*

(1) Sense

(i) Identifying opportunities

The three companies reported in the interviews that the companies were born from opportunities identified in the community or from the owners' perceptions. Alpha was born from the need to supply peripheral neighborhoods in the Brasília region with an application-based transport service. When the most popular apps decided to block these regions, the founder saw an opportunity to create an app. Beta was born from the discomfort and frustration of its founding partners, who saw relevant social proposals being shelved due to a lack of resources. Thus, they saw the opportunity to offer notices of social projects to organizations that could carry them out. The CEO of Gamma (E5) read a report that showed eight types of industries that could disappear by 2020. Two of them were credit cards and wallets. "I looked at my wallet and all that was left was the bus card. Why is it not yet on my cell phone?" he asked. This question led to the idea of a means of payment capable of integrating the urban transport system as a whole, allowing the user to access various modes and services through a single device, the smartphone. With this platform, people can buy credits and manage them using cell phones in a simple and agile way.

(ii) Technological possibilities

According to Teece [2018], it takes time for business model innovation to reach technological possibilities, perhaps because business models are more context-dependent than technology-dependent. According to the interviews, the companies did not use all technological possibilities from the beginning. At Alpha, service started simply: orders were received through a landline and a WhatsApp cell phone, while drivers waited for a call in a waiting room. Beta started with Internet searches for the notices of social projects across the country, and later evolved into a digital platform. At Gamma, the company's project aims to replace cash, cards, tickets and passes through the mobile application. When creating an account within the system, the user buys and manages credits, and uses the smartphone itself in the transport validator. These accounts of company beginnings reveal that companies did not start with digital platforms, but rather, evolved to reach this point.

(iii) Technology development

The companies surveyed reported that they developed the technologies needed for business models. Alpha initially developed a digital platform app for transportation, and then complemented it with an app for food delivery and payments. Beta created a platform that combines technology and information to optimize the research, evaluation and management of a company's social investment. Gamma's technological value proposition is to develop solutions for the online recharge of public transport cards through the application or through Facebook.

(2) Seize

(i) Design and refine BM

According to Teece [2018], dynamic resources and strategies combine to create and refine a defensible business model that guides organizational transformation. Ideally, this leads to an adequate level of profits, allowing the company to sustain and enhance its capabilities and resources. Alpha's business model could be the same as that of other transportation app companies, but the characteristics of the region, such as no streetsigns, uneducated and humble residents who may not know how to use smartphones, led the founders to adapt their operations, such as having a phone number to serve customers, and having resident drivers who know all the streets to drive them. Beta's business model has as its main value proposition to strengthen the connection between the first, second and third sectors by developing a new way of thinking to direct resources through incentive laws. Companies that hire the social impact startup start a process of managing taxes intelligently and quickly; organizations, in turn, now have the resources to take important projects off the ground. Gamma is a startup that provides exclusive means of payment for public transport, and is able to integrate the urban passenger transport system on a global scale. The proposal is to make the urban passenger transport system more flexible and versatile, integrating different cities, systems and modes through technology.

(ii) Commit resources

The three companies responded that they were committing resources to new projects. Committed to the Brasília region, Alpha is creating two more delivery services for the area. Beta and Gamma are investing in their respective digital platforms and human resources to scale and improve services.

(iii) Anticipating competitors' reactions

- Alpha — Yes
- Beta — Yes
- Gamma — Yes

(iv) Defending intellectual property

- Alpha — Yes
- Beta — Yes
- Gamma — Yes

(3) Transform

(i) Realigning structure and culture

The changes caused by the new business models forced companies to realign the structures and cultures of the new scenarios. Alpha focuses on serving Brasília and maintains an alternative for people with reading difficulties through the

WhatsApp service and the call center, in addition to investing in two new delivery services for the region. Beta started as consulting and advisory services for investments in social projects. With the launch of the platform, Beta focused on offering correspondence services (match) between companies that wish to invest in projects and companies that have social projects, effectively collaborating with the socio-environmental responsibility strategies of the private sector, offering investment auditing and adding more reliability to the entire process. Gamma emerged with the objective of digitizing public transport systems, improving the passenger experience through payment methods, and with the experience gained in the market, began to develop solutions for online recharge of public transport cards via the app or chatbots on social networks.

(ii) Investing in additional resources

All three companies are investing in new resources to enable new business models. Alpha intends to take its project to other peripheral regions with mobility difficulties similar to those in Brasília, and has launched an application for food delivery. Beta intends to launch an index that works as a national ranking of project scores, considering the social impact generated and the investments made by the companies. Based on APIs to enable and facilitate integration, the Gamma ticket is integrated with telemetry, applications and chatbots. Digital Ticketing is based on the Account-Based Ticketing concept, where each customer has an account in the system that allows integration with any other agreed modal. That is, the true billing of Cloud Mobility as a Service (MaaS).

The theoretical model of Teece [2018] made it possible to understand the business models of companies based on dynamic capabilities, and thus prove that dynamic capabilities include the detection, apprehension and transformation necessary to design and implement a business model, thus allowing a company to update its common resources and direct them, as well as the resources of partners, to high-return ventures.

5. Conclusion

The results of the empirical research showed that Alpha, Beta and Gamma have a digital platform as their main component, use the digital platform for business transactions, and connect customers and suppliers through their services. The companies' business models are based on current technologies, and these technologies contribute to their digital profit.

The case studies showed that digital platforms help companies and organizations to offer social value propositions, such as in the case of Alpha, which offered its users a service not provided by other applications due to security. Similarly, Beta's platform allows CSOs to find companies that want to sponsor social projects, while Gamma makes the urban passenger transport system more flexible, versatile and democratic digitally.

The concern and focus of companies on digital innovation is justified by the continuity of business, which has been proven by investments in new projects, new technologies and technological solutions.

The theory of dynamic capabilities made it possible to understand how processes such as the ability to reconfigure resources and organizational skills, a quick and flexible response and providing a competitive advantage, resulting from digital innovation applied on a digital platform, create value for the company, and thus achieve the objective of this paper.

The academic contribution of this paper is to encourage the discussion that digital platforms are innovating companies and associations with new business models, and creating new value propositions that cause social innovation. The study further provides an analysis of the effects and capabilities of digital platforms to innovate through the theoretical lens of dynamic capacity, which can help companies and associations in future endeavors.

As a suggestion for future research, it is suggested to analyze how other technological products innovate digitally. For instance, a Digital Twin, in literal translation, is a virtual version of a physical object or even an organizational process. The Digital Twin solution is designed to optimize inspection and optimization activities.

Acknowledgment

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior — Brasil (CAPES) — Finance Code 001.

Appendix A. Diagnostic Tool [Nylén and Holmström (2015)]

Table A.1.

		I do not agree	Partially agree	Accept	Score	Diagnosis (low score) with point 0 or 1
User experience						
Usability	Our digital products and services are easy to learn and interact with.	1	2	3	0	The user experience of products and services included in the company's current product portfolio needs to be redesigned.
Aesthetics	They have articulated aesthetic properties that evoke a positive emotional response.	1	2	3	0	
Engagement	They are created to offer our customers meaningful experiences.	1	2	3	0	
		Composite measure: 0				
Value offer						
Segmentation	We analyzed our customer base and divided it into several segments.	1	2	3	0	The company's digital profits can be increased by reconfiguring the
Package	The components of our digital portfolio of products and services are differentiated and the limits and relationships among them are clearly specified.	1	2	3	0	value proposal inscribed on the company's products and services.
Commissions	We continuously evaluate and negotiate our relationships with channel owners.	1	2	3	0	
		Composite measure: 0				
Digital evolution scanning						
Devices	We carefully follow which new hardware components and devices are under development.	1	2	3	0	The company needs to develop evolving digital scanning mechanisms.
Channels	We follow the evolution of digital distribution channels (for example, software platforms, operating systems and web services).	1	2	3	0	

Table A.1. (Continued)

		I do not agree	Partially agree	Accept	Score	Diagnosis (low score) with point 0 or 1
Behaviors	We pay attention to emerging user behaviors in contexts and markets.	1	2	3	0	
		Composite measure: 0				
Skills						
Learning	We promote continuous learning of the unique properties of digital technologies.	1	2	3	0	The company needs to acquire new skills internally and externally while promoting continuous learning.
Functions	The balance between general digital skills and specialized digital functions is adequate.	1	2	3	0	

Appendix B. Responses to the Nylén and Holmström [2015] Framework

Table B.1.

		Alpha	Beta	Gamma
User experience				
Usability	Our digital products and services are easy to learn and interact with.	3	3	3
Aesthetics	They articulated aesthetic properties that evoke a positive emotional response.	3	3	3
Engagement	They are created to offer our customers meaningful experiences.	3	3	3
Value offer				
Segmentation	We analyzed our customer base and divided it into several segments.	2	3	3
Package	The components of our digital portfolio of products and services are differentiated and the limits and relationships between them are clearly specified.	3	3	3
Commissions	We continuously evaluate and negotiate our relationships with channel owners.	2	2	2
Digital evolution scanning				
Device	We carefully follow which new hardware components and devices are in development.	3	3	3
Channels	We follow the evolution of digital distribution channels (for example, software platforms, operating systems and web services).	3	3	3
Behaviors	We pay attention to emerging user behaviors in different contexts and markets	3	3	3
Skills				
Learning	We promote continuous learning of the unique properties of digital technologies.	3	3	3
Functions	The balance between general digital skills and specialized digital functions is adequate.	3	3	3
Times	We can bring teams together with the right combination of skills for each digital project.	3	3	3
Improvisation				
Space	We try to organize the work so that structure and flexibility are balanced.	3	3	3
Time	We dedicate time to improvisation efforts in each profession.	3	3	3
Coordination	We have mechanisms to coordinate improvisation efforts.	3	3	3

References

Ballestar, M. T., Camiña, E., Díaz-Chao, Á. and Torrent-Sellens, J. (2020). Productivity and employment effects of digital complementarities. *Journal of Innovation & Knowledge*, **6**, 3: 177–190, Available at <https://doi.org/10.1016/j.jik.2020.10.006>.

Behne, A., Beinke, J. H. and Teuteberg, F. (2021). A framework for cross-industry innovation: Transferring technologies between industries. *International Journal of Innovation and Technology Management (IJITM)*, **18**, 3: 1–27.

Ciriello, R. F., Richter, A. and Schwabe, G. (2018). Digital innovation. *Business & Information Systems Engineering*, **60**, 6: 563–569.

- Claussen, J. and Halbinger, M. A. (2021). The role of pre-innovation platform activity for diffusion success: Evidence from consumer innovations on a 3D printing platform. *Research Policy*, **50**, 8: 103943.
- de Reuver, M., Sørensen, C. and Basole, R. C. (2018). The digital platform: A research agenda. *Journal of Information Technology*, **33**, 2: 124–135.
- Dresch, A., Lacerda, D. P. and Miguel, P. A. C. (2015). Uma análise distintiva entre o estudo de caso, a pesquisa-ação e a design science research. *Revista Brasileira de Gestão de Negócios*, **17**, 56: 1116–1133.
- Evans, P. and Gawer, A. (2016). *The Rise of the Platform Enterprise: A Global Survey*, The Emerging Platform Economy Series, No. 1. The Center for Global Enterprise. New York, NY, USA
- Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, **43**, 7: 1239–1249.
- Gomes, J. G. C. and Okano, M. T. (2019). Plataformas digitais como modelos de negócio: Uma pesquisa exploratória. *South American Development Society Journal*, **5**, 13: 232.
- Helfat, C. E. and Peteraf, M. A. (2003). The dynamic resource-based view: Capability life-cycles. *Strategic Management Journal*, **24**, 10: 997–1010, doi: 10.1002/smj.332.
- Hinings, B., Gegenhuber, T. and Greenwood, R. (2018). Digital innovation and transformation: An institutional perspective. *Information and Organization*, **28**, 1: 52–61.
- Huang J., Henfridsson O., Liu M. J. and Newell S. (2017) Growing on steroids: rapidly scaling the user base of digital ventures through digital innovation. *MIS Q* **41**, 1: 301–314.
- Kaiser, L. F., Wehking, C. and vom Brocke, J. (2021). How to organize digital innovation? The role of involvement, structure, and technology. *International Journal of Innovation and Technology Management (IJITM)*, **18**, 3: 1–22.
- Kallinikos, J., Aaltonen, A. and Marton, A. (2013). The ambivalent ontology of digital artifacts. *MIS Quarterly*, **37**, 2: 357–370.
- Lamberton, C. and Stephen, A. T. (2016). A thematic exploration of digital, social media, and mobile marketing: Research evolution from 2000 to 2015 and an agenda for future inquiry. *Journal of Marketing*, **80**, 6: 146–172.
- Mancha, R., Gordon, S. and Iyer, B. (2018). Figayou pursues a platform strategy: A case study of digital platform entrepreneurship. *Journal of Information Technology Case and Application Research*, **20**, 2: 55–70.
- Miguel, P. A. C. (2007). Estudo de caso na engenharia de produção: Estruturação e recomendações para sua condução. *Production*, **17**, 1: 216–229.
- Mishra, S. and Tripathi, A. R. (2020). Literature review on business prototypes for digital platform. *Journal of Innovation and Entrepreneurship*, **9**, 1: 1–19.
- Morvan, L., Hintermann, F. and Vazirani, M. (2016). Five ways to win with digital platforms. G-20 Young Entrepreneur Alliance.
- Mosig, T., Lehmann, C. and Neyer, A. K. (2021). Data-driven business model innovation: About barriers and new perspectives. *International Journal of Innovation and Technology Management (IJITM)*, **18**, 2: 1–32.
- Nambisan, S. et al.. (2017). Digital Innovation Management: Reinventing innovation management research in a digital world. *MIS Quarterly*, **41**, 1: 223–238.
- Nylén, D. and Holmström, J. (2015). Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Business Horizons*, **58**, 1: 57–67.
- Osterwalder, A. and Pigneur, Y. (2020). *Business Model Generation: Inovação Em Modelos De Negócios*. Alta Books (in Portuguese). Rio de Janeiro, RJ, Brazil
- Prefeitura de São Paulo. (2017). A dinâmica do IDH-M e suas dimensões entre 2000 e 2010 no município de São Paulo, p. 29. Informes Urbanos (in Portuguese).
- Sista, R., Hua, Z., Thwar, P., Sudarsan, A., Srinivasan, V., Eckhardt, A., . . . and Pamula, V. (2008). Development of a digital microfluidic platform for point of care testing. *Lab on a Chip*, **8**, 12: 2091–2104.

- Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, **43**, 2–3: 172–194.
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, **51**, 1: 40–49.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and micro-foundations of (sustainable) enterprise performance. *Strategic Management Journal*, **28**, 13: 1319–1350.
- Teece, D. J., Pisano, G. and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, **18**, 7: 509–533.
- Thress, K. S., Brant, R., Carr, T. H., Dearden, S., Jenkins, S., Brown, H., . . . and Barrett, J. C. (2015). EGFR mutation detection in ctDNA from NSCLC patient plasma: A cross-platform comparison of leading technologies to support the clinical development of AZD9291. *Lung Cancer*, **90**, 3: 509–515.
- Tiago, F., Gil, A., Stemberger, S. and Borges-Tiago, T. (2021). Digital sustainability communication in tourism. *Journal of Innovation & Knowledge*, **6**, 1: 27–34.
- Vardarli, P. and Ozsahin, M. (2021). Digital transformation of human resource management: Social media's performance effect. *International Journal of Innovation and Technology Management*, **18**, 3: 2150005.
- Yee, N., Bailenson, J. N., Urbanek, M., Chang, F. and Merget, D. (2007). The unbearable likeness of being digital: The persistence of nonverbal social norms in online virtual environments. *CyberPsychology & Behavior*, **10**, 1: 115–121.
- Yin, R. K. (2018). *Estudo De Caso: Planejamento E Métodos*. Bookman, Porto Alegre.
- Yoo, Y. et al. (2012). Organizing for innovation in the digitized world. *Organ Science*, **23**, 5: 1398–1408.
- Yoo, Y., Henfridsson, O. and Lyytinen, K. (2010). Research commentary: The new organizing logic of digital innovation: An agenda for information systems research. *Information Systems Research*, **21**, 4: 724–735.

Biography

Marcelo T. Okano is Permanent Professor of Professional Master in Productive Systems, holds PhD degree in Production Engineering from UNIP and PhD Degree in Business Administration from EAESP/FGV. Research areas are innovation, ICT and business.

Henry de Castro Lobo Dos Santos is a Doctorate Student at School of Technology - Unicamp with a Master degree in Technology from Campinas State University. He works with data networks and information security. His research area are innovation, ICT, business, queuing models, data traffic, discrete event simulation, continuous simulation and performance analysis.

Edson L. Ursini is an Associate Professor at School of Technology, Unicamp with a doctoral degree in Electrical Engineering(electronics and communications) from Campinas State University. He works with data networks, stochastic processes, queuing models, teletraffic and data traffic, discrete event simulation, continuous simulation, fuzzy logic systems, performance analysis, innovation, ICT and business.