Towards A Research Agenda on Digital Platform Disruption

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Abstract. Digital platforms are disruptive IT artifacts, because they facilitate the quick release of innovative platform derivatives from third parties. This study endeavors to unravel the disruptive potential, caused by distinct designs and configurations of digital platforms on market environments. We postulate that the disruptive potential of digital platforms is determined by the degree of alignment among the business, technology and platform profiles. Furthermore, we argue that the design and configuration of the aforementioned three elements dictates the extent to which open innovation is permitted. To shed light on the disruptive potential of digital platforms, we opted for digital payment platforms as our unit of analysis. Through interviews with experts and payment providers, we seek to gain an in-depth appreciation of how contemporary digital payment platforms are designed and configured to foster open innovation. We envision that this study bridges existing knowledge gaps between digital platform and open innovation literature.

Keywords: Digital Platforms, Disruption, Open Innovation, Layered Modular Architecture, Digital Payment.

1 Introduction

Digital platforms (e.g., Apple's App Store) are layered modular IT architectures [1] that deliver a shared technological scheme from which a family of platform derivatives (e.g., iOS apps) can be efficiently produced. In this sense, digital platforms facilitate the quick release of innovative platform derivatives from third parties [2]. Compared to their physical counterparts (e.g., product platforms like electronic shavers), digital platforms are particularly disruptive by nature because they alter conventional market structures by unbundling once glued business value chains, and bundling their core services with other innovative platform derivatives [3]. By storing and transmitting reprogrammable digital code on IT artifacts (e.g., mobile phones), digital platforms thus embody disruptive capabilities in that functionalities can be extended in an agnostic and rapid fashion [4]. Yet, despite the prevalence of disruptive digital platforms, few studies have endeavored to shed light

on the architectural *design* and *configuration* of such platforms. Responding to the call by Bharadwaj, El Sawy, Pavlou and Venkatraman [5] to rethink digital business strategy in the era of platformization, this research strives to supplement contemporary knowledge on digital platforms [1, 3, 6-8] by putting forth a research agenda aimed at unraveling the disruptive potential of digital platforms.

Specifically, we advance a research model that defines the disruptive potential of digital platforms in terms of their: (1) *strategic business profiles* [9] (i.e., strategic orientation of digital platforms in a given market environment); (2) *design* and *configuration* [1, 8] (i.e., architecture and governance of digital platforms); (3) *technology attributes* [10-13] (i.e., extent to which proprietary, compatible and agnostic technology in digital platforms), as well as; (4) *open innovation* and *open business* models [14, 15] (i.e., support of digital platforms for acquiring, integrating and commercializing innovative derivatives). We further argue that the interplay among the aforementioned digital platform dimensions forms the basis for developing different kinds of platform derivatives, be it exploitative, explorative, or ambidextrous [16, 17]. In turn, these platform derivatives may reinforce or challenge predominant market logic [4].

By advancing a research model of digital platform disruption, this research takes a small but concrete step towards developing a theory of digital platform disruption while concurrently setting the stage for the derivation of managerial prescriptions that can be harnessed by providers in designing and configuring digital platforms. Because the purpose of this paper is to outline related concepts that could be synthesized to construct a research model of digital platform disruption, we do not claim that our review of extant literature is definitive or exhaustive. Rather, what we did is to offer a preliminary glimpse into the next steps in our investigation into digital platform disruption.

The remainder of the paper is structured as follows. In the next section, we present our research model of digital platform disruption together with a brief overview of the different research streams that we have synthesized in constructing the model. Following which, we describe our rationale for deciding on the digital payment industry as the context for our study and also explain our choice of a mixed-method approach for data collection. Subsequently, we highlight preliminary findings related to our proposed research model. Last but not least, we reflect on possible contributions to theory and practice.

2 Theoretical Underpinnings

2.1 Digital Platform Disruption Model

Disruptive innovation can be classified into new market (i.e., uncontested market space) [18], or low-end disruption (i.e., an initial underperforming market which upsets the status quo over time) [4, 19]. Oftentimes, market incumbents are inclined to favor sustaining innovation due to organizational inertia and technological inflexibilities [20]. Nevertheless, certain incumbents subscribe to a two-prong approach to avoid the fate of disruption. By incorporating innovative and autonomous

business units into their organizational hierarchy, these incumbents attempt to maintain flexibility when markets are tipping [21] towards the gradual adoption or adaptation of a dominant design [22].

While past studies have explained the innovative capabilities of digital platforms [7, 23-25], few have investigated the potential of digital platforms for breeding *disruptive innovation*. Although digital platforms possess disruptive capabilities, there is a notable paucity of studies that examine how disruptive platforms are designed and configured for market disruption. We argue that disruptive digital platforms strategically align and configure business and *internal* IS strategies with *external* ones [cf. 7]. As such, successful digital platforms must constantly balance reciprocal interests (e.g., business and technology) among platform owners and third parties to *support* the development of innovative platform derivatives.

To explain the disruptive capabilities of digital platforms, we advance a research model of *digital platform disruption* as depicted in Figure 1 below. Based on the notion of strategic alignment [26], we delineate support for (open) innovation into: (1) ***business design*** (how does a digital platform *strategically* act on a given market), (2) ***platform design*** (how is a digital platform *tactically* designed and governed from an architectural point of view), and; (3) ***technology design*** (what kind of hardware and software is deployed *operationally*). We contend that the design and configuration of these three design constructs create *conducive* conditions to support innovative (and by extension) disruptive platform derivatives [cf. 27, 28, 29]. Ultimately, these platform derivatives are either *explorative, exploitative,* or *ambidextrous* in their attributes, which may challenge conventional market logics [4, 16]. In the next sections, we present the theoretical pillars underpinning our research model of digital platform disruption (see Figure 1).

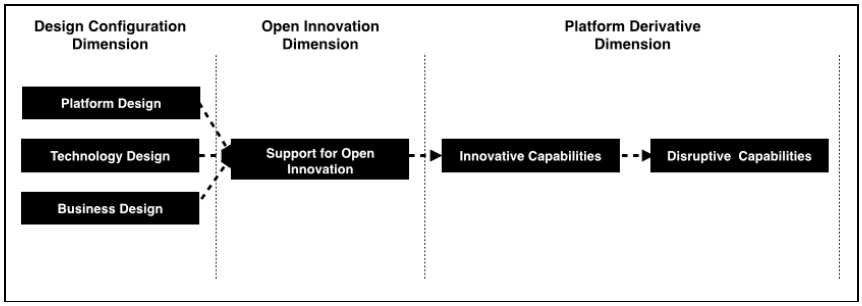

Figure 1. Digital Platform Disruption

2.2 Support for Open Innovation

Open innovation is the leveraging of external and internal ideas to create novel products and services [15], whereas open business model is the commercialization of co-created ideas [30]. In the digital platform context, open innovation and open business model are suitable theoretical lenses to describe digital platform innovation, which constitutes coupled open innovation [14, 31]. As digital platforms are

embedded in innovation ecosystems [32-34], digital platforms integrate selectively (core) innovations into their platforms, to offer afterwards the architectural foundation for future innovative platform derivatives. In doing so, it provides conditions for positive feedback loops.

As digital platforms practice open innovation, we argue that the number, and the attributes of platform derivatives (i.e., based on support for open innovation) are determined by its: (1) ***business design*** (2) ***platform design***, and; (3) ***technology design*** [27-29].

2.3 Business Design

Business management activities, can be classified into four industry-independent *strategic business profiles* [9, 35]: (1) *Defender* follows a exploitative strategy; (2) *Prospector* follows a explorative business strategy; (3) Analyzer follows an ambidextrous business strategy (*Defender* & *Prospector*), and; (4) *Reactor* (lack of strategies). Based on the works of Venkatraman [36], Chan, Huff, Barclay and Copeland [37], as well as Sabherwal and Chan [35], the aforementioned strategic business profiles are founded on *strategic business attributes* derived from management activities, which we have contextualized to digital platforms as (see Table 1):

Table 1. Strategic Business Attributes

Aggressiveness	Digital platforms sacrifice profitability to gain market share.
Analysis	Digital platforms have the trait of an overall problem solver, having the tendency to search deeper for the roots of problems or opportunities.
Defensiveness	Digital platforms focus on efficiency, where core products and markets are defended against new market entrants.
Futurity	Digital platforms have the trait to consider key strategic decisions from a long-term perspective.
Proactiveness	Digital platforms have the attitude to participate actively in emerging industries, search for new opportunities, which may or may not relate to current product and service offering.
Risk aversion	Digital platform have the trait being a second mover into a market.
Innovativeness	Digital platform have strengths in creativity and experimentation.
Internal/External Innovativeness	We extend the abovementioned literature by suggesting internal & external innovativeness as additional sub-strategic business attributes of innovativeness to reflect open innovation within digital platforms.

In the digital platform context, certain platforms may carry the abovementioned business attributes in their daily operations, which in turn may impact the choice of technology and platform design options. For instance, digital platforms, which are mature and tightly integrated, exhibit the traits of a *Defender* (e.g., stable technology and platform design approach to ensure efficiency). Conversely, digital platforms with a *Prospector profile* ensure innovativeness through flexibility in business and technology choices. Based on the dominance of certain business attributes, we posit that digital platforms embody strategic business profiles [9] that may impact the

support for open innovation. To our knowledge, we are unaware of prior research that has examined the strategy profiles of digital platforms.

2.4 Platform Design

Past studies have laid the theoretical foundation for understanding digital platforms as layered modular architectures [1, 38, 39], and the way digital platform owners govern their systems through balancing between control and generativity [7, 8]. Prior research has examined the idiosyncrasies of digital platforms (most of which are governed in a centralized or hybrid fashion), or how platform owners co-create innovative platform derivatives in a controlled manner [7, 11, 24]. As such, earlier studies had a more generic view on digital platforms, where the unit of analysis was primarily constrained to the service layer [cf. 1].

There is little discussion within extant literature on the holistic architecture of digital platforms. We conceive digital platforms not as monolithic IT artifacts, but as comprising five distinct platform layers (i.e., content, service, network, system, device) [1, 29]. In doing so, the conceptual granularity allows us to study digital platforms in a more precise manner. Furthermore, *platform governance* [7, 8, 40] determines the configuration of digital platforms on each platform layer, by being loosely coupled, or vertically integrated (i.e., *single platform integration view*) [cf. 41], and how accessible and open (modifiable) *each platform layer* is [28].

Lastly, as digital platforms have the capabilities to interconnect with other external/competing digital platforms on different platform layers, we introduce the concept of *cross-platform interoperability*, where different platforms integrate essential, or complementary layers in offering their service (e.g., Visa provides the network layer of Apple Pay). On the other hand, vertically integrated and proprietary platform tightly couple each layer to their own benefit [29].

From above, we argue that the *governance* and *implementation* of *platform layers* may lead to distinct *platforms design* options, leading either to *centralized, hybrid* and *decentralized* platforms. We argue that centralized digital platforms seek to obtain monopolistic power by tightly coupling platform layers to derive unique configurals, which are difficult to replicate. Conversely, decentralized platforms purposely decouple platform layers to mobilize third parties to innovate on each layer and accelerate innovative capabilities [29]. We thus contend that the architectural structure of digital platforms impact the support for open innovation from a platform governance perspective.

2.5 Technology Design

Based on technology standards, digital platforms are capable of converting and configuring standard technology components into digital platforms that are either: (1) propriety; (2) compatible, or; (3) agnostic [10-12, 42, 43]. Consequently, the dominance of the certain technology attributes may lead to certain technology profiles (i.e., technology design)

Compatibility. Based on different standards, technology *compatibility* is the *technological* rule, and the ability of interoperability between two, or more (platform) systems [43], without requiring modifications. Furthermore, application programming interfaces (APIs), software development kits (SDKs), and (industry) standard hardware and software interfaces are the mediators of technology compatibility, to allow interoperability among IT artifacts and their underlying systems [cf. 11].

Proprietary. *Proprietary* IT artifacts, which do not share the notion of technology compatibility, possess the attribute of a black box, causing (purposefully) vertical and horizontal interoperability issues [44]. The value proposition of proprietary technology brings the advantage to reap better margins, and creates barriers for imitation, as long as the IT artifact is perceived to be innovative compared to competing solutions.

Agnosticism. The opposite of proprietary technology shares the notion of free and open source (hardware/software), allowing, in a non-discriminative manner, others the opportunity to study, modify, and distribute IT artifacts and their derivatives in a heterogeneous and agnostic manner, leading to unprompted IT artifacts [cf. 1].

Accordingly, a *single digital platform* may carry multiple technology attributes in one platform on different layers. Therefore, we argue that the dominance of certain technology attributes my lead to certain *technology profiles* (i.e., technology design), which may have an impact on supporting open innovation from a software and hardware point of view.

3 Methodology

This section describes the stages of a three-stage study targeted at gaining insights into how digital platforms can be designed and configured to unleash their capabilities for market disruption. Of the three stages, data collection has already commenced for the first stage and will be completed shortly.

3.1 Research Setting

To unravel the disruptive capabilities of digital platforms, we opted for *digital payment platforms* as our context and unit of analysis. Digital payment platforms are especially amenable to explore digital platform disruption because the payment industry is in the midst of a technology revolution. Innovative digital payment platforms are invading the payment market (e.g., Apple Pay) and threatening the competitive positions of established financial institutions. The influx of novel platform solutions are disintermediating traditional payment value chains, leading to an increasingly fragmented and cutthroat payment landscape. It is against this backdrop that we plan for the execution of a multi-stage study to disentangle design and configuration options, which are responsible for shaping the disruptive capabilities of digital platforms.

In the first stage, we will scrutinize the digital payment industry as a whole in order to: (1) ascertain the disruptive forces at work within the digital payment market; (2) pinpoint relevant stakeholders (e.g., cardholder, merchants, acquirer, startups and

banking establishments), as well as; (3) determine how each of these stakeholders is contributing to and/or reacting to disruptive market pressures. Next, the second stage of the study will focus on deriving a taxonomy of digital platform disruptions that is anchored in case studies of various digital payment platforms. Each category within the taxonomy corresponds to a specific digital platform configuration with distinct capabilities for market disruption. Finally, the third stage will unpack each digital platform configuration in the taxonomy into design considerations for business, platform and technology elements. These design considerations will be validated through an online survey that examines the impact of business, platform and technology elements on the configuration of digital platforms, which in turn affects the capabilities of these platforms for market disruption (see Figure 1).

3.2 Data Collection Method

Corresponding to our three-stage study, data is gathered through a blend of quantitative and qualitative research methods [45, 46]. Mixed method brings the advantage of meta-inferences to: (1) overcome weaknesses associated with reliance on a single method, and; (2) permit theoretical complementarities to emerge between qualitative and quantitative insights. Data gathered via mixed methods is not only simultaneously rich in breadth (quantitative) and depth (qualitative), it can also fulfill both explorative and confirmative objectives within the same research inquiry. Our mixed method approach is explorative and adheres to the sequential study approach: a qualitative study (semi-structured interviews) followed by a quantitative study (online survey) in order to yield deep insights into the configuration of disruptive digital platforms while having the capacity to generalize our findings beyond a limited sample of cases [45].

Beginning with multiple and interpretative case studies [47, 48], we have contacted knowledgeable interviewees belonging to digital payment providers as well as payment associations and consultants based on their job title and job description. Interviews with payment associations and consultants are necessary to obtain a holistic view of the digital payment landscape and comprehend the market mechanisms, which underlie the payment value chain.

Interviews are conducted in a semi-structured format. Semi-structured interviews have the benefit of allowing the interviewer to capture additional and coincidental insights that interviewees may have overlooked otherwise. Interview questions are formulated from our proposed research model on digital platform disruption, especially with regards to understanding events and decisions leading up to: (1) how and why digital payment platform owners choose to design and configure their payment solutions from an architectural point of view (e.g., centralized), as well as; (2) the business and technology strategies employed by these owners when designing and configuring their digital payment platforms. The goal of the qualitative study is to not only shed light on disruptive forces within the digital payment market (i.e. Stage 1), but to also continuously refine our proposed taxonomy of digital payment disruption (i.e., Stage 2) until theoretical saturation has been reached: when the inclusion of additional interviewees do not generate substantive insights above and beyond what has already been disclosed in previous interviews.

To-date, semi-structured interviews have been conducted within the UK payment industry and plans are being drawn up to replicate the data collection procedures in other European countries. In doing so, we are able to perform cross-country comparisons to derive country specific as well as generic patterns in how digital payment platform owners design and configure their payment platforms.

Upon the completion of the qualitative study, we will embark on a quantitative study in the form of an online survey questionnaire that we plan to administer on a much larger sample of key stakeholders within the digital payment industry. Particularly, we will survey respondents affiliated with different industry (e.g. Payments Council UK) and payment associations (e.g., acquirers and retailers), which when taken together, represent a comprehensive pool of key stakeholders, who will be affected by the growth of digital payment platforms, be it in a positive or negative manner. It is envisioned that the data from the online survey will be utilized to validate the impact of business, platform and technology designs on the configuration of digital platforms for market disruption (i.e., Study 3). In turn, this will lay the groundwork for further research into the disruptive capabilities of digital platform design and configuration.

4 Preliminary Findings

Industry transformation and the prevalence of digitized payment services has given birth of interconnected payment actors. These payment actors tend to modularize their payment service components of one another in order to co-create and capture value through orchestrated digital business models [cf. 5]. In that sense, the platformization of payment services has created the ground for an application programming interface (i.e., API) driven digital payment network. Initial findings suggest that payment actors collaborate and compete on different platform layers (e.g., service layer) by granting and restricting platform access through technical, contractual and in rare occasions through regularity means. In doing so, digital payment platforms differ in regards to third party integration.

In our study, payment platforms grant third parties (e.g., start-ups) privileged API access to create innovative services on top of their payment services (e.g., through accelerator programs). These newly created third party services (i.e., platform derivatives) are in their nature to a large degree complementary to the core platform service (e.g., driving payment transaction volume). Other innovative payment services (e.g., cryptocurrencies) face hurdles to gain platform access in the first place. Accordingly, our preliminary observations indicate that payment platforms practice selective open innovation to their advantage by leveraging their architectural boundary resources.

5 Contributions to Theory and Practice

The purpose of this study is to bridge knowledge gaps between open innovation and digital platform literature by uncover how digital platforms are designed and

configured to create innovative and disruptive platform derivatives. By advancing a more fine-grained and integrated model of digital platform disruption, we hope to reveal: (1) distinct configurations of digital platforms (i.e., centralized, hybrid, decentralized) which correspond to their potential for market disruption, as well as; (2) business and technology profile which align with these configurations. We argue that different platform configurations create specific innovative and disruptive capabilities. From being initially descriptive and illustrating correlational relationships among the theoretical constructs, it is envisioned that this research proposal sets the foundation to explain causality in terms of predicting, platforms disruptions from a platform incumbent, and disrupter point of view. We are not aware of past studies that have explored the disruptive potential of digital platforms. In this sense, we seek to contribute to theory and practice on three fronts.

First, this study extends the strategic typology from the seminal works of [cf. 5] and Miles, Snow, Meyer and Coleman [9] to the context of digital platforms. To our knowledge, the application of business attributes and strategy typologies to describe *digital platform strategy profiles* has not been done previously.

Second, this research contributes to information systems strategy literature Sabherwal and Chan [35]. Past studies have investigated the attributes of *internal* IT system of organizations and their strategic implications. This research therefore aims to extend this research stream by exploring the implications of intertwined and interdependent *internal* as well as *external systems*.

Third, this research also contributes to open innovation and digital platform literature by bridging knowledge gaps between these two research streams [13]. Although digital platforms practice open innovation and open business models through innovative platform derivatives, there is notable paucity in how organizations integrate and commercialize open innovation [15, 30, 49].

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